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COMMISSION FOR THE GEOLOGICAL MAP OF THE WORLD

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FOREWORD

Not only technology proceeds rapidly. It concerns also the way public geoscientific information is made available to the public and professionals: large databases are supplied by big servers, Geographic Information Systems are now common and more user-friendly. In the meantime, it become increasingly challenging to screen the information and get the most reliable and validated geological support. CGMW occupies a key position in this debate, due to its international reputation and visibility, which makes it the reference for validating international geological maps and attached data bases.

This comes at a price. CGMW is a non-profit geoscience body emanating from the geological surveys of the World. It is also a NGO to which countries participate on a voluntary basis and is therefore subject to the fluctuations of finance and countries' wealth. In this context, we held in February 2018 our Bureau and General Assembly, in the main building of UNESCO in Paris. Thanks to its support and encouragements. During these 3 days of passionate discussions, decisions were taken to revalorize the CGMW membership fees which allows Country Members to ensure they retain a position of influence in the world of Geosciences alongside delegates from other major national geological survey organizations. Major large projects were completed or almost completed and displayed among which the *Tectonic Map of the Arctic at 1:5 M*. and the large *Gondwana geological Map – pre-1st edition*. A spectacular demonstration of the cooperation between countries was shown with the *Geological Map of South America at 1:5 M*. With the new *Structural Map of the eastern Pacific* the World Ocean is close to be completed.

A long term vision was proposed. It is to work towards a fully digital and seamless 1:5M Geological Map of the World. This is now reachable due to the completion of all the 1:5M Maps of the continents and the progress of technology. This new project was advertised at the Deep time Digital Earth IUGS Meeting in February 2019.

Besides the new projects, our organization looks for supplementary resources to sustain its activities and to secure, as far as possible, additional financial support from the industry in order to grant, at the best of its means, the dissemination of its printed and digital products at the most affordable prices, at the same time that it ensures a balanced budget.

PRÉFACE

La technologie n'est pas seule à progresser rapidement, mais avec elle évolue aussi la manière dont une masse d'informations est mise à la disposition du public et des professionnels des Services Géologiques, de la recherche et de l'enseignement. Des bases de données de plus en plus riches sont délivrées par des serveurs de grande capacité, et les Systèmes d'Information Géographique sont devenus plus courants et plus conviviaux. En revanche, il devient de plus en plus difficile de filtrer l'information et d'obtenir des données géologiques les plus fiables et validées. En cela, la CCGM occupe une position clé, en raison de sa réputation et de sa visibilité internationales, ce qui en fait la référence pour la validation des cartes géologiques internationales.

Cela a un prix. La CCGM est un organisme géo-scientifique à but non lucratif émanant des Services Géologiques du monde. C'est aussi une ONG à laquelle les pays participent sur une base volontaire et qui est donc soumise aux fluctuations financières et à la richesse des pays. C'est dans ce contexte que s'est tenu en février 2018 notre réunion du Bureau et notre Assemblée Générale à l'UNESCO à Paris. Grace à son son soutien et ses encouragements, au cours de ces 3 jours de discussions passionnantes, des décisions ont été prises pour revaloriser le montant du support à la CCGM qui permet aux Pays Membres de conserver une position d'influence dans le monde des Géosciences. De grands projets majeurs ont été achevés ou presque terminés parmi lesquels la carte tectonique de l'Arctique au 1:5 M. et la grande carte géologique du Gondwana - pré-1ère édition. Une démonstration spectaculaire de la coopération entre les pays s'est concrétisée avec la carte géologique de l'Amérique du Sud au 1:5 M. Avec la nouvelle carte structurale du Pacifique oriental, la carte de l'océan mondial est presque terminée. D'autres projets plus récents ont été présentés et de nouvelles propositions ont été faites.

Une vision à long terme est ainsi de travailler à la réalisation d'une carte géologique du monde au 1:5M entièrement numérique. Ceci est aujourd'hui faisable grâce à l'achèvement de toutes les cartes au 1:5M des continents ainsi qu'aux progrès technologiques.

Outre les nouveaux projets, notre organisation recherche des ressources supplémentaires pour pérenniser ses activités et obenir, dans la mesure du possible, un soutien financier supplémentaire de la part de l'industrie afin d'assurer, la diffusion de ses produits imprimés et numériques à des prix raisonnables, tout en garantissant un budget équilibré.

Manuel Pubellier
CGMW President

Paris. Mars 2019

OBITUARY

Our colleague, **Professor Jean Sougy** passed away on Thursday 26 January 2017 at the age of 89, in his home at Hyères (southern France). He was a well-known and widely acknowledged French geoscientist who devoted a large part of his career to geological studies on Western Africa.

Jean Sougy graduated in 1961 as a geo-engineer at the ENSG (France's leading Grande École in Geosciences). He started teaching geology at the University of Dakar, Senegal (1960-1967) and in 1968 he was appointed Professor of Geology at the University of Marseille. In 1985 he was appointed Director of the Research Laboratory on the Geology of Western Africa at the University of Marseille. Two of his main scientific acomplishments have been to establishe the existence of the Panafrican chain as early as in 1957, and demonstrated (1962, 1964) that the unconformity, in Mauritania, of horizontal sandstones onto metamorphic basement previously observed in the Adrar and interpreted by A. Blanchot as Lower Proterozoic on Archean (1955) was in reality a series of late Precambrian sediments thrust by the tectonic nappe of Mauritanides that he correlated with the Appalachians.

Jean Sougy served as **Secretary General** of the **CGMW Sub-commission for Africa** from 1985 to 2004 and was entrusted, in November 1987, together with R. M. Schackleton (Imperial College, U.K.), of the coordination of the synthesis of the second edition of the **Tectonic Map of Africa** which was achieved in 2010 by J. P. Milesi and D. Frizon.

Jean Sougy combined his activities at CGMW with the creation of a non-profit association to protect the environment of his home country. The association known as A.P.G (Association des Amis de la Presqu'île de Giens) develops scientific studies for the awareness and preservation of the natural environment of this area of southern France and regularly organizes outreach actions aimed at the general public and in particular young people.

NÉCROLOGIE

*Notre collègue, le **professeur Jean Sougy** est décédé le jeudi 26 janvier 2017 à l'âge de 89 ans à son domicile à Hyères (sud de la France). Géologue français reconnu et réputé, il a consacré une grande partie de sa carrière aux études géologiques sur l'Afrique de l'Ouest.*

***Jean Sougy** a obtenu son diplôme d'Ingénieur-géologue en 1961 à l'Ecole Nationale Supérieure de Géologie à Nancy. Il a commencé à enseigner la géologie à l'Université de Dakar, au Sénégal (1960-1967). Il a été professeur de géologie à l'Université de Marseille de 1968 à 1985. En 1985, il a été nommé directeur du laboratoire de recherche sur la géologie de l'Afrique de l'Ouest à l'Université de Marseille III. Deux de ses principaux résultats de recherche ont établi l'existence de la chaîne panafricaine dès 1957 et démontré (1962, 1964) que la discordance, en Mauritanie, de grès horizontaux sur des socles métamorphiques observés auparavant dans l'Adrar et interprétés par A. Blanchot comme Protérozoïque inférieur sur Archéen (1955) était en réalité une série de sédiments du Précambrien supérieur poussés par la nappe tectonique des Mauritanides, qu'il a corrélée avec les Appalaches.*

***Jean Sougy a été Secrétaire Général de la sous-commission de la CCGM pour l'Afrique** de 1985 à 2004 et chargé en novembre 1987, avec R. M. Schackleton (Imperial College, Royaume-Uni) de la coordination de la synthèse de la deuxième édition de **la carte tectonique de l'Afrique** qui a été achevée en 2010 par J. P. Milesi et D. Frizon.*

***Jean Sougy** a combiné ses activités à la CCGM avec la création d'une association à but non lucratif visant à protéger l'environnement de la région où il était domicilié. L'association connue sous le nom d'AAPG (Association des Amis de la Presqu'île de Giens) développe des études scientifiques pour la sensibilisation et la préservation de l'environnement naturel de cette région du sud de la France et organise régulièrement des actions de sensibilisation destinées au grand public et en particulier aux jeunes.*

Our colleague, the academician **Yuri Leonov** passed away on November 5, 2017 after a serious illness at the age of 82.

Yuri Leonov was born on the 15th of November, 1934. In 1957, he graduated from the Lomonosov Moscow State University (Geological Faculty) and then worked in the field of stratigraphy, tectonics, regional geology, seismotectonics, and tectonic cartography.

In 1964 he wrote a thesis on the stratigraphy and tectonics of Jurassic rocks of the Greater Caucasus and received the degree of Doctor Ph.

In 1979 **Yuri Leonov** wrote a thesis on the global correlation of tectonic movements on the example of Early and Middle Paleozoic and received the degree of Doctor Sci.

Yuri Leonov was a member of the Editorial Board, regional coordinator over the USSR and Near-Middle East territory and the leader of works on the International Tectonic Map of the World.

Yuri Leonov worked at the Geological Institute of the USSR Academy of Sciences he was Vice-president of the Commission for International Tectonic Maps of the USSR Academy of Sciences.

During almost forty years **Yuri Leonov** worked at the CGMW, first as the Secretary General of the Subcommission on Tectonic Maps and from 1996 to 2012 as its President.

At the CGMW, the following important maps were compiled with his direct participation: the *Tectonic Map of the World, scale 1:45,000,000, International Tectonic Map of the World, scale 1:15,000,000*, Monograph *Tectonics of Continents and Oceans – Explanatory Note to the International Tectonic Map of the World, scale 1:15,000,000* (1988, in English and Russian). The *International Tectonic Map of Europe, scale 1:5,000,000* still remains one of the best examples of tectonic maps published under the auspices of the CGMW.

The memory of **Yuri Leonov**, one of the most active figures of the CGMW, will always stay in the memory of those who knew him well.

*Notre collègue, l'académicien **Youri Leonov** est décédé, le 5 novembre 2017, des suites d'une grave maladie à l'âge de 82 ans.*

***Yuri Leonov** est né le 15 novembre 1934. En 1957, il a été diplômé de l'Université d'État Lomonossov de Moscou (faculté de géologie) puis travailla dans les domaines de la stratigraphie, de la tectonique, de la géologie régionale, de la sismotectonique et de la cartographie tectonique.*

En 1964, il a soutenu une thèse sur la stratigraphie et la tectonique des roches jurassiques du Grand Caucase et a obtenu son doctorat (Ph.D).

*En 1979, **Youri Leonov** a soutenu une thèse sur la corrélation globale des mouvements tectoniques sur l'exemple du Paléozoïque ancien et moyen et a obtenu le titre de Docteur ès Sci.*

***Youri Leonov** était membre du comité de rédaction, coordinateur régional pour les territoires de l'URSS et du Proche-Orient et responsable des travaux sur la carte tectonique internationale du Monde.*

***Yuri Leonov** a travaillé à l'Institut de géologie de l'Académie des sciences de l'URSS. Il a été vice-président de la Commission des cartes tectoniques internationales de l'Académie des sciences de l'URSS.*

*Pendant près de quarante ans, **Yuri Leonov** a d'abord exercé les fonctions de Secrétaire Général de la Sous-Commission des cartes tectoniques à la CCGM et de 1996 à 2012 en tant que Président.*

À la CCGM, les principales cartes suivantes ont été compilées avec sa participation directe : Carte tectonique du monde à l'échelle 1/45 000 000, Carte tectonique internationale du monde à l' échelle 1/15 000 000, Monographie Tectonique des continents et des océans - Note explicative Carte tectonique du monde, à l'échelle 1/15 000 000 (1988, en anglais et en russe). La carte tectonique internationale de l'Europe, à l'échelle 1/5 000 000, reste l'un des plus fameux exemples de cartes tectoniques publiées sous les auspices de la CCGM.

*La mémoire de **Yuri Leonov**, l'une des personnalités les plus actives de la CCGM, restera toujours dans la mémoire de ceux qui l'ont bien connu.*

Our colleague, academician **Jean Dercourt,** former President of the Commission for the Geological Map of the World (CCGM) from 1992 to 2000, passed away on March 22, 2019 at 84.

Jean Dercourt was born on March 11th, 1935. He graduated as Docteur ès Sciences in 1964 at the University of Paris. He taught, as a Professor at Lille University, from 1965 to 1979, and at Pierre et Marie Curie University in Paris from 1979 to 1990. On April 15, 1991, he was elected to the Academy of Sciences; of which he was Perpetual Secretary from 1995 to 2004. He was also a member of mathematical and physical sciences. He was too member of five foreign academies and of Academia Europaea. In 1969, he was invited researcher at the University of Edmonton (Alberta, Canada) and in 1987-1988 at the Imperial College (London, UK). From 1987 to 1992, he was co-director (with L. E. Ricou, CNRS, Paris) of the Tethys program and from 1993 to 2001 (with M. Gaetani, University of Milano) of the Peri-Tethys program.

He was Vice-Chairman of the Organizing Committee of the 26th International Geological Congress, Commission for Field Sessions, Paris (1975-1980), Member and then Chairman of the Tectonic Commission (COMTEC) of the International Union of Geological Sciences (IUGS) (1980-1992), Chairman of the Executive Commission of the Middle-East Basins Evolution Program (2003-2007) and Member of the Société Géologique de France since 1957, and its president in 1984-1985.

After contributing to the geological study part of the Northern Peloponnese and the Eastern Mediterranean (1958-1968), **Jean Dercourt** turned to the geodynamics of the Canadian Cordillera. At the time when the hypothesis of plate tectonics was emerging, he participated to the reconstruction of the main domains of this Cordillera and highlighted ophiolitic material thrust sheets reflecting the crash of a Paleozoic ocean (300 million years) at the heart of the chain (1968-1972). The comparison with part of the Alpine chain showed the extension of global tectonics to the ancient history of the Earth.

Jean Dercourt used multi-criteria stratigraphy, which proved to be the relevant tool for large-scale stratigraphic correlations. He participated to a multidisciplinary study (biostratigraphy, magnetostratigraphy, chemostratigraphy) of sedimentary series that identified the shortest deposition units at a given site (1979-1987).

Notre collègue, l'académicien Jean Dercourt, ancien président de la Commission de la Carte Géologique du Monde (CCGM) de 1992 à 2000, est décédé le 22 mars 2019 à l'âge de 84 ans.

***Jean Dercourt** est né le 11 mars 1935. Il obtint son diplôme de Docteur ès Sciences en 1964 à l'Université de Paris. Il a été professeur de 1965 à 1979 à l'Université de Lille et de 1979 à 1990 à l'Université Pierre et Marie Curie. Le 15 avril 1991, il fut élu membre de l'Académie des Sciences dont il a été le secrétaire perpétuel de 1995 à 2004. Il fut également membre des sciences physiques et mathématiques. Il fut également membre de cinq académies étrangères et de l'Academia Europaea. Il a été chercheur invité en 1969 à l'Université d'Edmonton (Alberta, Canada) et en 1987-1988 à l'Imperial College (Londres, Royaume-Uni). De 1987 à 1992, il a été codirecteur (avec L. E. Ricou, CNRS, Paris) du programme Téthys et de 1993 à 2001 (avec M. Gaetani, Université de Milan) du programme Péri-Téthys.*

Il a été vice-président du comité d'organisation du 26ème Congrès Géologique International, Commission des sessions de terrain à Paris (1975-1980), membre puis président de la Commission Tectonique (COMTEC) de l'Union Internationale des Sciences Géologiques (IUGS) (1980-1992), Président de la commission exécutive du programme d'évolution des bassins du Moyen-Orient (2003-2007) et membre de la Société Géologique de France depuis 1957, dont il en a été président en 1984-1985. Après avoir contribué à l'étude géologique du nord du Péloponnèse et de la Méditerranée orientale (1958-1968), Jean Dercourt s'est tourné vers la géodynamique de la Cordillère canadienne. Au moment où l'hypothèse de la tectonique des plaques faisait jour, il participa à la reconstruction des principaux domaines de cette Cordillère et mis en avant des nappes ophiolitiques reflétant l'obduction d'un océan paléozoïque (300 millions d'années) au cœur de la chaîne (1968-1972). La comparaison avec une partie de la chaîne alpine a montré l'extension de la tectonique globale à l'histoire ancienne de la Terre.

Jean Dercourt a utilisé la stratigraphie multicritères, qui s'est avérée être l'outil pertinent pour les corrélations stratigraphiques à grande échelle. Il a participé à une étude multidisciplinaire (biostratigraphie, magnétostratigraphie, chimiostratigraphie) de séries sédimentaires identifiant les unités de dépôt les plus courtes sur un site donné (1979-1987).

Jean Dercourt focused on the palaeodynamics and paleoenvironment of the Tethys in two international programs (Tethys and Peri-Tethys, 1987-2004) involving researchers and engineers from universities, public research institutions, national geological surveys and oil companies. This ocean opened 250 million years ago in the Permian Pangaea, which separated the northern continents from the southern ones, then closed 80 million years ago leaving only the central Atlantic and surviving today. He mapped several periods from the opening to the current closure, which allowed him to establish the marine and terrestrial environments of this globally significant area.

Those who knew him well will never forget Jean Dercourt.

Jean Dercourt s'est concentré sur la paléodynamique et le paléoenvironnement de la Téthys dans deux programmes internationaux (Téthys et Péri-Téthys, 1987-2004) associant des chercheurs et ingénieurs d'universités, d'instituts de recherche publics, d'études géologiques nationales et de compagnies pétrolières. Cet océan s'est ouvert il y a 250 millions d'années dans la Pangée Permienne qui séparait les continents septentrionaux des continents méridionaux, puis s'est fermé il y a 80 millions d'années pour ne laisser que l'Atlantique central et survivre aujourd'hui. Il a cartographié plusieurs périodes allant de l'ouverture à la fermeture actuelle, ce qui lui a permis de reconnaître les environnements marins et terrestres de cette zone d'importance mondiale.

Ceux qui l'ont bien connu n'oublieront jamais Jean Dercourt.

RESOLUTIONS OF THE CGMW
GENERAL ASSEMBLY
Paris – UNESCO
23 February 2018

RÉSOLUTIONS DE
L'ASSEMBLÉE GÉNÉRALE DE LA CCGM
Paris - UNESCO
23 février 2018

THE COMMISSION

1. **expresses its thanks** to the UNESCO for its support to the activities of the CGMW and for providing the facilities for the holding of this General Assembly in Paris, and
2. **thanks** Dr. P. J. Mac Keever, Chief of UNESCO Global Earth Observation Section, for his support to CGMW mapping programs, and
3. **thanks** Dr. **Teresa Ponce de Leão**, Eurogeosurveys President for her introductive lecture opening the CGMW General Assembly, and
4. **thanks** IUGS for its active support to CGMW and Episodes' Chief Editor for contributing to the promotion and visibility of CGMW publications, and
5. **thanks** the IUGG Secretary General Dr. **Alik Ismail-Zadeh** for its encouragements and suggestions to compile new maps, and
6. deeply **regrets** the death of Prof. Acad. **Yuri Leonov**, late CGMW President for the S/C for Tectonic Maps, and
7. **acknowledges** the following changes in the CGMW Bureau decided in the last CGMW General Assembly held in Cape Town (South Africa):
   - Dr. **Philippe Rossi** leaves his position of CGMW President and is replaced by Dr. **Manuel Pubellier**, and
   - Dr. **Pierre Nehlig**, former Deputy Secretary General, is nominated as CGMW Secretary General, and
   - Dr. **Bruno Vrielynck**, current Financial supervisor is nominated as CGMW Deputy Secretary General, and
8. **endorses** the changes in the following new Bureau Members:
   - M. **Peter Miles**, President of the CGMW S/C for Seafloor maps is appointed Advisor to the Executive Board, and
   - Dr. **Nicolay Chamo**v leaves his position of CGMW President of the S/C for Tectonic Maps and Acad. **Alexander Khanchuk** is appointed to replace him, and
   - Dr. **Martín Gozalvez** is appointed Secretary General of the CGMW S/C for Metallogenic maps, and
   - Dr. **Eikichi Tsukuda** leaves his position of CGMW President of the S/C for Natural Hazards maps and Dr. **Shinji Takarada** is appointed to replace him, and
   - **Acad. Ren Jishun** leaves his position of CGMW Vice-President of the S/C for South and East Asia and Prof. **Wu Zhenhan** is appointed to replace him, and
   - **Dr Jin Xiaochi** leaves his position of CGMW Deputy Secretary General of the S/C for South and East Asia and Dr. **Zhao Lei** is appointed to

LA COMMISSION

1. **tient à remercier** l'UNESCO pour son aide aux activités de la CCGM et pour son hospitalité qui a permis de tenir de son Assemblée Générale à Paris, et
2. **remercie le** Dr. P. J. Mac Keever, Chef de la Section Observation Globale de la Terre à l'UNESCO pour son soutien aux programmes de cartographie de la CCGM, et
3. **remercie** la Dre. **Teresa Ponce de Leão**, Présidente d'Eurogeosurveys pour son allocution d'ouverture de l'Assemblée Générale de la CCGM, et.
4. **remercie** l'IUGS pour son support actif ainsi que le rédacteur en chef d'Épisodes pour son soutien à la promotion et à la visibilité des publications de la CCGM,
5. **remercie** le Dr. **Alik Ismail-Zadeh** Secrétaire Général de l'IUGG pour ses encouragements et ses suggestions pour la compilatin de nouvelles cartes, et
6. **exprime son émotion** suite au décès du Prof. Acad. **Yu. Leonov**, ancien Président de la S/C de la CCGM pour les cartes tectoniques, et
7. **prend acte** des changements suivants, au sein du Bureau de la CCGM, décidés lors de la dernière Assemblée Générale au Cap (Afrique du Sud):
   - Le Dr. **Philippe Rossi** quitte son poste de Président de la CCGM et est remplacé par le **Dr. Manuel Pubellier**, et
   - Le Dr. **Pierre Nehlig**, précédemment Secrétaire Général adjoint, est nommé Secrétaire Général de la CCGM, et
   - Le Dr. **Bruno Vrielynck**, actuel Superviseur financier, est nommé Secrétaire Général adjoint de la CCGM, et
8. **entérine** les modifications suivantes des nouveaux membres du Bureau :
   - M. **Peter Miles** President de la S/C de la CCGM pour les Cartes océaniques est nommé Conseiller auprès du Bureau exécutif et,
   - Le Dr. **Nicolay Chamov** quitte son poste de Président de la S/C de la CCGM pour les Cartes tectoniques et l'Acad. **Alexander Khanchuk** est nommé pour le remplacer, et
   - Le Dr. **Martín Gozalvez** est nommé Secrétaire Général de la S/C de la CCGM pour les cartes métallogéniques, et
   - Le Dr. **Eikichi Tsukuda** quitte son poste de Président de la S/C de la CCGM pour les cartes de Risques naturels et le Dr. **Shinji Takarada** est nommé pour le remplacer, et
   - L'Acad. **Ren Jishun** quitte son poste de Vice-Président de la S/C de la CCGM pour l'Asie du Sud et de l'Est et le Prof. **Wu Zhenhan** est nommé pour le remplacer, et
   - Le Dr **Jin Xiaochi** quitte son poste de Secrétaire Général Adjoint de la S/C de la CCGM pour l'Asie

replace him, and

- Dr **Carlos Schobbenhaus** leaves his position of CGMW Vice-President for South America and M. **Jorge Gómez Tapias** is appointed to replace him, and
- Mr. **Jorge Gómez Tapias** leaves his position of CGMW Secretary General for South America and **Dr. Lêda Maria Fraga** is appointed to replace him, and

9. **warmly thanks:**
   - the Geological Surveys which, in addition to their membership fees, provided the Commission support through the expertise of their geologists, researchers, engineers and technicians who participated in regional, continental and oceanic syntheses to compile CGMW maps, and
   - **acknowledges** and **thanks Clara Cardenas** for her strong commitment and support for the Commission during the past 22 years and

FINANCIAL COMITTEE

10. **acknowledges** the comments of the Financial committee and **thank** the meticulous work of Bruno Vrielynck presenting the annual balances and financial statistics for the last 15 years (2003-2017) and **approves** the balance, and
11. **agrees** the conclusions of the Financial Committee that membership fees did not change over the last 18 years and must be adjusted, and **follows** the proposal of the Financial Committee to submit on this occasion a resolution to do so during the period 2018-2020 and **is informed** that the increase of Consumer Price Index (CPI) amounts to 27% over the 2003-2017, and **is aware** of the dramatic deterioration of the financial balance and that failing to follow the recommendations of the Financial Committee, CGMW will not make it to the 38th IGC 2024 in Korea, and therefore **decides** as follows:
    - a 10% increase of the Membership fees will be implemented in 2018 and 2019 and a modification of Categories proposed to Country and Associate Members on a voluntary basis;
    - starting 2020 Membership fees will be indexed to CPI for compensation of the monetary fluctuations (OECD level proposed);
    - in order to help CGMW to bail out the current deficit, Members are encouraged to seek for private or public grants or donations, and
12. **was informed** that CGMW sales dropped significantly and constantly over the last years despite new products. Suggestions by the Bureau in changing the sales strategy, especially of digital products is welcomed and endorsed, and
13. **suggests** investing to contact more sponsors is welcomed and **expresses** the wish that a Bureau Member act as Sales Promoter, with well-defined task and aim, and

du Sud et de l'Est et le **Dr. Zhao Lei** est nommé pour le remplacer, et

- Le Dr **Carlos Schobbenhaus** quitte son poste de Président de la CCGM pour l'Amérique du Sud et M. **Jorge Gómez Tapias** est nommé pour le remplacer, et
- M. **Jorge Gómez Tapias** quitte sa position de Secrétaire Général de la S/C de la CCGM pour l'Amérique du Sud et la **Dre Lêda Maria Fraga** est nommée pour le remplacer, et

9. **remercie chaleureusement**
   - les Services Géologiques qui, en sus de leurs cotisations régulières, ont soutenu la Commission en particulier grâce au travail de leurs géologues, chercheurs, ingénieurs et techniciens qui ont travaillé à des synthèses régionale, continentale et océanique pour compiler les cartes de la CCGM, et
   - **prend acte** et **remercie** Clara Cardenas pour son implication totale et son dévouement à la Commission durant ces 22 dernières années, et

COMITÉ FINANCIER

10. **prend acte** des remarques du Comité financier et remercie Bruno Vrielynck pour son travail méticuleux présentant les comptes annuels et les statistiques financières des 15 dernières années (2013-2017) et **approuve** les comptes, et
11. **donne son quitus** aux conclusions du Comité financier quant à l'ajustement nécessiare des cotisations qui sont restées inchangées depuis 18 ans et **suit** la proposition du Comité financier de soumettre à cette occasion une résolution de procéder à cet ajustement au cours de la période 2018-2020 et **est informé** que l'augmentation des prix à la consommation (CPI) a augmenté de 27% durant la période 2003-2017, et **est au courant** de la sérieuse détérioration des comptes et que faute de suivre les recommandations du Comité financier, la CCGM ne pourra pas particper au 38e CGI en Corée, et donc **décide** ce qui suit :
    - une augmentation de 10% des cotisations des membres en 2018 et 2019 et une modification des catégories proposées aux pays et aux Membres associés sur la base du volontariat, et
    - à partir de 2020, les cotisations des membres seront indexées sur le CPI pour tenir compte des fluctuations monétaires, et
    - pour aider la CCGM à résorber son déficit actuel, les Membres sont encouragés à rechercher des dons privés ou publics ou des donations, et
12. **ont été informés** que les ventes de la la CCGM ont décru significativement ces dernières années en dépit de nouveaux produits. Les suggestions du Bureau pour changer la stratégie des ventes en se tournant plus particulièrement vers les produits numériques est bienvenue et approuvée, et
13. **suggère** que rechercher à contacter davantage de sponsors est **bienvenu** et **forme** le vœu qu'un membre du Bureau assure le rôle de promoteur des ventes, avec une tache et un but bien définis, et

CONTINENTAL SUBCOMMISSIONS
SUBCOMMISSION FOR EUROPE

14. **acknowledges** the progress of the cooperative project of *International Quaternary Map of Europe at 1:2.5 M scale (IQUAME),* compiled under the umbrella of INQUA and CGMW with the scientific and technical support of BGR and **takes note** that an event for this project is planned for the next IGC 36 to be held in March 2020 at New Delhi (India), and

15. **thanks** the participants of the IQUAME 2500 for their contributions particularly during the harmonization workshop held from December 11th to 13th 2017 in Berlin at BGR, and

16. **encourages** and appreciates the coordination and compilation work on the International Quaternary Map of Europe (IQUAME 2500) by Dr. Kristine Asch and the team at BGR and **thanks** the participants and scientific advisors of the IQUAME for the continuing support.

17. **takes note** of the *EMODnet* project, an EU project that adapted principles of the OneGeology-Europe project and the INSPIRE Directives for the European marine regions, and

18. **supports** the realization of an IQUAME session at the next INQUA congress in Dublin in 2019 and **encourages** the standardization work within the CGMW/IQUAME-EMODnet Working Group on (marine) geomorphology led by Dr. Kristine Asch, and

19. **appreciates** the synergies and good cooperation between the Subcommissions of Europe and the Middle East in their work on the Quaternary Maps of Europe and Middle East.

SUBCOMMISSION FOR AFRICA

20. **takes notes** of the project of compiling the *Tectonic Map of Africa* especially dealing with the representation of the basement sand of the Eastern offshore and encouraged the coordination with the Western part of the second edition of the Structural map of the Indian ocean to be presented to the next IGC 36; and

21. **encourages** the Working Group on the *Seismotectonic Map of Africa* to pursue their activities, in cooperation with UNESCO, focusing on seismic hazard assessment in some of the Earthquake-prone major cities in Eastern Africa.

SUBCOMMISSION FOR NORTH AND CENTRAL AMERICA

22. **appreciates** the presentation of the complete draft of the *Structural Map of the Caribbean at 1:4 M scale* carried in collaboration with the CGMW S/C for North and Central America, the S/C for South America and the S/C for Seafloor maps and **thanks** the numerous experts and namely Dr Andreina García (Venezuela) for her new interpretation of the offshore geophysical data carried out in the framework of her Ph.D. and the Total oil company for providing expertise and ensuring the digitization and design of the map, and

SOUS-COMMISSIONS CONTINENTALES
SUBCOMMISSION POUR L'EUROPE

14. **prend acte de** la progression du projet coopératif de la *Carte Internationale du Quaternaire de l'Europe* à 1:2,5 M (*IQUAME*), compilé sous l'égide de l'INQUA et de la CCGM, avec le soutien scientifique et technique du BGR et **prend note** que l'achèvement de ce projet est prévu pour le prochain 36e CGI qui se tiendra, en mars 2020, à New Dehli (Inde), et

15. **remercie** les participants au projet *IQUAME 2500* pour leurs contributions, en particulier au cours de l'atelier d'harmonisation en qui s'est tenu au BGR à Berlin du 11 au 13 décembre 2017, et

16. **encourage et apprécie** le travail de coordination et de compilation mené sur la *Carte Internationale du Quaternaire de l'Europe* (IQAME 2500) par le Dr. Kristine Asch et son équipe du BGR et remercie les participants et les conseillers scientifiques pour leur soutien continu, et

17. **prend note** du projet européen *EMODnet* qui vise à poursuivre le projet OneGeology-Europe en l'adaptant à la façade maritime européenne, et

18. **supporte** la réalisation d'une session IQUAME au prochain congrès INQUA qui se tiendra à Dublin en 2019 et encourage le travail de standardisation mené au sein du groupe de travail en géomorphologie marine CGMW/IQUAME-EMODnet conduit par le Dr. Kristine Asch, et

19. **apprécie** les synergies et la bonne coopération entre les Sous-commissions pour l'Europe et le Moyen-Orient dans leur travail sur les cartes du Quaternaire de l'Europe et du Moyen-Orient, et

SOUS-COMMISSION POUR L'AFRIQUE

20. **prend note** du projet d'actualisation de la *Carte Tectonique de l'Afrique*, en particulier pour ce qui concerne les socles et la partie marine de la façade orientale qui devra être coordonnée avec la nouvelle édition de *la Carte structurale de l'Océan Indien* qui sera présentée au prochain 36e CGI, et

21. **encourage** le groupe de travail sur la *Carte sismotectonique de l'Afrique* à pouruivre ses activités, en coopération avec l'UNESCO, en se concentrant sur l'évaluation du risque sismique dans les grandes villes soumises à un risque de tremblement de terre, et

SOUS-COMMISSION POUR L'AMÉRIQUE DU NORD ET CENTRALE

22. **apprécie** la présentation de la *Carte Structurale des Caraïbes* à 1:4 M, réalisée en collaboration avec les S/C de la CCGM pour l'Amérique Centrale et du Nord, pour l'Amérique du Sud et pour les Cartes structurales des océans et **remercie** les nombreux experts et en particulier la Dre Andréïna García (Vénézuela) pour sa nouvelle interprétation de la géophysique de la partie maritime réalisée dans le cadre de son doctorat ainsi que la compagnie Total pour son expertise et la prise en charge de la digitalisation de la carte, et

23. **prend acte** du projet de compilation structurale des cordillères nord-américaines de l'Alaska à l'Amérique

23. **acknowledges** the project of a structural compilation of the North American Cordillera from Alaska to Central America tied hopefully in the near future to a sister project to be realized in South America from Colombia to Tierra de Fuego, and

24. **suggest**s this project of a structural map of the Cordillera could serve as a support for a metallogenic layer, as it is being realized in Central America, and

SUBCOMMISSION FOR SOUTH AMERICA

25. **thanks** the Geological Survey of Colombia (GSC) for its support to the realization of the *Geological Map of South America (GMSA)* under the aegis of CGMW and the Ibero-American Association of Geological and Mining Surveys (ASGMI), with the collaboration of geological surveys and several universities of the continent; the project was placed under the general coordination of Jorge Gómez Tapias (SGC) and Nohora Montes for the building of the GIS, together with his supervision for the Andean Orogen, and Carlos Schobbenhaus's (CPRM) for the South American Platform and for the technical and scientific support from SGC and CPRM, and

26. **thanks** CPRM for having approved the inclusion of the *Geological Map of the Amazonian Craton at 1:2.5 M* as part of its work program for the 2017-2018 biennium, and **acknowledges** the presentation of the first draft of the *Geological Map of the Amazonian Craton at 1:2.5 M,* under the coordination of Lêda Maria Fraga from the Geological Survey of Brazil (CPRM), and

27. **acknowledges** the project of preparation of a *Geoheritage Map of South America* as defined by Carlos Schobbenhaus, and

28. **listens carefully to** the advancement of the project of *Geological and Mineral Resources Map of South America at 1:1 M and related database (GIS-South America 1:1 M)***,** an initiative of ASGMI with endorsement of CGMW, and

SUBCOMMISSION FOR SOUTH AND EAST ASIA

29. **acknowledges** the accomplished compilation of the 1:10M reduced scale of IGMA (IGMA 10M) in 2018 and **were informed** of its next publication in 2019, and

30. **is informed** that the subcommission continues the tectonic studies on East and South Asia and the compilation of the International Tectonic Map of East and South Asia (ITMESA) in 2018, and

31. **appreciates** the compilation of the first draft of ITMESA to be ready in 2019 and i**s informed** of the holding of an International symposium on Asian tectonics in Beijing in the autumn of 2019, and

32. **thanks** the keen support of the subcommission for South and East Asia for the project of ITMA 5000 and very ready to cooperate with other CGMW Subcommissions, and

SUBCOMMISSION FOR THE MIDDLE EAST

33. **appreciates** the efforts of the Subcommission, with the

centrale qui pourrrait souhaitablement être relié dans un futur proche à un projet jumeau à mettre en œuvre en Amérique du Sud, entre la Colombie et la Terre de Feu, et

24. **suggère** que le projet de carte structurale des Cordillères serve de support à la couche d'information métallogénique, comme cela se fait actuellement en Amérique centrale, et

SOUS-COMMISSION POUR L'AMÉRIQUE DU SUD

25. **remercie** le Service Géologique Colombien (SGC) qui a supporté la réalisation de la *Carte Géologique de l'Amérique du Sud* (*GMSA*) à 1:5 M sous l'égide de la CCGM et de l'Association des Services Géologiques et Miniers Ibéro-Américains (ASGMI) avec la collaboration de la majorité des services géologiques et de certaines universités du continent; le projet de cartographie a été réalisé sous la coordination générale de Jorge Gómez Tapias qui a en outre supervisé la partie andine tandis que Carlos Schobbenhaus a coordonné la plate-forme d'Amérique du Sud et avec l'appui technique et scientifique de la CRPM et du SGC, et

26. **remercie** la CPRM pour avoir approuvé l'insertion de la Carte géologique du craton amazonien à 1 :2,5M comme un élément de son programme de travail pour la biennale 2017-2018, et prend acte de la présentation de la première maquette de la Carte géologique du craton amazonien à 1 :2,5M, sous la coordination de Lêda Maria Fraga du Service Géologique du Brésil (CPRM), et

27. **prend acte** du projet de préparation d'une Carte du patrimoine géologique de l'Amérique du Sud proposée par Carlos Schobbenhaus, et

28. **prête attention** à l'avancement du projet sur les Ressources géologiques et Minières de l'Amérique du Sud à 1 :1M et de sa base de données associée (SIG Amérique du Sud à 1:1M), une initiative de l'ASGMI approuvée par la CCGM, et

SOUS-COMMISSION POUR L'ASIE DU SUD ET DE L'EST

29. **prend acte** de l'achèvement de la compilation à l'échelle de 1 :10M de la carte IGMA(IGMA10M) et **a été informée** de sa prochaine publication en 2019, et

30. **a été informée** que la subcommission poursuit des études tectoniques en Asie de d'Est et du Sud ainsi que la compilation de la *Carte Tectonique Internationale de l'Est et du Sud de l'Asie* (ITMESA), et

31. **apprécie** que la compilation de la première maquette de l'ITMESA soit prête en 2019 et est informée de la tenue d'un symposium international sur la Tectonique del'Asie à Pékin à l'automne 2019, et

32. **remercie** le concours enthousiaste de la Sous-commission pour l'Asie du Sud et de l'Est pour le projet ITMA 5000 et est tout à fait prête à coopérer avec les autres commissions de la CCGM, et

SOUS-COMMISSION POUR LE MOYEN-ORIENT

33. **apprécie** les efforts déployés par la Sous-Commission, avec l'appui du Service Géologique d'Iran, qui ont abouti à la présentation du projet de

support of the Geological Survey of Iran, that led to the presentation of the draft of the second edition of the *International Geological Map of the Middle East (IGMME) at 1:5 M scale* at the present CGMW General Assembly, and

34. **acknowledges** the advancement of the Quaternary Map (IQMME) and the Tectono-Magmatic Map (TMMME) to be reviewed before the next General Assembly in New-Dehli 2020 and the launching of a project of a Metamorphic Map of the Middle East (IMMME) after the completion of those maps, and

35. **appreciates** the collaborative meetings between IQUAME 2500 and IQUAMME and **recommends** ensuring the best fit between these two maps particularly in the overlapping zone between Asia and Europe, and

SUBCOMMISSION FOR NORTHERN EURASIA

36. **acknowledges** the changes performed in the legend and content of the 1: 5M *Tectonic Map of the Arctic* - TeMAr after workshops held in February and March 2017 in Paris, and in April 2017 in Vienna, and

37. **acknowledges** the completion of the Tectonic Map of the Arctic at 1:5 M under the aegis of UNESCO, and **addresses** CGMW to prepare a version of the map for educational purposes at a scale of 1:10M based on the 1:5M TeMAR, and

38. **endorses** the initiative by the Subcommissions for Northern Eurasia and Tectonic Maps to prepare the *International Tectonic Map of the Earth's Northern and Southern Hemispheres* at 1:25M and 1:50M scales using the recent CGMW maps published or in progress, and

39. **acknowledges** the invitation of the VSEGEI to hold a working meeting on the new international project International Tectonic Map of the Earth's Northern and Southern Hemispheres at 1:25M and 1:50M scales this autumn at VSEGEI (St. Petersburg) with the support of CGMW Subcommissions, and

40. **welcomes** the long-term close cooperation with the S/C for Tectonic Maps (Russian Academy of Sciences) in implementing international projects on the compilation of tectonic and other geological maps, **expresses** gratitude to Dr. Nikolai Chamov for his fruitful work as President of the Subcommission in 2016-2018 and welcomes Academician Aleksandr Khanchuk in relation with his election to the position of President of the Sub-Commission, and

41. **acknowledges** that after the publication of geological and tectonic maps of regions for the whole of Asia in the past 10 years (*International Geological Map of Asia* - IGMA-5000, *Tectonic Map of Central Asia and Adjacent Areas* 1: 2.5M, *Tectonic Map of Northern-Central-Eastern Asia and Adjacent Areas* 1: 2.5M, 1:5M *International Tectonic Map of the Arctic* (TeMAR), currently there are prerequisites for the map renovation based on an updated legend to prepare the *International Tectonic Map of Asia* - ITMA-5000, suspended in 2006, and

deuxième édition de la *Carte Géologique Internationale du Moyen-Orient* (*IGMME*) à l:5 M, à la présente Assemblée générale, et

34. **constate** la progression de la *Carte du Quaternaire* (*IQMME*) et de la *Carte Tectono-Magmatique* (*TMMME*) à finaliser et examiner lors de la prochaine Assemblée Générale à Paris 2018 ainsi que le lancement d'un projet d'une *Carte Métamorphique du Moyen-Orient* (*IMMME*) à l'issue de la finalisation de ces cartes, et

35. **apprécie** la tenue de réunions collaboratives entre *QUAME 2500* et *IQUAMME* et **recommande** d'assurer le meilleur ajustement entre ces deux cartes, en particulier dans la zone de recouvrement entre l'Asie et l'Europe, et

SOUS-COMMISSION POUR LE NORD DE L'EURASIE

36. **prend acte** des modifications intervenues dans le contenu de la légende de la *Carte Tectonique de l'Arctique* (TeMAR) à 1:5 M après les séances de travail tenues en février et en mars 2017 à Paris et en Avril 2017 à Vienne, et

37. **prend acte** de l'achèvement de la *Carte Tectonique de l'Arctique* (TeMAR) à 1:5 M sous l'égide de l'UNESCO et demande à la CCGM de préparer une version de la carte à 1:10M, à but éducatif, fondée sur la *TeMAR* à 1:5 M, et

38. **approuve** l'initiative des Sous-commissions de l'Eurasie du nord et des Cartes tectoniques de préparer une *Carte tectonique internationale des hémisphères nord et sud* à 1 :25 et 1 :50M en utilisant les cartes récentes ou en cours de la CCGM, et

39. **prend acte** de l'invitation du VSEGEI d'organiser une réunion de travail sur le nouveau projet international de *Carte tectonique internationale des hémisphères nord et sud* à 1 :25M et 1 :50M cet automne au VSEGEI à Saint-Petersbourg, et

40. **se réjouit** de la longue coopération entre la Sous-commission pour les cartes tectoniques (Académie Russe des Sciences) pour sa partipation aux projets internationaux de compilations de cartes tectoniques et d'autes cartes géologiques, adresse sa gratitude au Dr. Nicolay Chamov pour sa collaboration fructueuse comme Président de la Sous-commission pour la période 2016-2018 et souhaite la bienvenue à l'Académicien Aleksandr Khanchuk à la suite de son élection comme president de la Sous-commission, et

41. **prend acte** qu'après la publication des cartes géologiques et tectoniques des régions de toute l'Asie dans les 10 dernières années (*Carte géologique Internationale de l'Asie* -IGMA 5000), *Carte Tectonique de l'Asie Centrale et des régions avoisinantes* à 1 :2,5M, *Carte Tectonique du Nord, Centre et Est de l'Asie et des régions avoisinantes* à 1 :2,5M, *Carte tectonique de l'Arctique* à 1:5M (TeMAR), tous les prérequits sont réunis pour une actualisation, fondée sur une légende mise à jour, de la *Carte tectonique internationale de l'Asie* à 1:5M –ITMA 5000 suspendue en 2006, et

SUBCOMMISSION FOR AUSTRALIA-OCEANIA

42. **thanks to** Geoscience Australia for having provided the file of the *Geological Map of Australia* at 1:5 M scale to be integrated in the CGMW project of a 1:5M scale geological digital map of the World comprising both continental geology and structural representation of Oceanic areas and,

SUBCOMMISSION FOR ANTARCTICA

43. **appreciates** the efforts of Dr. German Leitchekov and Dr. Garrik Grikurov in preparation of the second edition of the *Tectonic Map of Antarctica, 1:10 M,* and

44. **notes** important changes which are being incorporated in the new draft in accordance with modern geological and geophysical information from the southern polar region and **recognizes** the significance of this evidence for upgrading the Map, and

45. **acknowledges** the delay in finishing the new draft and explanatory notes caused by a large amount of new data requiring interpretation, and

46. **encourages** the authors to submit a complete package of Map and Explanatory Notes of the *Tectonic Map of Antarctica* (2nd ed.) at the 2020 General Assembly, and

47. **asks** to strengthen the relationship between CGMW S/C for Antarctica and SCAR (Scientific Committee on Antarctic Research) Geoscience Standing Scientific Group, and

THEMATIC SUBCOMMISSIONS

SUBCOMMISSION FOR TECTONIC MAPS

48. **appreciates** the cooperation between the Subcommissions for Northern Eurasia and Tectonic Maps in the realization of tectonic cartographic projects for Asia (see resolutions from the S/C for South and East Asia and S/C for Northern Eurasia), and

49. **proposes** to send to the participants of the ITMA project the legend of the TeMAR map in order to test its relevance with the future legend of the ITMA project in order that leaders of the project receive proposals of possible revisions and comments to be discussed at a launch meeting, and

SUBCOMMISSION FOR METALLOGENIC MAPS

50. **welcomes** the preparation of the *Metallogenic Map of Central America and the Caribbean* by the members of the Ibero-American Association of Geological and Mining Surveys (ASGMI) under the general coordination of Dr. Eduardo Zappettini (SEGEMAR) and **expects** its presentation during the next General Assembly in 2020, and

51. **recognizes** the importance of the preparation of the *Metallogenic Map of North America*, as expressed in a previous resolution by the 2016 General Assembly, and **expresses** the interest for its production under coordinated work by the Subcommissions for Metallogenic Maps and North and Central America, and

SOUS-COMMISSION POUR L'AUSTRALIE ET L'OCÉANIE

42. **remercie** Geoscience Australia pour la fourniture du fichier de la *Carte géologique de l'Australie* à 1 :5M en vue de son intégration au projet CCGM d'une carte géologique digitale mondiale à 1 :5M, comprenant à la fois la géologie des continents et la représentation structurale des océans, et

SOUS-COMMISSION POUR L'ANTARCTIQUE

43. **apprécie** les efforts du Dr. German Leitchenkov et du Dr. arrik Grikurov pour préparer la seconde édition de la *Carte tectonique del'Antarctique* à 1 :10M, et

44. **note** que des changements importants qui sont en train d'être pris en compte dans la nouvelle maquette tiennent compte des informations géologiques et géophysiques récentes sur la région du pôle sud et **reconnaît** naturellement la nécessité d'une actualisation de la carte, et

45. **prend acte** du retard dans l'achèvement de la maquette des notes explicatives à cause du grand nombre de nouvelles données demandant à être interprétées, et

46. **encourage** les auteurs à soumettre un binôme carte-notice explicative de la *Carte Tectonique de l'Antarctique* (2e édition) à la prochaine Assemblée Générale de la CCGM en 2020, et

47. **demande** que soient fortifiées les relations entre la Sous-commission CCGM pour l'Antarctique et le Groupe Scientifique Permanent sur les Géosciences du SCAR (Comité Scientifique de la Recherche en Antarctique), et

SOUS-COMMISSIONS THÉMATIQUES

SOUS-COMMISSION POUR LES CARTES TECTONIQUES

48. **apprécie** la coopération entre les Sous-commissions pour le Nord de l'Eurasie et la S/C pour les Cartes Tectoniques dans la réalisation de projets cartographiques tectoniques pour l'Asie (voir les résolutions des Sous-commissions pour l'Asie du Sud et del'Est et de la S/C pour Eurasie du Nord), et

49. **propose** d'envoyer aux participants du projet ITMA la légende de la carte TeMAR pour tester sa pertinence avec la future légende du projet ITMA afin que les chefs de projet reçoivent les propositions de révision et les commentaires afférents pour qu'ils soient discutés lors de la réunion de lancement, et

SOUS-COMMISSION POUR LES CARTES MÉTALLOGÉNIQUES

50. **prend connaissance avec intérêt** de la préparation de la *Carte métallogénique des Caraïbes et de l'Amérique centrale* par les membres de l'Association des Services Géologiques et Miniers Ibéroaméricains (ASGMI) sous la coordination générale du Dr. Eduardo Zappettini (SEGEMAR) et **compte sur** sa présentation au cours de la prochaine assemblée Générale en 2020, et

51. **reconnaît** l'importance de la préparation d'une *Carte métallogénique de l'Amérique du Nord*, comme stipulé dans les résolutions précédentes de l'Assemblée Générale de 2016, et exprime son intérêt pour sa réalisation dans le cadre d'un travail coordonné entre les S/C pour les Cartes

SUBCOMMISSION FOR GEOPHYSICAL MAPS

52. **thanks** the Geological Survey of Brazil (CPRM) for providing CGMW the files of the magnetic anomalies at 5 km spacing to upgrade the *World Digital Magnetic Anomaly Map* (*WDMAM),* and

53. **recommends** the inclusion of the *Antarctic Magnetic Anomaly Map* (ADMAP) to the new version of the WDMAM, and

54. **acknowledges** the presentation in the Joint Scientific Assembly of IAPSO-IAMAS-IAGA held in September 2017 in Cape Town (South Africa) of the actualization of the *WDMAM,* and **wishes** this map be published in the CGMW Geophysical map series, and

SUBCOMMISSION FOR HYDROGEOLOGICAL MAPS

55. **thanks** the CGMW for the long standing support of the WHYMAP programme, and **thanks** UNESCO for the continuous support of the WHYMAP activities and **acknowledges** the excellent cooperation, partly fostered by the International Geoscience Programme (IGCP) and the International Hydrological Programme (IHP) steered by UNESCO, and

56. **thanks** the BGR for providing the coordination for the WHYMAP programme, and **thanks** the Karlsruhe Institute of Technology (KIT) for the excellent cooperation in project management and preparing and publishing of the *World Karst Aquifer Map* within the WHYMAP programme, and

57. **thanks** UNESCO for the excellent support in preparing, printing and publishing the *World Karst Aquifer Map*, and **commends** the special efforts of the Subcommission for Hydrogeological Maps to finalize the *World Karst Aquifer Map* at the 1:25 M and 1:40 M scale and **congratulates** the WHYMAP group and partners for the printing of this important new global map, and

58. **thanks** BGR for the digital publication of the map sheets D1 Nordkapp, E1 Kanin, F1 Vorkuta and the finalization of the map sheets F5 Tbilisi and F6 Haleb of the *International Hydrogeological Map of Europe* 1:1.5 M (IHME1500), and **thanks** the IQUAME 2500 project (International Quaternary Map of Europe at 1:2.5M scale) for supporting the finalization of the IHME1500 map sheets D1 Nordkapp, E1 Kanin, F1 Vorkuta, and **thanks** the Geological Surveys of Norway and Finland in reviewing their respective territories of the IHME1500 sheets D1 Nordkapp and E1 Kanin, and

59. **asks** the Subcommission to continue its support in favour of the WHYMAP programme and **suggests** improvement to the Global Groundwater Resources Map by updating it based on the World Karst Aquifer Map and to integrate it into the WHYMAP GIS, and offers its support for the compilation of additional thematic layers that should be included in the WHYMAP GIS, and

60. **asks** the CGMW to support the Subcommission in identifying hydrogeological cross-sections for the large aquifer systems of the world, and **asks** the CGMW to support a new WHYMAP project on submarine groundwater discharge, and

métallogéniques et de l'Amérique du Nord et Centrale, et

SOUS-COMMISSION POUR LES CARTES GÉOPHYSIQUES

52. **remercie** le Service Géologique du Brésil (CPRM) d'avoir fourni à la CCGM les fichiers des anomalies magnétiques à espacement de 5 km afin d'améliorer la *Carte Digitale des Anomalies Magnétiques du Monde* (*WDMAM)*, et

53. **recommande** l'insertion de la *Carte des anomalies magnétiques de l'Antarctique* (ADMAP) dans la nouvelle version de la carte WDMAM, et

54. **prend acte** de la présentation à la réunion de septembre 2017 l'IUGG au Cap (Afrique du Sud) de la seconde édition de la WDMAM et **souhaite** que cette carte soit publiée dans les séries de cartes géophysiques de la CCGM, et

SOUS-COMMISSION POUR LES CARTES HYDROGÉOLOGIQUES

55. **remercie** la CCGM pour son soutien sur le long terme au programme WHYMAP, et remercie l'UNESCO pour son soutien continu aux activités de WHYMAP et prend acte de l'excellente coopération, en partie favorisée par les programmes internationaux en Géosciences (IGCP) et Hydrogéologique (IHP) dirigés par l'UNESCO, et

56. **remercie** le BGR pour avoir délégué un coordinateur au programme WHYMAP, et remercie l'Institut de Technologie de Karlsruhe (KIT) pour son excellente coopération dans la conduite du projet et pour la préparation et la publication de la *Carte des Aquifères Karstiques du Monde* dans le cadre du programme WHYMAP, et

57. **remercie** l'UNESCO pour son excellent support dans la préparation, l'impresssion et la publication de la *Carte des Aquifères Karstiques du Monde*, et **salue** les efforts de la sous commission pour les cartes Hydrogéologiques pour sa finalisation de la *Carte Aquifères karsitques du Monde* à 1 :25M et 1 :40M et **félicite** le groupe WHYMAP et ses partenaires pour l'impression de cette nouvelle et importante carte globale, et

58. **remercie** le BGR pour la publication des cartes numériques suivantes : D1 Nordkapp, E1 Kanin, F1 Vorkuta et pour la finalisation des feuilles F5 Tbilisi et F6 Haleb du programme de la *Carte hydrogéologique internationale de l'Europe* à 1:1.5 M (IHME1500), et remercie le projet IQUAME 2500 (Carte internationale du Quaternaire de l'Europe à 1:2.5M) pour son support à la finalisation des feuilles IHME1500 : D1 Nordkapp, E1 Kanin, F1 Vorkuta, et remercie les Services géologiques de Norvège et de Finlande pour la relecture de leurs territoires respectifs sur les feuilles D1 Nordkapp and E1 Kanin du programme IHME1500, et

59. **demande** à la sous commission de poursuivre son soutien au programme WHYMAP et **suggère** une amélioration du Programme global des ressources en eaux souterraines en le mettant à jour à partir de la *Carte des Aquifères karstiques du Monde* et de l'intégrer dans le SIG WHYMAP, et offre sont appui pour la compilation de niveaux thématiques additionnels qui pourraient être intégrés dansle SIG WHYMAP, et

60. **demande** à la CCGM de soutenir la Sous-commission en identifiant des coupes hydrogéologiques des grands systèmes hydrogéologiques mondiaux, et **demande** à la CCGM de soutenir le nouveau projet WHYMAP sur les

SUBCOMMISSION FOR NATURAL HAZARDS MAPS

61. **acknowledges** the proposition of launching the project of an *Asia-Pacific Region Geohazard Map*, and

62. **acknowledges** the contributions from PHIVOLCS, CVGHM, CEA, VAST, Academia Sinica and G-EVER Promotion Team members to publish the *Eastern Asia Earthquake and Volcanic Hazards Information Map,* and

63. **acknowledges** Dr. Eikichi Tsukuda's valuable contributions during his tenure of office as President of the Subcommission for Natural Hazards Maps, and

SUBCOMMISSION FOR SEAFLOOR MAPS

64. **acknowledges** after the completion of the CGMW *Structural Map of the Western Pacific Region* at 1:20M scale published at the General Assembly in Cape Town, the completion of the complementary *Structural map of the Eastern Pacific* has been extended to include the Caribbean region and was presented before the General Assembly, and

65. **congratulates** the coordinator Peter Miles for the quality and the regularity of his production and his continued efforts to look for, and integrate, the most recent research results, and for submitting the draft to reviewers, and

66. **expresses** the S/C satisfaction to see the set of structural maps of the ocean floor at 1:20M nearly completed and that this will provide full coverage of the World's oceans, a project that will be finalized when the revision of earlier maps and integration of new elements, symbols and legends be implemented, and

67. **appreciates** the launching of a work aimed at revisiting and editing the *Structural Map of the Indian Ocean* (2006) in order to harmonize the symbols and legends with recent structural maps and integrate new parameters collected since its publication; **asks** that this map be published in time for the next IGC36 to be held in March 2020 in New-Dehli (India); **recalls** the proposal made by Prof Dr. Harsh Gupta in Cape Town IGC35 to provide scientific contacts in India in order to upgrade the relevant areas of the *Structural Map of the Indian Ocean*, and **acknowledges** this will enable all maps in the series to be viewed as a set, and

68. **acknowledges** that it is timely to revise the *Structural Map of the Atlantic Ocean* as a second edition integrating new elements developed in the Pacific Ocean maps, and

69. **acknowledges** the collaboration with Canada on data for offshore Canada, and

SUBCOMMISSION FOR MAGMATIC AND METAMORPHIC MAPS

70. **expresses its satisfaction** for the realization of the first draft of the *Map of the Metamorphic evolution of the Eastern Mediterranean realm*, which complements the *Tectonic and Metamorphic framework maps of the Alps,* and

déversements sous-marins d'eau douce, et

SOUS-COMMISSION POUR LES CARTES DE RISQUES NATURELS

61. **prend acte** de la proposition de lancement du projet d'une *Carte sur les Risques naturels de la Région Asie-Pacifique*, et

62. **prend acte** des contributions de PHIVOLCS, CVGHM, CEA, VAST, Academia Sinica et des members de l'équipe de promotion de G-EVER pour la publication de la *Carte d'information sur les risques sismiques et volcaniques en Asie de l'est*, et

63. **reconnaît** la qualité des contributions du Dr. Eikichi Tsukuda réalisées au cours de sa présidence de la Sous-commission pour les cartes des risques naturels, et

SOUS-COMMISSION POUR LA CARTES DES FONDS MARINS

64. **prend acte,** suite à l'achèvement du projet CCGM de *Carte Structurale de l'océan Pacifique ouest* à l/20M publiée à l'Assemblée Générale du Cap, de la finalisation de son complément, la *Carte structurale de l'Océan Pacifique est,* dont la couverture a été élargie pour inclure la région Caraïbe et la version finale a été présentée avant cette Assemblée générale, et

65. **félicite** Peter Miles, le coordinateur de cette carte pour la qualité et la régularité de sa production et sa volonté indéfectible de collecter et d'intégrer les données plus récentes de la recherche, et également pour soumettre à révision la maquette finie de son travail, et

66. **exprime** sa satisfaction de voir quasiment completé l'ensemble des cartes structurales des fonds océaniques à 1/20M qui fournit une couverture complète des océans du Monde, un projet qui verra son aboutissement une fois que les premières cartes publiées seront révisées et des éléments nouveaux, symboles et légendes intégrés, et

67. **apprécie** le lancement d'un travail visant à revisiter et à éditer la *Carte structurale de l'Océan Indien* (2006) afin d'harmoniser les symboles et la légende avec ceux des cartes structurales plus récentes, et d'intégrer des nouveaux paramètres obtenus depuis sa publication; **demande** que cette carte soit publiée pour le prochain CGI36 qui se tiendra en mars 2020 à New Dehli (Inde); **rappelle** ici la proposition du Prof. Dr. Harsh Gupta au CGI35 du Cap, de fournir des contacts scientifiques en Inde afin de mettre à jour les régions concernés de la *Carte structurale de l'océan Indien*, et **prend acte** que ce projet permettra de réunir dans un ensemble toutes les cartes de la série, et

68. **prend acte** qu'il est très opportun de réviser la *Carte sructurale de l'océan Atlantique* en tant que 2e édition en intégrant les nouveaux éléments dévéloppés dans les cartes de l'océan Pacifique.

69. **prend acte** de la collaboration avec le Canada pour les données sur l'offshore du Canada, et

SOUS-COMMISSION POUR LES CARTES MAGMATIQUES ET METAMORPHIQUES

70. **exprime sa satisfaction** pour la réalisation de la première maquette de la *Carte de* l'*évolution*

71. **acknowledges** the future cooperation with the S/C for the Middle-East in the realization of the *Metamorphic and Magmatic Map of the Middle East*, and

72. **endorses** the idea to prepare a *Metamorphic Map of the Indian subcontinent* for the IGC36 in New-Dehli, and

OTHER MAPPING PROJECTS

73. **agrees** that a contribution to a compilation of the Orogens of the World could benefit from the optimized methodology developed for the Cordilleran project or proceed in tandem subject to man-power, and

GEOLOGICAL MAP OF THE WORLD

74. **acknowledges** the proposal by Richard Ernst to supply his database of dyke swarms and LIP (Large Igneous Provinces) and to prepare a World map with this information on a structural background of selected Precambrian crust elements derived from the CGMW World maps, and

75. **appreciates** the project to realize a 12 inch diameter plastic globe of the CGMW *Geological Map of the World*, and **anticipates** worldwide outreach, and

76. **was informed and fully supports** the project of a CGMW *Whole Digital Geological Map of the World* at 1:5 M scale (*WDMW*-5M) featuring continents and oceans to be realized mainly through harmonization of the CGMW existing maps and periodically updated, and designed to be viewed in spherical projection, and

THE GONDWANA PROJECT

77. **congratulates** the Project Leader Prof. Renata Schmitt from the Universidade Federal do Rio Janeiro, Department of Geology, for the completion of the *Geological Map of Gondwana (GMP)* within the framework of the IGCP 628 project and **hopes** the 1:5 million and 1:10 million scale maps will be printed as soon as possible, and **appreciates** the GIS also be available soon after, and

78. **expects** CGMW to provide its expertise in publishing the map of the *GMP* at the 1:10 M scale and,

VISIOTERRA visualization facility

79. **acknowledges** the test of visualization of CGMW maps on the Web through the VisioTerra® system and **takes note** that the service provided by VisioTerra® is free of charge for CGMW and is non-exclusive and **appreciates** the rapid loading and display of the maps on different 3D platforms (*i.e* geoid, Bing® topography etc.) and **validates** the ongoing cooperation between CGMW and VisioTerra® for two years and **anticipates** a re-evaluation of the cooperation at the next General Assembly and **notes** that the CGMW maps cannot be used for any commercial use by VisioTerra®, and

métamorphique du Rameau Est-Méditerranéen oriental, qui vient compléter la carte métamorphique des Alpes, et

71. **prend acte** de la future coopération avec la S/C pour le Moyen-Orient sur la réalisation de la *Carte métamorphique du Moyen-Orient*, et

72. **soutient** l'idée de préparer une *Carte métamorphique du sous-contient indien* pour le prochain CGI36 à la Nouvelle-Dehli, et

AUTRES PROJETS DE CARTOGRAPHIE

73. **est d'accord** sur le bénéfice que la compilation d'une carte des orogènes mondiaux pourrait tirer de la méthodologie optimisée développée dans le projet sur les cordillères ou de leur marche conjointe en fonction des ressources humaines disponibles, et

CARTE GÉOLOGIQUE DU MONDE

74. **prend acte** du projet prposé par Richard Ernst de fournir sa base de données sur les essaims filonniens et les LIP (grandes provinces magmatiques) et de préparer une carte du Monde avec ces informations sur un fond d'éléments crustaux précambriens tirés des cartes CCGM du monde, et

75. **apprécie** le projet de réaliser un globe en plastique de 30 cm de diamètre de la *Carte Géologique du Monde* de la CCGM, et **en attend** une diffusion mondiale, et

76. **a pris connaissance et soutient** le projet d'une *Carte Géologique du Monde* entièrement numérique à 1:5 M (WDMW-5M), représentant les continents et les océans, réalisée principalement à partir de l'harmonisation des cartes CCGM existantes, puis actualisée périodiquement, et conçue pour être consultée en projection sphérique, et

PROJET GONDWANA

77. **félicite** le chef de projet le Prof. Renanta Schmit du Département de Géologie de l'Université Fédérale de Rio-de-Janeiro pour la réalisation de la *Carte géologique du Gondwana (GMP)* dans le cadre du projet PICG 628 et souhaite que les cartes à 1 :5M et 1 :10M soient imprimées au plus tôt, et apprécie que le SIG soit disponible peu après, et

78. **demande** à la CCGM qu'elle apporte son expertise pour la publication la carte du Projet Gondwana à l'échelle de 1:10 M et,

Visualisateur VISIOTERRA

79. **prend acte** du test de visualisation de cartes de la CCGM sur le Web via le système VisioTerra® et **prend note** que le service fourni par VisioTerra® est gratuit pour la CCGM et non-exclusif et **apprécie** le chargement rapide et l'affichage des cartes sur différentes plates-formes 3D (c.-à-d. geoid, Bing®, topographie etc.) et **valide** la coopération actuelle entre la CCGM et VisioTerra® pendant deux ans et **prévoit** une réévaluation de la coopération à la prochaine Assemblée Générale, et **note** que les cartes de la CCGM ne peuvent être utilisées à des fins commerciales par VisioTerra® et,

ONEGEOLOGY

80. **encourages** and **supports** the cooperation between OneGeology and CGMW.

THESE RESOLUTIONS WERE ADOPTED AT THE LAST PLENARY SESSION OF THE GENERAL ASSEMBLY ON FRIDAY 23 FEBRUARY 2018 AT UNESCO HEADQUARTERS IN PARIS.

THE CGMW EXECUTIVE BUREAU THANKS ALL PARTICIPANTS TO THE GENERAL ASSEMBLY FOR THEIR PARTICIPATION AND CONTRIBUTIONS TO THE DISCUSSIONS AND EDITION OF THE PRESENT RESOLUTION AND LOOKS FORWARD TO SEEING THEM AT THE NEXT CGMW GENERAL ASSEMBLY TO BE HELD ON THE OCCASION OF THE 36th INTERNATIONAL GEOLOGICAL CONGRESS IN 2020, NEW DELHI (INDIA).

ONEGEOLOGY

80. **encourage** et **soutient** la coopération entre OneGeology et la CCGM.

CES RÉSOLUTIONS ONT ÉTÉ ADOPTÉES LORS DE LA DERNIÈRE SESSION PLÉNIÈRE DE L'ASSEMBLÉE GÉNÉRALE DE LA CCGM, LE VENDREDI 23 FÉVRIER 2018 AU SIEGE DE L'UNESCO A PARIS.

LE BUREAU EXÉCUTIF DE LA CCGM REMERCIE TOUS LES PARTICIPANTS À L'ASSEMBLÉE GÉNÉRALE POUR LEUR PARTICIPATION ET LEUR CONTRIBUTION AUX DISCUSSIONS ET A L'ÉDITION DES PRÉSENTES RÉSOLUTIONS ET LEUR DONNE RENDEZ-VOUS À LA PROCHAINE ASSEMBLÉE GÉNÉRALE DE LA CCGM QUI SE TIENDRA LORS DU PROCHAIN 36E CGI DU 2 AU 8 MARS 2020 À NEW-DEHLI (INDE).

CHANGES ON CGMW BUREAU MEMBERS

Submitted to the approval of CGMW Bureau Members and the ratification by the General Assembly on February 23th, 2018

Resignations and nominations			
	Outgoing	**Nomination**	
		Name	**Organisation/Country**
Subcommissions			
SOUTH & EAST ASIA Vice-President	Jishun REN	**Zhenhan WU**	Institute of Geology of the Chinese Academy of Geological Sciences
SOUTH & EAST ASIA Deputy Secretary General	Xiaochi JIN	**Lei ZHAO**	Institute of Geology of the Chinese Academy of Geological Sciences
TECTONIC MAPS President	Nicolay P. Chamov	**Alexander KHANCHUK**	Far Eastern Branch of Russian Academy of Sciences
NATURAL HAZARD MAPS President	Eikichi TSUKUDA	**Shinji TAKARADA**	AIST, Geological Survey of Japan
METALLOGENIC MAPS Secretary General	---------	**Martín R. GOZALVEZ**	SEGEMAR, Instituto de Geologica y Recursos Minerales

Resignations and nominations taking effect in February 2018 - BUREAU			
	Outgoing	**Nomination**	
		Name	**Organisation/Country**
President	Philippe Rossi	Manuel Pubellier	Ecole Normale Supérieure de Paris-CNRS
Secretary General	Manuel Pubellier	Pierre Nehlig	BRGM
Deputy Secretary General	Pierre Nehlig	Bruno Vrielynck	University Pierre and Marie Curie (UPMC)
Financial Supervisor		Bruno Vrielynck	UPMC

36th International Geological Congress

2-8 March, 2020, Delhi, India

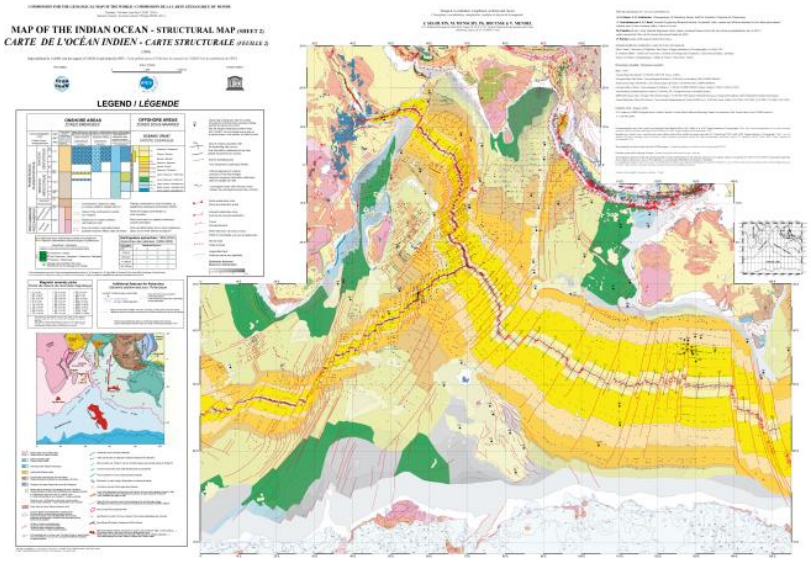
As for the past forty years, the next CGMW General Assembly will be hosted by the IGC 36 in Delhi, India, from the 2th to 8th of March 2020.
The General Assembly will be organized in two stages. One and a half day is devoted to the formal session where a review of the activity of CGMW Continental & Thematic Sub-commissions will be presented, and the proposed resolutions approved by representatives of country Members. As for the second part (half a day) of our biennial meeting, scientific lectures dealing with CGMW maps are scheduled. The IGC 36 organizing committee has informed CGMW that it will be happy to provide an appropriate hall/room for holding CGMW meetings of the CGMW for these two days.

The exact dates and room will be announced on the next circulars but proposed title of lectures may be sent already at CGMW secretariat (ccgm@sfr.fr)

The second edition of the CGMW Structural map of the Indian Ocean and surrounding areas will be published for this occasion, with lots of new elements namely:

- The map will be enlarged up to the 40°N to display the collision between India and Asia
- Kinematics will be revisited with emphasis on the convergent vectors
- A sketch map depicting kinematics will be inserted
- East African and Arabian peninsula offshore will be upgraded
- Etc.

The map will be accompanied by a booklet of the CGMW Faces Series illustrating interesting spots of the Indian Ocean and its margins, from various experts of these regions and topics.



The CGMW Structural map of the Indian Ocean (1st edition, 2004)

Summary of the activities of CGMW Sub-commissions for the period 2017-2018

Résumé des activités des Sous-commissions de la CCGM pour la période 2017-2018

Regional Sub-commissions

Africa

2016: Printing and release of the *1:10M scale Geological Map of Africa* (August 2016)

Sismotectonic Map of Africa: see Thematic Subcommissions / Geophysical maps

in progress: explanatory notes of the *1:0.2M scale Geological Map of the Republic of Djibouti* (planed to be printed in 2019).

in progress: compilation of data for a second edition of the *1:5M CGMW Tectonic Map of Africa*

North and Central America

Project of the *1:10M scale Structural Map of the Caribbean*: successive drafts of the map were presented at IGC 2016, AGU 2018 and EGU 2017 and 2018 meetings. Last draft is under revision. The printing is planned for IGC36 in 2020.

South America

The project of *the 1:5M scale Geological Map of South America*, 3rd edition was launched during a workshop meeting held in Villa de Leyva, Colombia to the invitation of the Geological Survey of Colombia in 2014, July 21-26.
2016, September, IGC in Capetown: presentation of the first draft of the map
2018, February, CGMW General Assembly in Paris: presentation of the final draft.
The printing is planned in 2019.

in progress: *Geological and Mineral Resources Map of the Guyana Shield at 1:2.5M scale*

Antarctica

Preparation of the *Explanatory booklet to the second edition of the Tectonic map of Antarctica.*
In progress: the second edition of the *Tectonic map of the Antarctica* taking into account the progress namely provided by geophysical data and correlations within Gondwana.

South and East Asia

2017: *The structural Map of the South China Sea* at 1:3M scale.
The Tectonic Map of Asia (see Tectonic maps)

Northern Eurasia

Activity related with the *TeMAR* and *Tectonic map of Asia* projects (*see Tectonic maps*).

Europe

Progress of the project of the *1:2.5M scale International Quaternary Map of Europe* (*IQUAME 2500*).

Meetings (2016-2018) after the kick-off workshop at the XVIII INQUA Congress in Bern (July 2011), the General Information and Guide lines for the review (2014) and the IQUAME 2500, Workshop V, CGMW Headquarters in Paris (2015).

- 2016, June 1-3: IQUAME 2500, Quaternary Harmonization Workshop in Berlin.
- 2017, December 11-13: IQUAME 2500 Workshop in Berlin.
- 2018, April 10: IQUAME 2500 at EGU meeting in Vienna.

Middle-East

2015 October 5-7: workshops at the 3rd CGMW Meeting on the Geosciences of the Middle East, Geological Survey of Iran, Tehran. During this meeting was examined the state of the art of the following projects:

- *the 1:5M scale geological Map of the Middle East; the 1:5M scale Quaternary Map of the Middle East*
- *the 1:5M scale Magmatic Map of the Middle East.*

Oceania

See Thematic Subcommissions / Sea floor maps (*Pacific Ocean*).

Thematic Sub-commissions

A part of the following projects are carried out in collaboration with the relevant regional Sub-commissions.

Metallogeny

2016: Translation into English and printing of the educational booklet: *Mineral Resources, Mining and Environment*

In progress: *The metallogenic Map of the Caribbean* (using the structural background of the Structural map of the Caribbean)

Geophysics

2016: *The 1:10M scale Sismotectonic Map of Africa*.

in progress: *Project MarMaRA* (Marine Magnetics in Remote Areas): filling gaps together in education, research and observations, supported by IUGG.

in progress: *Project World Digital Magnetic Anomaly Map (WDMAM)*: a second CGMW edition is planned to take into account the upgrade of information as presented at the IUGG conferences in Prague 2015 and Capetown 2017. This map will namely include new data on Brazil (provided thanks to CPRM) and on Antarctic.

Magmatic and metamorphic maps

In progress: *The Metamorphic map of the Middle East*.

In progress: *The Metamorphic map of the NE Mediterranean*.

Hydrogeology

2015: *The Global Groundwater Vulnerability to floods and Droughts* at 1:40M scale.

Sea Floor Maps

2016: *The 1:20M scale Structural Map of the Western Pacific Ocean* (P. Miles et al.)

in progress: *The 1:5M scale Structural Map of the Eastern Pacific Ocean* (P. Miles et al.), completion planned for 2019.

Tectonic Maps

2016: *The 1:5M scale Tectonic Map of South America*, 2nd edition (U. Cordani, V. Ramos, C. Schobbenhaus)

2018: Achievement of the project of *1:5M scale Tectonic Map of Arctic regions* (*TeMAr*), launched in Saint-Petersbourg, Russia, April, 2010.

Meetings (2014-2016):

18 February 2014: Working meeting V, CGMW Paris, France,
15 April 2015: EGU, Vienna, EGU Splinter meeting, Wien, Austria,
2-5 June 2015: ICAM meeting, Trondheim, Norway,
24-26 February 2016: CGMW workshop, VSEGEI, Russia,
18 April 2016: EGU, Vienna, Splinter meeting, Wien, Austria.
6-8 February 2017. CGMW worshop in Paris (Canada, USA, Russia).
April 2018: EGU, Vienna, Splinter meeting, Wien, Austria.
Printing planned, April 2019.

In progress: *The Tectonic Map of Asia (see Tectonic maps)* managed by the s/c for South and East Asia, s/c for Northern Eurasia and s/c for Middle East.

Hazards Maps

2016: 1:10M scale *Eastern Asia Earthquake and Volcanic Hazard Information Map* (Geological Survey of Japan and the G-EVER Group). (S. Takarada *et al*.)

INTRODUCTORY NOTES OF
CGMW PUBLICATIONS RELEASED IN 2017-2018

NOTES INTRODUCTIVES AUX PUBLICATIONS CCGM PRODUITES ENTRE 2017 ET 2018

The Earth Geological Globe (CGMW)

30 cm / 12” diameter
Approx. scale: 1: 42 000 000
Injection molded plastic globes, printing on vinyl, thermoforming process
Free stand on a clear acrylic base
Produced for CGMW by Replogle
© CCGM-CGMW 2018, Paris, France

The Earth Geological Globe is based on the revised 3rd edition of the *Geological Map of the World*, originally drawn at the scale of 1:25 million, published in 2014 by the Commission of the Geological Map of the World (CGMW). It integrates the state of the art of the geological knowledge of our planet at the turning-point of the XX/XXI centuries. This work is a synthetic compilation basically aimed at educational purposes and constitutes an attempt at representing a simplified geology of the continents and oceans of our planet in its entirety.

This representation, enhanced by a shaded physiographic base more attenuate in the continents than in the oceans, is the only one existing today that presents the world geological setting at a glance. There is a clearly distinguishable contrast between the continents –where rocks may attain an age up to nearly 4 billion years– and the oceanic crust, not exceeding 200 million years.

Here is summary of the main geological units and features:

- 8 broad chronostratigraphic units, from recent to oldest : 1= Cenozoic; 2= Mesozoic; 3= Upper Paleozoic; 4= Lower Paleozoic; 5= Neoproterozoic; 6= Mesoproterozoic; 7= Paleoproterozoic; 8= Archean (> 2 billion years).
- Discrimination of "Large Igneous Provinces" (LIP) since the end of the Paleozoïc (continental traps, "oceanic plateaus") with indication of mean age of the major volcanic episode (including the extent of the "Central Atlantic Magmatic Province" zone), corresponding to large magmatic pulses.
- Meso-Cenozoic ophiolites that underline suture zones.
- Zones where the subglacial bedrock of the Antarctica and Greenland indlandsis are lowered under sea level.
- Continental shelf (depth < 200 m).
- Limit between continental crust / oceanic crust.
- Axis of active mid-oceanic ridges marking the boundary between two divergent lithospheric plates.

- Subduction zones representing the convergence between two plates and sedimentary accretionary prisms.
- Transform faults which is a type plate boundary that links spreading ridges and subduction zones; fracture zones representing the "scars" of transform faults.
- Anomalous submarine features such as seamounts, oceanic plateaus, hotspot tracks (6 hotspots tracks with indication of the age of the build-up of several hotspots that allows visualizing the progression of the plate throughout time).
- Crustal deformation zones (diffuse boundary) between some plates.
- Identification of extensive submarine volcanic provinces linked to the opening of the North Atlantic Ocean and South Atlantic Ocean (SDRs),
- 45 hotspots categorized in four types.

The **Earth Geological Globe** is a major teaching aid that allows, among others, a rapid visual reconstruction of the main plates and sub-plates of the global tectonics.

Authors

Philippe Bouysse, French marine geologist, retired official of the French Geological Survey (BRGM) and former Secretary General of the Commission for the Geological Map of the World – CGMW (1990-2000). Presently Scientific Advisor of the CGMW. Conception, synthesis and drawing of the original map.

Bruno Vrielynck, geologist, paleographer and GIS expert from the Institut des Sciences de la Tierra de Paris (Istep), Sorbonnes Universités/UMPC for the restructuration and enhancement of the GIS database achieved in 2017.

Alain Rabaute (GeoSubsight), geologist and GIS expert from the Institut des Sciences de la Tierra de Paris (Istep), Sorbonnes Universités/UMPC, for the cartographic adaptation of the Mercator map to the Global projection and production of the graphic files for the production of the globe.

The manufacture of the Globe was entrusted to ***Replogle Globes Partners LLC*** (Illinois, USA), world leaders in the conception and production of globes.

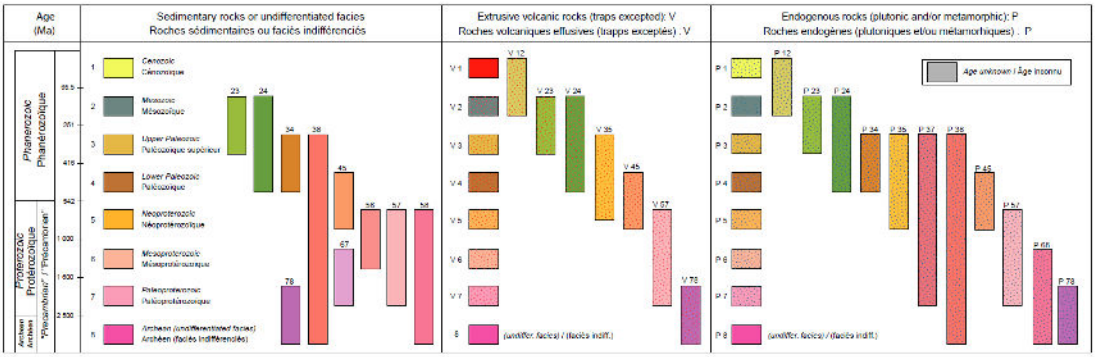
THE EARTH GEOLOGICAL GLOBE / GLOBE GÉOLOGIQUE TERRESTRE

LEGEND / LÉGENDE

www.cgm.org

ONSHORE AREAS / ZONES CONTINENTALES

(except Iceland / sauf Islande)



Glacier, inland ice / Glacier, inlandsis

a Subglacial bedrock located under the sealevel (Antarctica & Greenland ice caps) / Bedrock sous glaciaire situé sous le niveau de la mer (calotte de l'Antarctique et du Groenland)

Extension of the ice self (Antarctica) / Extension de la plate forme de glace (Antarctica)

Main fault / Faille majeure

Masked or inferred main fault / Faille supposée ou cachée

Thrust front / Front de chevauchement

Inferred thrust front / Front de chevauchement supposé

Lake / Lac

Sealevel 0 m at South Pole / Niveau de la mer 0 m au Pôle Sud

Boundary of continental or island shelf (depth lower than 200 m)
Limite de la plate-forme continentale ou insulaire (profondeur inférieure à 200 m)

65 Ma — Large Igneous Province (LIP) / Grande Province Magmatique (LIP) :
Traps (with indication of mean age in Ma) / Trapps avec indication de l'âge moyen en Ma)
Sills (Antarctica /Antarctique), ca 175 Ma

Inferred boundary of the "Central Atlantic Magmatic Province" (CAMP: dykes and sills) ca. 200 Ma.
Enveloppe de l'extension supposée de la "Province Magmatique de l'Atlantique Central" (CAMP : dykes et sills) ca 200 Ma.

Ophiolite, ophiolitic complex of Meso-Cenozoic age
Ophiolite, complexe ophiolitique méso-cénozoïque

Peridotite of Zabargad isl. (Red Sea) / Péridotite de l'île Zabargad (mer Rouge)

Inferred western boundary of the Siberian traps (minimum estimate)
Extension occidentale supposée des traps sibériens (estimation minimale)

Note ▲ The age of the Seychelles microcontinent (PS) and that of the dykes (✱ = 65 Ma) are indicated
L'âge du microcontinent des Seychelles (PS) et celui des intrussions de dykes (✱ = 65 Ma) sont indiqués

OTHER FEATURES / AUTRES SYMBOLES

Towns / Villes

Polar circles / Cercles polaires

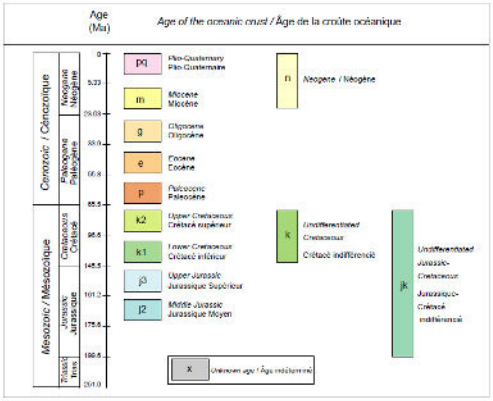
Tropic / Tropique

Coast / Trait de côte

Rivers / Fleuves

OFFSHORE AREAS / ZONES SOUS-MARINES

(including Iceland / Islande incluse)



Continental or island shelf (depth < 200 m), except Antarctica
Plate-forme continentale ou insulaire (profondeur < 200 m), sauf Antarctique

Continental or island arc slope, except Antarctica
Pente continentale ou d'arc insulaire, sauf Antarctique

Antarctica continental margin / Marge continentale de l'Antarctique

Approximate boundary between "true" oceanic crust and continental crust ("normal", continentalized stretched, ...) / Limite approximative entre croûte océanique "vraie" et croûte continentale (continentalisée, étirée,...)

Approximate boundary between "true" oceanic crust and continental crust, masked
Limite approximative entre croûte océanique et croûte continentale, recouverte

Axis of oceanic accretionary ride (1: active, 2: extinct) / Axe d'accrétion océanique (1 : active, 2 : fossile)

Transform fault, fracture zone, main fault / Faille transformante, zone de fracture, faille majeure

Left Major Transforming Fault / Faille transformante senestre

Right Major Transforming Fault / Faille transformante dextre

Active subduction zone / Zone de subduction active

Incipient subduction zone / Zone de subduction naissante

Extinct subduction zone / Zone de subduction fossile

Thrust front / Front de chevauchement (zone en compression)

Front of submarine sedimentary accretionary prism / Front de prisme d'accrétion sédimentaire sous-marin

Oceanic plateau (= LIP; with indication of mean age in Ma)
"Plateau océanique" (= LIP ; avec indication de l'âge moyen, en Ma

Age progression along hotspot track (in Ma)
Âge de la progression de la trace d'un point chaud (en Ma)

Submarine morphostructure generated over the "normal" crust : other oceanic plateaus, hotspot track, "seismic" ridge, seamount (purple contour = second order elevation)
Relief sous-marin établi sur croûte océanique "normale" : autre plateau océanique, traces de point chaud, ride "asismique", mont sous marin (contour bleu = relief de second ordre)

Distributed deformation of the oceanic crust (diffuse plate boundary)
Zone de déformation de la croûte terrestre (limite diffuse de plaque)

Offshore Cenozoic volcanism related to the opening of the North Atlantic ocean and the Iceland hotspot (North Atlantic Volcanic Province): Seaward Dipping Reflector sequences(SDRs), Paleogene basalt exposed or buried
Volcanisme sous-marin cénozoïque lié à l'ouverture de l'Atlantique Nord et/ou point chaud de l'Islande : Réflecteurs sismiques pentés vers la mer (SDRs), basaltes paléogènes affleurants ou enfouis

SDRs related to the opening of the South Atlantic ocean during Early Cretaceous (passive margin volcanism)
SDRs liés à l'ouverture de l'Atlantique Sud au Crétacé inférieur (volcanisme de marge passive)

Hotspots

I. Currently active hotspots, or hotspots whose ultimate known activity settles within the last million years or so.

1. HA, ... HG: "Primary" hotspots i.e. assumed to correspond to a deep seated thermal plume (after Courtillot et al. , 2003)
HA: Afar - HB: Easter - HC: Hawaii - HD: Iceland - HE: Louisville - HF: Reunion - HG: Tristan

2. Hh, ... Hl: Possible "primary" hotspots (ibid.)
Hh : Galapagos - Hi : Kerguelen

3. H1, ... H34: Other "hotspots" , i.e. assumed to have a relatively shallow mantle origin (upper/lower mantle transition zone,"hotline", passive lithosphere breakup, ...) or whose deeper origin is yet questionable.
H1: Arago seamount (mtf) - H2: Ascension - H3: Azores - H4: Balleny - H5: Bouvet - H6: Bowie/ Kodiak semts - H7: Cameroun - H8 : Canary - H9: Cape Verde - H10 : Caroline - H11: Comores - H12: Crozet - H13: Darfur/ Jebel Marra - H14: Fernando de Noronha - H15: Foundation smt - H16: Flinders smt/ Lord Howe Rise - H17: Hoggar - H18: Jan Mayen - H19: Juan de Fuca/Cobb - H20: Juan Fernandez/A. Selkirk - H21: Macdonald - H22: Marion - H23: Marquesas - H24: Pitcairn - H25: Rarotonga - H26: St Paul/Amsterdam - H27: Samoa - H28: San Felix/ Desventuradas - H29: Socorro/Revillagigedo - H30: Tahiti/Society - H31: Tasmanid - H32: Tibesti - H33: Trindade/ Martin Vaz - H34: Yellowstone

II eH1 & eH2: Hotspots whose extinction is much older.
eH1: Great Meteor smt/ New England smts - eH2: St. Helena

Points chauds

I. Points chauds actifs, ou dont la cessation d'activité ne remonte guère au delà du million d'années.

1- HA, ... HG: Points chauds "primaires" supposés correspondre à un panache d'origine profonde (d'après Courtillot et al., 2003)
HA : Afar - HB : Île de Pâques - HC : Hawaï - HD : Islande - HE : Louisville - HF : Réunion - HG : Tristan

2- Hh, ... Hl: Points chauds "primaires" possibles (ibid.)
Hh : Galapagos - Hi : Kerguelen

3- H1, ... H34: Autres "points chauds" pouvant avoir une origine relativement peu profonde dans le manteau (p. ex. zone de transition manteau supérieur/manteau inférieur, "ligne chaude", rupture passive de la lithosphère, ...) ou ceux dont la réalité est mise en doute.
H1 : Mont sous-marin (Msm) Arago - H2 : Ascension - H3 : Açores - H4 : Balleny - H5 : Bouvet - H6 : Msm Bowie/ Kodiak - H7 : Cameroun - H8 : Canaries - H9 : Cap Vert - H10 : Caroline - H11 : Comores - H12 : Crozet - H13 : Darfour/Djebel Marra - H14 : Fernando de Noronha - H15 : Msm Foundation - H16 : Msm Flinders/ Lord Howe Rise - H17 : Hoggar - 18 : Jan Mayen - H19 : Juan de Fuca/Cobb - H20 : Juan Fernandez/A. Selkirk - H21 : Macdonald - H22 : Marion - H23 : Marquises - H24 : Pitcairn - H25 : Rarotonga - H26 : St Paul/Amsterdam - H27 : Samoa - H28 : San Félix/ Desventuradas - H29 : Socorro/Revillagigedo - H30 : Tahiti/Société - H31 : Tasmanides - H32 : Tibesti - H33 : Trindade/Martin Vaz - H34 : Yellowstone

II eH1 & eH2: Points chauds dont la cessation d'activité est beaucup plus ancienne.
eH1 : Msm Great Meteor/ New England - eH2 : Ste Hélène

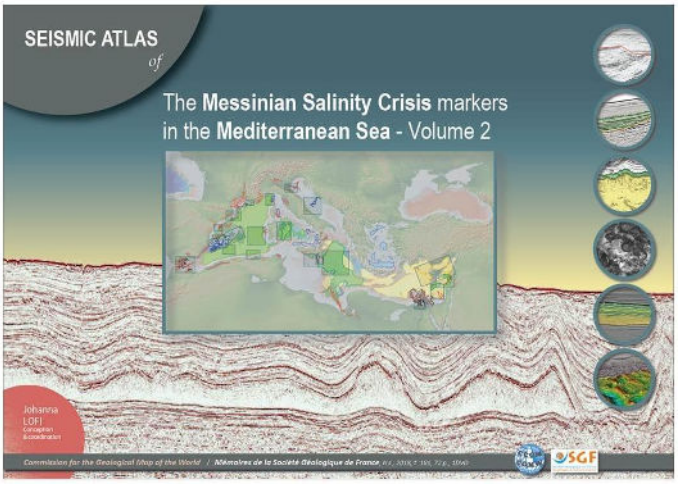
Explanatory Notes: https://ccgm.org/img/cms/Notice%20Earth%20Geological%20Globe_2018.pdf

Notice explicative : https://ccgm.org/img/cms/Notice%20Globe%20g%C3%A9ologique%20terrestre.pdf

CGMW has partnered with **Real World Globes** based in Visalia, California to produce the ***Geological Globe of the World***.

The ***Geological Globe of the World*** is available in three sizes: **Colossal** (30-inch diameter), **Large** (18-inch diameter), and **Small** (10-inch diameter). For more informations: http://www.realworldglobes.com/shop#!/Geological-Globe-of-the-World%E2%84%A2/p/87312665/category=23886013

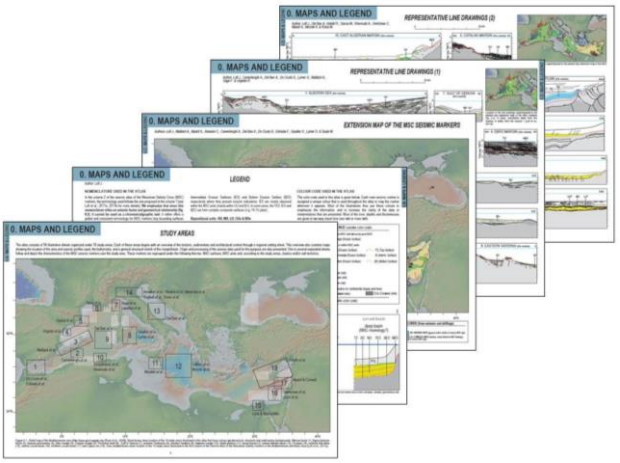
The Seismic Atlas of the Messinian Salinity Crisis Markers in the Mediterranean Sea, Vol. 2

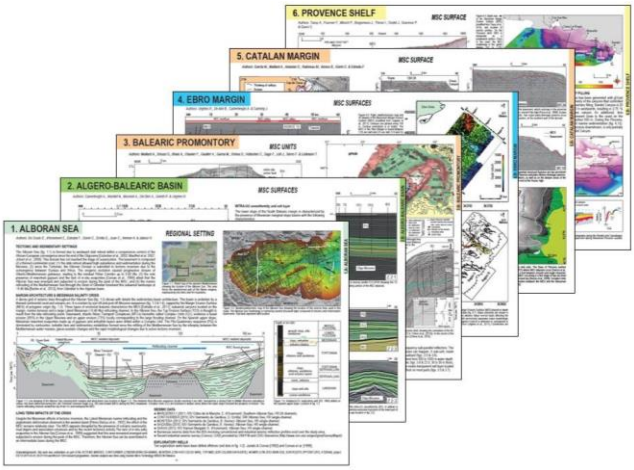


72 pages + DVD
Release in December 2018
Co-publishers © CGMW and Mémoires de la Société Géologie de France, n.s., t. 181.
Conception and coordination by **Johanna Lofi** (University of Montpellier, France)

The Messinian Salinity Crisis (MSC) is a huge outstanding succession of events that has deeply modified the Mediterranean area within a short time span at the geological scale and led to the emplacement of one of the youngest and most debated salt giant on Earth.

In 2011, the *Seismic atlas of the Messinian salinity crisis markers in the Mediterranean and Black Seas* summarized, in one publication with a common format, the most relevant seismic features related to this exceptional event in the offshore domain. It also proposed a new global and consistent terminology for the MSC seismic markers (bounding surfaces and depositional units), describing and illustrating their facies, geometry and extent throughout 13 sites in the offshore Mediterranean and Black sea area.





The volume 2 of the **Seismic atlas of the Messinian salinity crisis markers in the Mediterranean Sea** is published in the continuity of the volume 1. It illustrates the seismic characteristics of the markers over 18 new study areas, using the same color code and terminology. Interpreted seismic data were carefully selected according to their quality, position and significance in order to reach these objectives, and are presented here. This new atlas also provides a revised extension map of the MSC markers in the offshore domain at the Mediterranean scale.

Raw and interpreted seismic profiles are available as images on the accompanying DVD-Rom.

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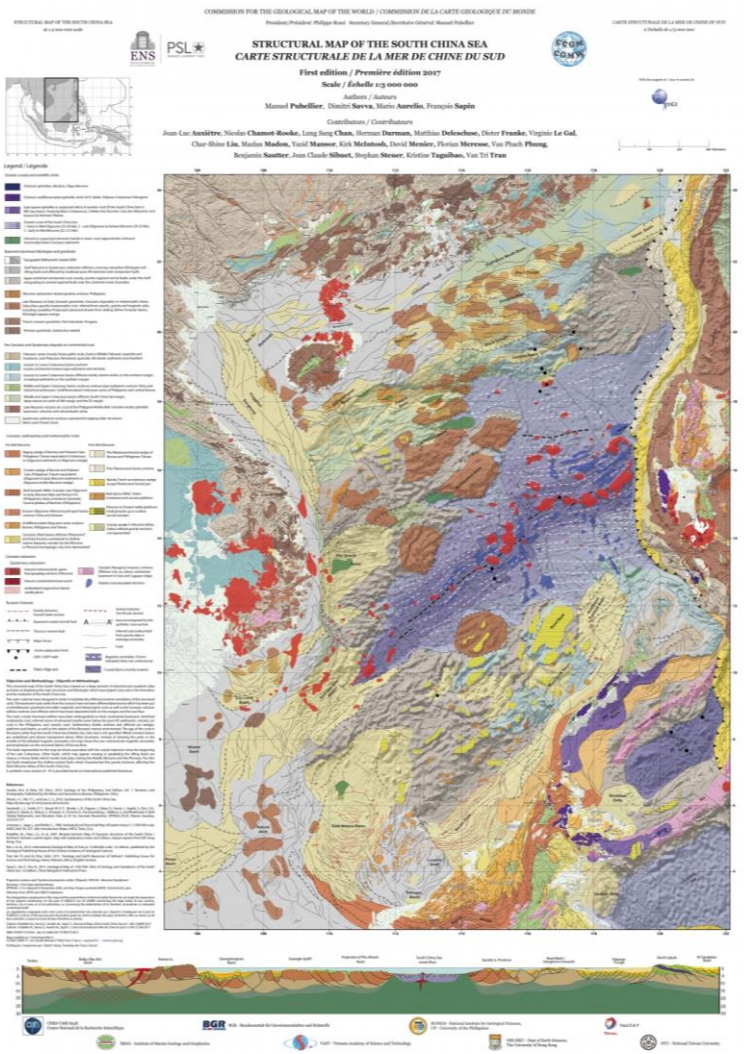
The Structural Map of the South China Sea



1st ed., scale 1:3 000 000
Projection: Mercator Equidistant
Dimensions: 118,5 x 84 cm
Authors : M. Pubellier, D. Savva, M. Aurelio, F. Sapin
Contributors : J.L Auxiètre, N. Chamot-Rooke, L.S. Chan, H. Darman, M. Delescluse, D.Franke, V. Le Gal, C.S. Liu, M. Madon, Y. Mansor, K. McIntosh, D. Menier, F. Meresse, V. P. Phung, B. Sautter, J-C. Sibuet, S. Steuer, K. Taguibao, V.T. Tran
© CCGM-CGMW 2017

Altimetry from SRTM and GEBCO databases
doi:10.14682/2017STRUCTUSCS

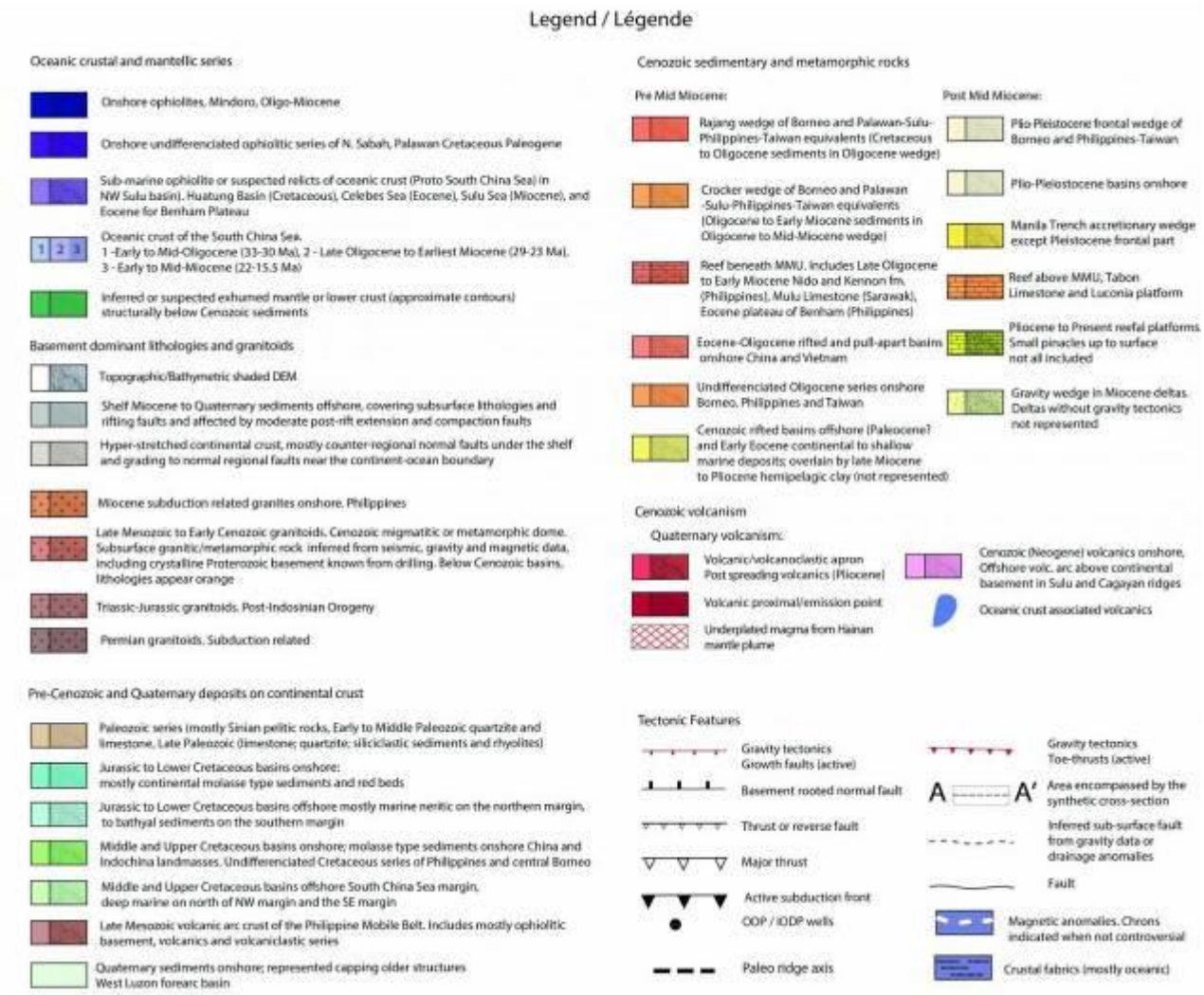
This structural map of the South China Sea is based on a large amount of industrial and academic data and aims at displaying the main structures and lithologies which have played a key role in the formation and the evolution of the South China Sea.

The color code has been designed in order to facilitate the offshore/onshore correlation of the structural units. The basement rocks older than the Jurassic have not been differentiated and an effort has been put on the Mesozoic granitoids and older magmatic and metamorphic rocks as well as the Cenozoic volcanic edifices onshore and offshore which have been deposited both on the margins and the sea-floor.

The main crustal structural entities have been distinguished as thick continental basement, stretched continental crust, inferred zones of exhumed mantle (even below the post-rift sediments), volcanic arc crust in the Philippines, and oceanic crust. Sedimentary bodies onshore and offshore are wedges, platforms and basins, as well as the extent of the Mesozoic marine environment. The age of the crust in the basins other than the South China Sea (Celebes Sea, Sulu Sea) is not specified. Rifted Cenozoic basins are underlined and shown transparent above rifted structures. Instead of showing the picks or the models of the debated magnetic anomalies, the map shows the non-controversial magnetic anomalies and emphasizes on the structural fabrics of the sea-floor.

The faults represented on the map are those associated with the crustal extension since the beginning of the Late Cretaceous. Other faults, which may appear crossing or paralleling the rifting faults are reverse or thrust faults which mostly took place during the Middle Miocene and the Pliocene. The thin red faults emphasize the shallow-rooted faults which characterized the gravity tectonics affecting the thick Miocene deltas of the South China Sea.

A synthetic cross-section is provided based on international published literature. This cross section provides a comprehensive image of a hyper extended margin developed in a batholith.



CGMW mapping programs for the period 2018-2019

2018

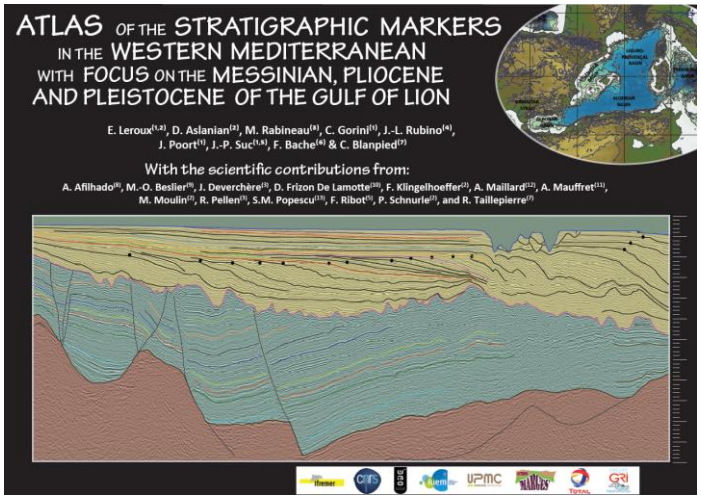
Maps and documents printed

- The Seismic Atlas of the Messinian crisis in the Mediterranean (vol. 2) (December)
- The Geological Globe of the World on a 12 inch diameter plastic sphere (June)

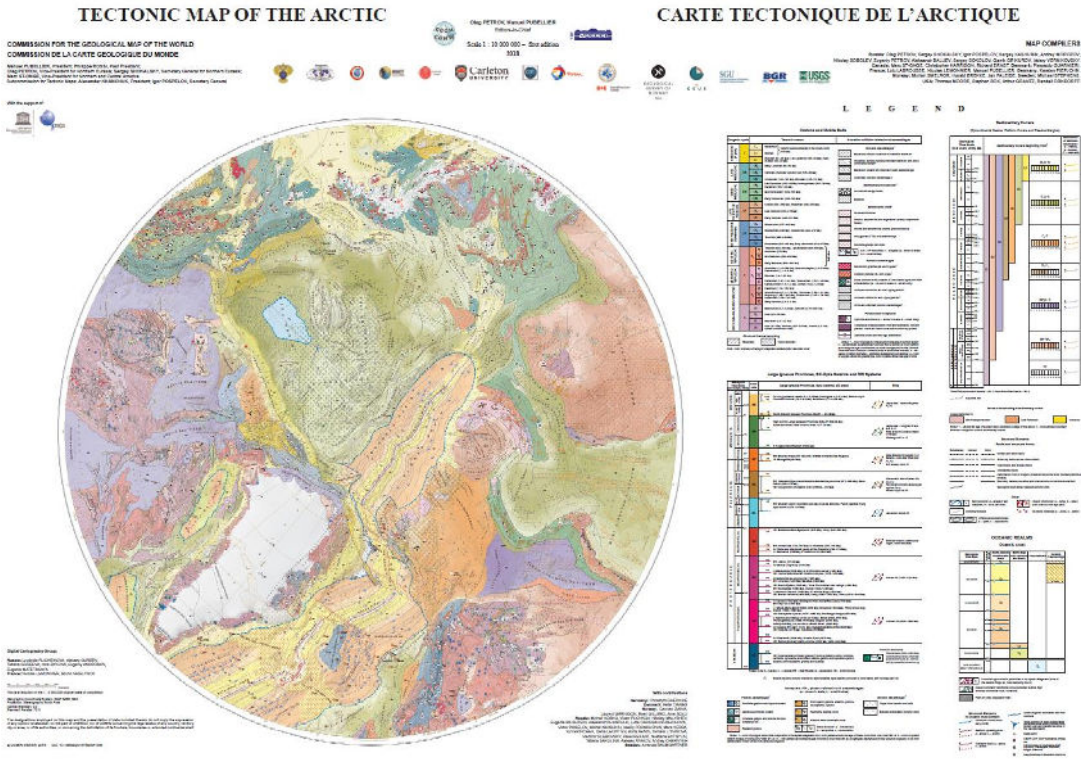
2019

Maps and documents to be printed and / or digitally accessible

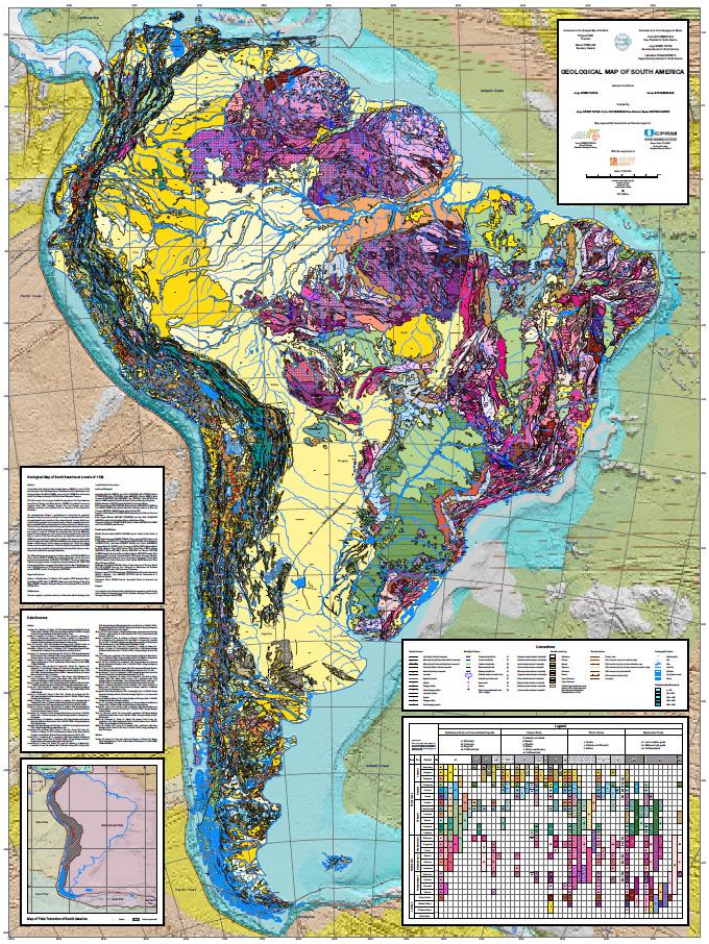
- Atlas of the Stratigraphic markers of the Gulf of Lion (March):



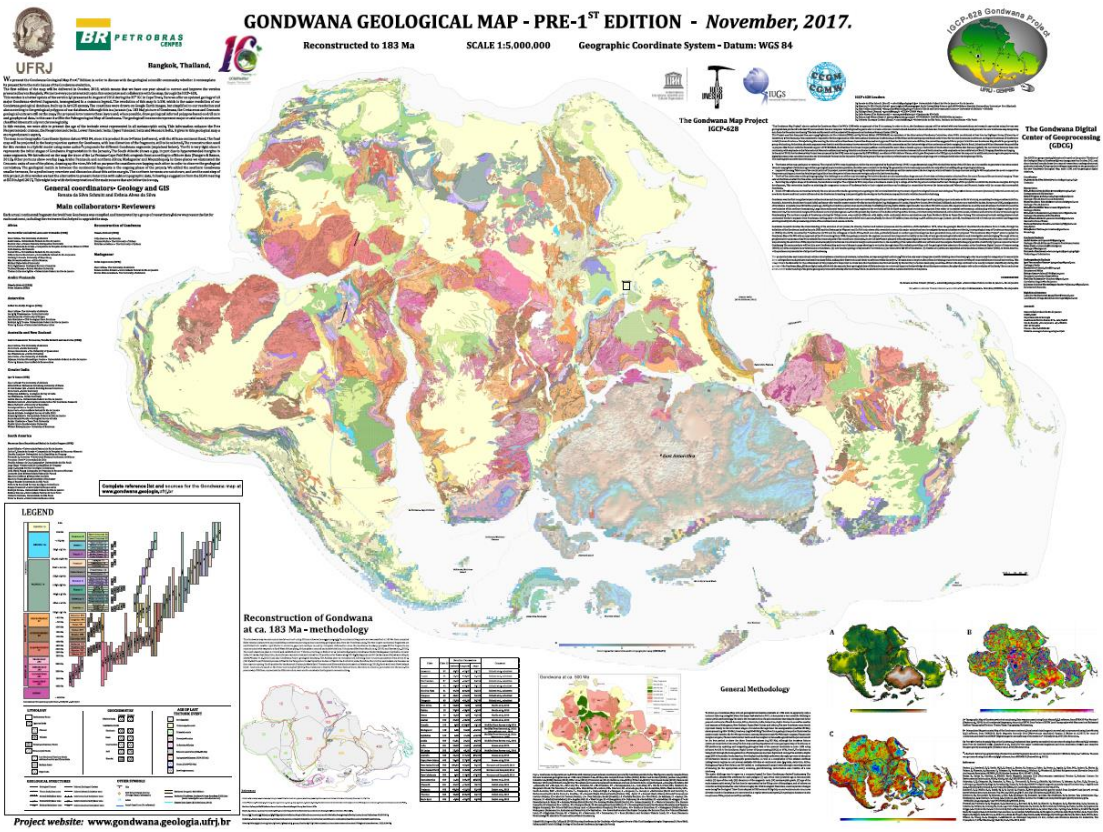
- The Tectonic Map of the Arctic (TeMAr project) at 1:10 M (April):



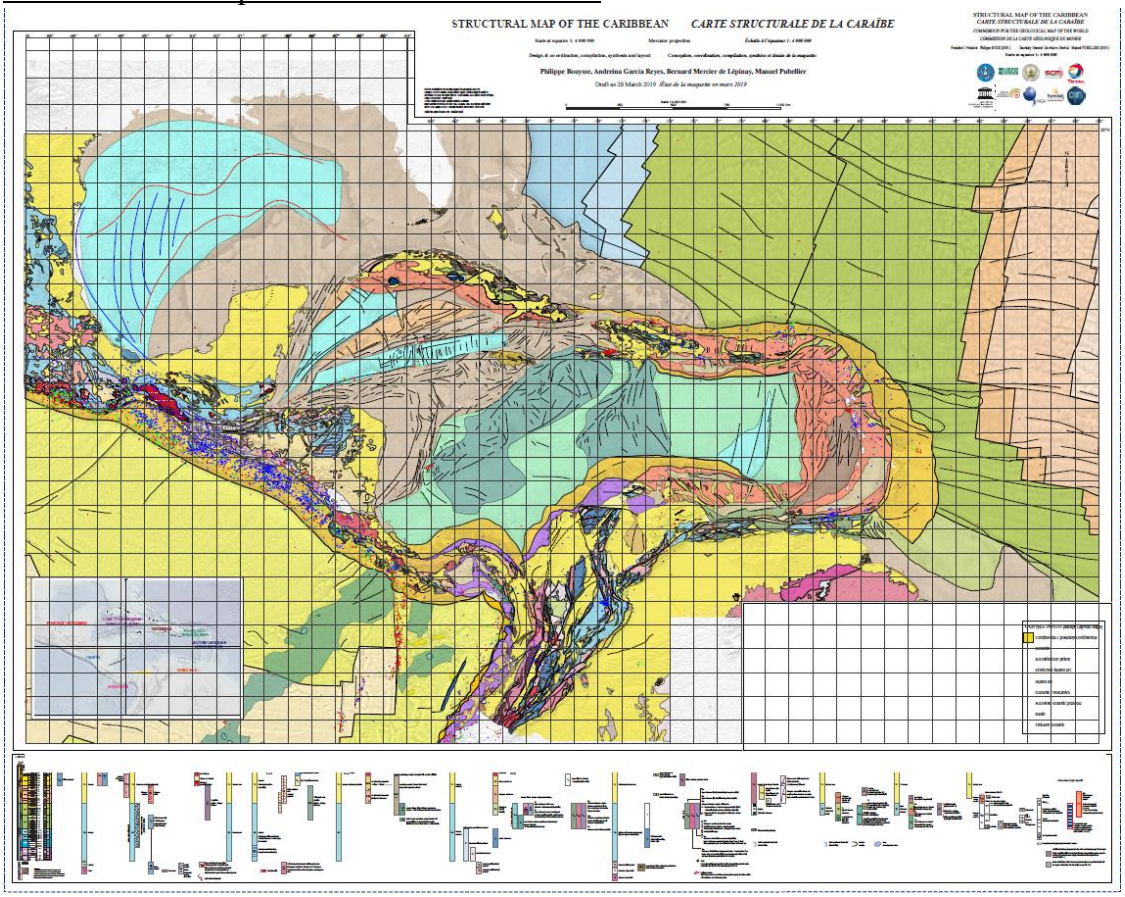
- The Geological Map of South America at 1:5 M (Summer 2019):



- The Gondwana map at 1:10M scale (Spring 2020):



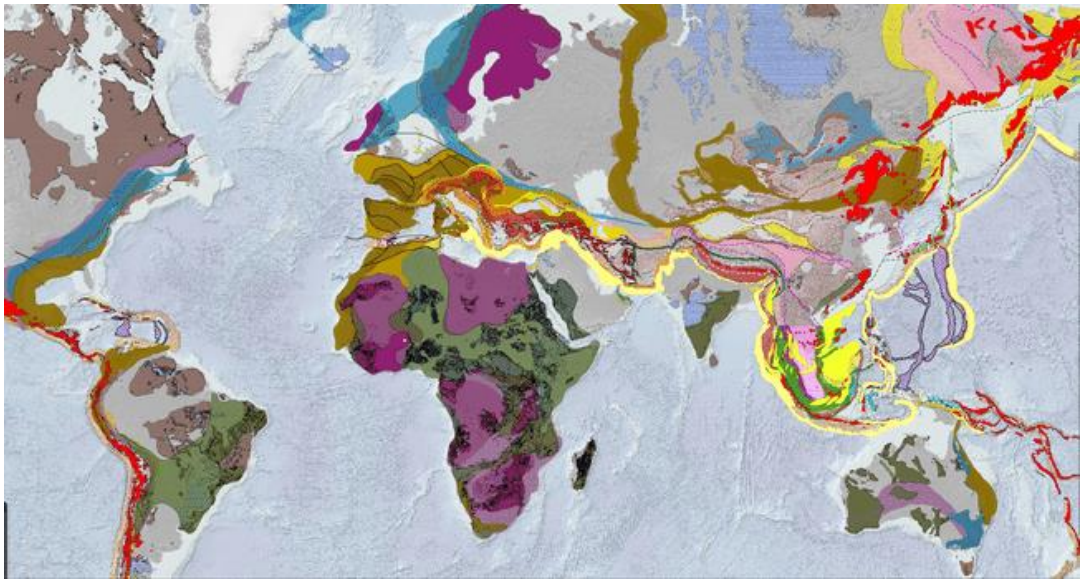
- The Structural Map of the Caribbean at 1:4 M:



- The Metamorphic map of the East Mediterranean
- The Structural Map of the Eastern Pacific Ocean
- The 2nd edition of the World Digital Magnetic Anomaly Map (WDMAM) jointly with IUGG

Maps in progress

- The World Map of the Orogens (IGCP Program 667):



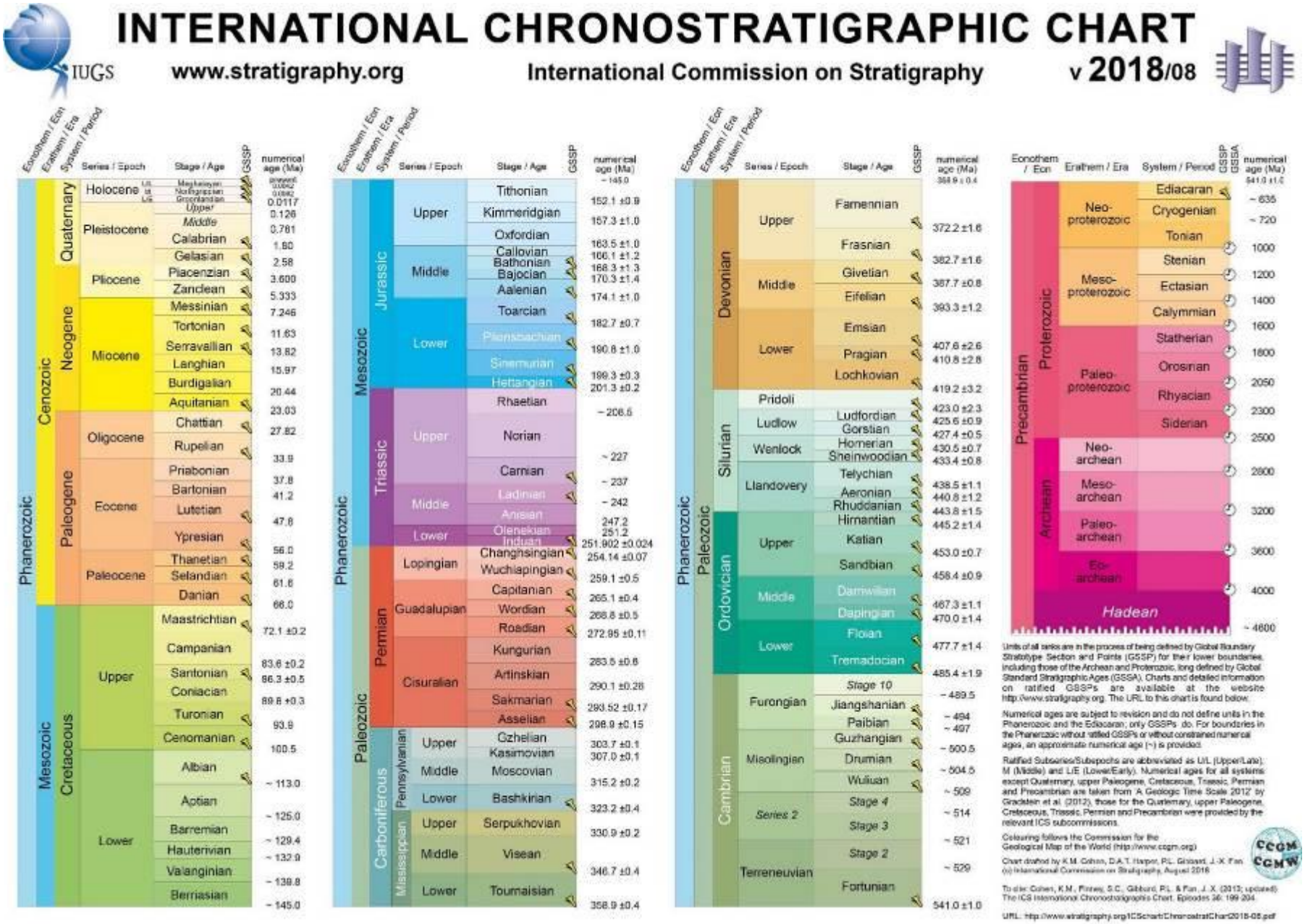
- The International Quaternary Map of Europe Map of Quaternary in Europe (IQUAME).at 1:5 M: completed draft to be presented at IGC 36 in New Dehli (India)
- The 2nd edition of the Geological Map of the Middle East at 1:5 M
- The Quaternary Map of the Middle East at 1:5 M
- The Metamorphic and Magmatic Map of the Middle East at 1:5 M
- The Structural synthesis at the scale of 1:10 M of the World's oceans to be carried out in digital format based on the published maps and current seafloor mapping projects. The Worldwide ocean map is planned to be ready for the next IGC36 in New-Dehli (India) to be held in March 2020 and is designed to be available online on the OneGeology portal.
- The Structural Map of the Indian Ocean 1:40 M to be presented at IGC 36 in New Dehli (India)
- Booklet of the "Geology of the Indian Ocean and its margins" to be presented at IGC 36 in New Dehli (India)

Global projects

- The digital geological map of the world at 1:5M scale
- The digital structural map of the World Ocean at 1:20M scale.

INTERNATIONAL CHRONOSTRATIGRAPHIC CHART

CHARTE CHRONOSTRATIGRAPHIQUE INTERNATIONALE


INTERNATIONAL CHRONOSTRATIGRAPHIC CHART
IUGS
www.stratigraphy.org
International Commission on Stratigraphy
v 2018/08
Phanerozoic
Cenozoic
Quaternary
Neogene
Paleogene
Mesozoic
Cretaceous
Holocene
Pleistocene
Pliocene
Miocene
Oligocene
Eocene
Paleocene
Upper
Lower
Meghalayan
Northgrippian
Greenlandian
Upper
Middle
Calabrian
Gelasian
Piacenzian
Zanclean
Messinian
Tortonian
Serravallian
Langhian
Burdigalian
Aquitanian
Chattian
Rupelian
Priabonian
Bartonian
Lutetian
Ypresian
Thanetian
Selandian
Danian
Maastrichtian
Campanian
Santonian
Coniacian
Turonian
Cenomanian
Albian
Aptian
Barremian
Hauterivian
Valanginian
Berriasian
0.0042
0.0082
0.0117
0.126
0.781
1.80
2.58
3.600
5.333
7.246
11.63
13.82
15.97
20.44
23.03
27.82
33.9
37.8
41.2
47.8
56.0
59.2
61.6
66.0
72.1 ±0.2
83.6 ±0.2
86.3 ±0.5
89.8 ±0.3
93.9
100.5
~ 113.0
~ 125.0
~ 129.4
~ 132.9
~ 139.8
~ 145.0
Phanerozoic
Mesozoic
Paleozoic
Jurassic
Triassic
Permian
Carboniferous
Pennsylvanian
Mississippian
Upper
Middle
Lower
Tithonian
Kimmeridgian
Oxfordian
Callovian
Bathonian
Bajocian
Aalenian
Toarcian
Pliensbachian
Sinemurian
Hettangian
Rhaetian
Norian
Carnian
Ladinian
Anisian
Olenekian
Induan
Lopingian
Guadalupian
Cisuralian
Changhsingian
Wuchiapingian
Capitanian
Wordian
Roadian
Kungurian
Artinskian
Sakmarian
Asselian
Gzhelian
Kasimovian
Moscovian
Bashkirian
Serpukhovian
Visean
Tournaisian
~ 145.0
152.1 ±0.9
157.3 ±1.0
163.5 ±1.0
166.1 ±1.2
168.3 ±1.3
170.3 ±1.4
174.1 ±1.0
182.7 ±0.7
190.8 ±1.0
199.3 ±0.3
201.3 ±0.2
~ 208.5
~ 227
~ 237
~ 242
247.2
251.2
251.902 ±0.024
254.14 ±0.07
259.1 ±0.5
265.1 ±0.4
268.8 ±0.5
272.95 ±0.11
283.5 ±0.6
290.1 ±0.26
293.52 ±0.17
298.9 ±0.15
303.7 ±0.1
307.0 ±0.1
315.2 ±0.2
323.2 ±0.4
330.9 ±0.2
346.7 ±0.4
358.9 ±0.4
Phanerozoic
Paleozoic
Devonian
Silurian
Ordovician
Cambrian
Upper
Middle
Lower
Pridoli
Ludlow
Wenlock
Llandovery
Furongian
Miaolingian
Series 2
Terreneuvian
Famennian
Frasnian
Givetian
Eifelian
Emsian
Pragian
Lochkovian
Ludfordian
Gorstian
Homerian
Sheinwoodian
Telychian
Aeronian
Rhuddanian
Hirnantian
Katian
Sandbian
Darriwilian
Dapingian
Floian
Tremadocian
Stage 10
Jiangshanian
Paibian
Guzhangian
Drumian
Wuliuan
Stage 4
Stage 3
Stage 2
Fortunian
372.2 ±1.6
382.7 ±1.6
387.7 ±0.8
393.3 ±1.2
407.6 ±2.6
410.8 ±2.8
419.2 ±3.2
423.0 ±2.3
425.6 ±0.9
427.4 ±0.5
430.5 ±0.7
433.4 ±0.8
438.5 ±1.1
440.8 ±1.2
443.8 ±1.5
445.2 ±1.4
453.0 ±0.7
458.4 ±0.9
467.3 ±1.1
470.0 ±1.4
477.7 ±1.4
485.4 ±1.9
~ 489.5
~ 494
~ 497
~ 500.5
~ 504.5
~ 509
~ 514
~ 521
~ 529
541.0 ±1.0
Precambrian
Proterozoic
Archean
Hadean
Neo-proterozoic
Meso-proterozoic
Paleo-proterozoic
Neo-archean
Meso-archean
Paleo-archean
Eo-archean
Ediacaran
Cryogenian
Tonian
Stenian
Ectasian
Calymmian
Statherian
Orosirian
Rhyacian
Siderian
~ 635
~ 720
1000
1200
1400
1600
1800
2050
2300
2500
2800
3200
3600
4000
~ 4600
Units of all series are in the process of being defined by Global Boundary Stratotype Section and Points (GSSP) for their lower boundaries, including those of the Archean and Proterozoic, long defined by Global Standard Stratigraphic Ages (GSSA). Charts and detailed information on ratified GSSPs are available at the website http://www.stratigraphy.org. The URL to this chart is found below.
Numerical ages are subject to revision and do not define units in the Phanerozoic and the Ediacaran; only GSSPs do. For boundaries in the Phanerozoic without ratified GSSPs or without constrained numerical ages, an approximate numerical age (~) is provided.
Ratified Subseries/Subepochs are abbreviated as L/L (Upper/Late); M (Middle) and L/E (Lower/Early). Numerical ages for all systems except Quaternary, upper Paleogene, Cretaceous, Triassic, Permian and Precambrian are taken from 'A Geologic Time Scale 2012' by Gradstein et al. (2012); those for the Quaternary, upper Paleogene, Cretaceous, Triassic, Permian and Precambrian were provided by the relevant ICS subcommissions.
Colouring follows the Commission for the Geological Map of the World (http://www.cgmw.org)
Chart drafted by K.M. Cohen, D.A.T. Harper, P.L. Gibbard, J.-X. Fan
(c) International Commission on Stratigraphy, August 2018
To cite: Cohen, K.M., Finney, S.C., Gibbard, P.L. & Fan, J.-X. (2013; updated) The ICS International Chronostratigraphic Chart. Episodes 36: 199-204.
URL: http://www.stratigraphy.org/ICSchart/ChronostratChart2018-08.pdf
CCGM
CGMW

CGMW FINANCIAL STATEMENTS / *BILANS FINANCIERS CCGM*

2016, 2017, 2018

COMMISSION DE LA CARTE GEOLOGIQUE DU MONDE
COMMISSION FOR THE GEOLOGICAL MAP OF THE WORLD

YEAR 2016 FINANCIAL STATEMENT

ACCUMULATED RESERVES (01/01/16) **259 809.78 €**

INCOME 2016

Membership fees	55 131.41 €	
Subsidies (IUGS,TOTAL)	7 011.90 €	
Mapping sponsoring	23 354.08 €	
Publication sales	30 876.43 €	
TOTAL I		116 373.82 €
Financial income and account interest	8 268.22 €	
TOTAL II		8 268.22 €
TOTAL I + II		**124 642.04 €**

EXPENSES 2016

Map production	34 544.55 €	
Purchase of Maps and Documents	3 821.99 €	
Sales costs - Marketing - Web	2 716.68 €	
Participation to international and national exhibitions & events	10 590.26 €	
Meetings, missions	9 942.80 €	
Postage, phone, fax, internet	7 205.81 €	
Bureautics	4 987.32 €	
Office rent, supplies & maintenance	19 582.89 €	
Financial taxes	942.20 €	
Banking fees	2 598.10 €	
Salaries and social contributions	86 060.36 €	
TOTAL III		182 992.96 €
Change loss	- 14 666.61 €	
TOTAL IV		- 14 666.61 €
TOTAL III + IV		**168 326.35 €**

BALANCE 2016 (TOTAL I + III - TOTAL III + IV) **- 43 684.31 €**

deferred expenses/income - €

CLOSING BALANCE (31/12/16) **216 125.47 €**

COMMISSION DE LA CARTE GEOLOGIQUE DU MONDE
COMMISSION FOR THE GEOLOGICAL MAP OF THE WORLD

YEAR 2017 FINANCIAL STATEMENT

ACCUMULATED RESERVES (01/01/17) **216 125.47 €**

INCOME 2017

Membership fees	55 863.01 €	
Subsidies (IUGS,TOTAL)	9 759.72 €	
Mapping sponsoring	13 236.25 €	
Publication sales	31 067.70 €	
TOTAL I		109 926.68 €
Financial income and account interest	3 040.17 €	
TOTAL II		3 040.17 €
TOTAL I + II		**112 966.85 €**

EXPENSES 2017

Map production	7 024.64 €	
Purchase of Maps and Documents	1 245.99 €	
Sales costs - Marketing - Web	2 038.09 €	
Participation to international and national exhibitions & events	2 564.57 €	
Meetings, missions	960.20 €	
Postage, phone, fax, internet	5 949.65 €	
Bureautics	7 300.01 €	
Office rent, supplies & maintenance	14 711.77 €	
Financial taxes	563.00 €	
Banking fees	1 992.95 €	
Salaries and social contributions	69 354.33 €	
TOTAL III		113 705.20 €
Change loss	19 918.58 €	
TOTAL IV		19 918.58 €
TOTAL III + IV		**133 623.78 €**

BALANCE 2017 (TOTAL I + III - TOTAL III + IV) **- 20 656.93 €**

deferred expenses/income 2 152.70 €

CLOSING BALANCE (31/12/17) **193 315.84 €**

COMMISSION DE LA CARTE GEOLOGIQUE DU MONDE
COMMISSION FOR THE GEOLOGICAL MAP OF THE WORLD

YEAR 2018 FINANCIAL STATEMENT

ACCUMULATED RESERVES (01/01/18) **193 315.84 €**

INCOME 2018

Membership fees	68 112.50 €	
Subsidies (IUGS,TOTAL)	6 449.70 €	
Mapping sponsoring	3 919.40 €	
Publication sales	48 762.63 €	
TOTAL I		127 244.23 €
Financial income and account interest	5 821.01 €	
TOTAL II		5 821.01 €
TOTAL I + II		**133 065.24 €**

EXPENSES 2018

Map production	54 377.88 €	
Purchase of Maps and Documents	- €	
Sales costs - Marketing - Web	2 879.88 €	
Participation to international and national exhibitions & events	4 121.84 €	
Meetings, missions	13 215.53 €	
Postage, phone, fax, internet	8 404.40 €	
Bureautics	5 642.98 €	
Office rent, supplies & maintenance	25 818.35 €	
Financial taxes	554.00 €	
Banking fees	2 605.68 €	
Salaries and social contributions	57 724.57 €	
TOTAL III		175 345.11 €
Change loss	7 655.69 €	
TOTAL IV		7 655.69 €
TOTAL III + IV		**183 000.80 €**

BALANCE 2018 (TOTAL I + III - TOTAL III + IV) **- 49 935.56 €**
deferred expenses/income

CLOSING BALANCE (31/12/18) **143 380.28 €**

ANNEX

Resumes of new CGMW Bureau Members

ANNEXES

Curricula vitae des nouveaux Membres du Bureau

Alexander KHANCHUK

Professor, Academician of the Russian Academy of Sciences

USSR, Belarus, 19 September 1951

Science Leader, Far East Geological Institute
Far Eastern Branch of Russian Academy of Sciences (FEGI FEB RAS)

159, Prospekt 100-letiya
Vladivostok, 690022, Russia
Tel.: +7 914792 3252 (cell); +7 423 2318 750 (office)
Fax: +7 432 2317 847
E. mail: axanchuk2@gmail.com

General research interests
Tectonics, petrology, Metallogeny

Education
1976 – Lvov State University, USSR, Ukraine

Academic and professional background

Academician of Russian Academy of Sciences - 2006

Correspondent member of Russian Academy of Sciences - 1997

Doctorate - 1993 (Institute of Geology, Russian Academy of Sciences, Moscow, Russia)

PhD – 1982 (Far East Geological Institute, FEB RAS, Vladivostok, Russia)

Employment

2017 - present: Science Leader, Far Eastern Geological Institute of the Far Eastern Branch of Russian Academy of Sciences, Vladivostok, Russia.

1993 - 2016: Director, Far Eastern Geological Institute of the Far Eastern Branch of Russian Academy of Sciences; **since 1994**, Professor of the Far Eastern Federal University, Vladivostok, Russia.

1976 – 1993: Post-graduate, research scientist, junior and senior research scientist, Laboratory chief, Head of department Deputy Director for science of the Far Eastern Geological Institute of the Far Eastern Branch of Russian Academy of Sciences, Vladivostok, Russia.

International membership and professional affiliations

1992-2004 - Co-leader of international projects: "Major Mineral Deposits, Metallogenesis and Tectonics of the Russian Far East, Alaska, and the Canadian Cordilleras", and "Mineral Deposits, Metallogenesis, and Tectonics of Northeast Asia". Both projects were carried out with the participation of experts and research institutions from USA, Russia, China, Japan, Mongolia, and South Korea

2004 - 2008 - President of International Association on Ore Deposits Genesis

Russian Journal of Pacific Geology; Editor in Chief (**since 2006**)

Petrology, Editorial Board Member

Geology of Ore Deposits Journal, Editorial board Member

Publications (selection)

Khanchuk, A.I. *(Ed.) 2006, Geodynamics, magmatism, and metallogeny of Russian East: in 2 volumes: Vladivostok: Dalnauka, vol. 1, pp. 1-572 + colored map, vol. 2, pp. 573-981, [10 p.] + 5 colored sheets (in Russian).*

Khanchuk A.I.*, Ivanov V.V. Meso-Cenozoic geodynamic settings and gold mineralization of the Russian Far East. Russian Geology and Geophysics, 1999, vol.40, no. 11. pp. 1607-1617.*

*Nokleberg, W.J., Parfenov, L.M., Monger, J.W.H., Norton, I.O**., Khanchuk**, A.I**., Stone, D.B., Scotese, C.R., Scholl, D.W., and Fujita, K., 2000, Phanerozoic tectonic evolution of the circum-North Pacific: U.S. Geological Survey Professional Paper 1626, 122 p.*

Khanchuk, A.I. *in Nokleberg, W.J. (Ed.) 2010, Metallogenesis and tectonics of northeast Asia: U.S. Geological Survey Professional Paper 1765, 624 p.*

Khanchuk, A.I., *Kemkin, I.V., Kruk, N.N. The Sikhote-Alin orogenic belt, Russian South East: Terranes and the formation of continental lithosphere based on geological and isotopic data. Journal of Asian Earth Sciences. 2016, vol. 120, pp. 117-138. DOI: 10.1016/j.jseaes.2015.10.023.*

Khanchuk A.I. *Didenko A.N., Popeko L.I., Sorokin A. A.,Shevchenko B.F. Structure and Evolution of the Mongol-Okhotsk Orogenic Belt - The Central Asian Orogenic Belt – Geology, Evolution, Tectonics and Models /Edited by Alfred Kroner, Borntraeger Science Publishers, Stuttgart, 2015, 311p., pp. 211-234.*

Khanchuk A.I*., Kemkin I.V. Jurassic geodynamic history of the Sikhote-Alin-Priamurye region - Late Jurassic Margin of Laurasia - A Record of Faulting Accommodating Plate Rotation / Edited by T.H. Anderson et al. Geological Society of America. 2015, 606 p., pp. 509-525.*

Yurii A. Martynov ***Alexander I. Khanchuk****, Andrei V. Grebennikov a,b , Alexander A. Chashchin a,b , Vladimir K. Popov Late Mesozoic and Cenozoic volcanism of the East Sikhote-Alin area (Russian Far East): A new synthesis of geological and petrological data. Gondwana Research.47, 2017, pp. 358-371.*

Martín Ricardo GOZALVEZ

Amenabar 3220, BUENOS AIRES CITY, Argentina
Phone: +54 11 4544 8752
Cell: +549 11 50247550
martin.gozalvez@segemar.gov.ar / mrgozal@gmail.com

Education

Ph.D., Geology, National University of Córdoba, 2010
Concentrations: Metallogeny, Granite ore deposits
Dissertation: Metallogenesis associated to magmatic evolution of the Gondwanic eruptive sequences in the Valcheta area and surroundings, Rio Negro province.
M.S., Geology, National University of Córdoba, 2000
Concentrations: Petrology, Granites, Metamorfic basament
Thesis: Petrology and geochemistry of the anatectic granite of Vilacato and its relationship with the host rock.

Experience

Junior Geologist, 2001 – 2002
Geological and Mining Survey of Argentina
Area: Mining Geological Resource

CONICET Post-Graduated Fellowship, 2003–2007
Geological and Mining Survey of Argentina
Area: Mining Geological Resource

Senior Geologist, 2008–Present
Geological and Mining Survey of Argentina
Area: Mining Geological Resource

Research skills

Extensive knowledge of Metallogenesis, Metallic and non-Metallic ore deposits.

MAIN PUBLICATIONS

Published research articles

Cravero, F., Ponce, M. B., **Gozalvez, M. R.** y Marfil, S. A., 2014. "Piedra Mar del Plata": An Argentine orthoquartzite worthy of being considered as a "Global Heritage Stone Resource". Pereira, D., Marker, B. R., Kramar, S., Cooper, B. J. & Schouenborg, B. E. (eds) Global Heritage Stone: Towards International Recognition of Building and Ornamental Stones. Geological Society, London, Special Publications, 407, http://dx.doi.org/10.1144/SP407.9.

Gozalvez, M. R., 2009. Caracterización del plutón San Martín y las mineralizaciones de wolframio asociadas, departamento Valcheta, provincia de Río Negro. Revista de la Asociación GeológicaArgentina 64 (2): 285-294.

Gozalvez, M. R., 2009. Petrografía y edad 40Ar/39Ar de leucogranitos peraluminosos al oeste deValcheta. Macizo Nordpatagónico (Río Negro, Argentina). Revista de la Asociación Geológica Argentina 64 (3): 409-425.

Perez, D., M. Rubio, A. A. Bonalumi, J. Sfragulla, A. López, A. Guereschi, C. Vázquez, M. R. **Gozalvez, M.** Luchesi, R. G. Badini, S. L. Cuffini, G. Sphan, M. Inga, A. Germanier, y R. E. Servant, 2005. X-ray fluorescence analysis applied to geochemistry of quartz in Argentina. In X-RaySpectrometry, 34:59-63.

Books

Gozalvez, M. R., C. J. Herrmann, y Zappettini, E. O., 2004. Minerales Industriales de la República Argentina. Instituto de Geología y Recursos Minerales, Servicio Geológico Minero Argentino. Anales 39, 371 pp. Buenos Aires.

Special publications

Gozalvez, M. R., Bercheñi, V. y Ramallo, E., 2016. Carta Minero-Metalogenética 2366-III, Susques. Provincias de Jujuy y Salta. Instituto de Geología y Recursos Minerales, Servicio Geológico Minero Argentino. Boletín Nº 419, 71pp. Buenos Aires.

Herrmann, C. J. y **Gozalvez, M. R**., 2007. Carta Minero-Metalogenética 4166-I, Valcheta. Provincia de Río Negro. Instituto de Geología y Recursos Minerales, Servicio Geológico Minero Argentino. Boletín Nº 370, 66 p. Buenos Aires.

Herrmann, C. J., y **Gozalvez, M. R**., 2005. Disponibilidad de fertilizantes y enmiendas minerales para el agro argentino. Instituto de Geología y Recursos Minerales, Servicio Geológico Minero Argentino. Boletín 353, 71p. Buenos Aires.

Languages

Spanish Native
English Fluid
Portuguese Average

Further academy-related activities

Member of the Geological Association of Argentina since 2007
President of the Geological Association of Argentina /IUGS National Commitee between 2011-2013
Treasurer of the Geological Association of Argentina between 2014-2015
2009 – 2015 Member Board of Directors of the Geological Association of Argentina

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General research interests
Volcanology, Geohazards, Geology and Geoinformation

Education
1990: M.S., Kobe University, Kobe, Japan
1994: PhD, Hokkaido University, Sapporo, Japan

Employment
2004 - present: Geological Survey of Japan, National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan
1991 - 2004: Hokkaido Branch, Geological Survey of Japan, Sapporo, Japan

Membership and recent activities
2017 - **present**: Leader of Commission on Volcanic Hazards and Risk, International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI)
2015 - **present:** Leader of Geoinformation Sharing Infrastructure (GSi) Project, Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP), https://ccop-gsi.org/main/
2014 - **present:** Member of Volcanic Hazard Mitigation Committee, Volcanological Society of Japan
2012 - **present:** Secretary General of G-EVER (Global Earthquake and Volcanic Eruption Risk Management) Project, http://g-ever.org/
2008 - 2012: Leader of Commission on Explosive Volcanism, IAVCEI
2012-present: Editorial Board Member, Journal of Applied Volcanology

Publications

Takarada, S., Kazahaya, K., Kawanabe, Y., Sakaguchi, K., Suto, S., Yamamoto, T., et al. (1993). Volume estimation of 1991-92 eruption of Unzen volcano, and initiation mechanisms of pyroclastic flows on June 3 and June 8, 1991. Bull. Geol. Surv. Jap. 44, 11–24. (in Japanese)

Takarada, S., Ui, T. and Yamamoto, Y. (1999) Depositional features and transportation mechanism of valley-filling Iwasegawa and Kaida debris avalanches, Japan. Bull. Volcanol, 60, 508-522.

Takarada, S., Bandibas, J. C., Ishikawa, Y., and G.-EVER Promotion Team (2014).

Global earthquake and volcanic eruption risk management activities, volcanic hazard assessment support system and Asia-pacific region hazard mapping project in G-EVER. Episodes 37, 321–328.

Takarada, S., Ishikawa, Y., Maruyama, T., Yoshimi, M., Matsumoto, D., Furukawa, R., et al. (2016a). Eastern Asia Earthquake and Volcanic Hazards Information Map. Tsukuba: Geological Survey of Japan, AIST.

Takarada, S., Oikawa, T., Furukawa, R., Hoshizumi, H., Itoh, J., Geshi, N., et al. (2016b). Estimation of total discharged mass from the phreatic eruption of Ontake volcano, central Japan, on September 27, 2014. Earth Planets Space68:138. doi: 10.1186/s40623-016-0511-4

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Kano, K. and Takarada, S. (2006) Cone-building block-and-ash flows: the Senyama volcanic products of O'e Takayama volcano, SW Japan. Bull. Volcanol., 69, 563- 575.

Uehara, D., Cas, R., Folks, C., Takarada, S., Oda, K. and Porecca, M. (2015) Using thermal remanent magnetisation (TRM) to distinguish block and ash flow and debris flow deposits, and to estimate their emplacement temperature: 1991-1995 lava dome eruption at Mt. Unzen Volcano, Japan. Jour. Volcanol. Geotherm. Res., 303, 92-111.

Ui, T., Takarada, S. and Yoshimoto, M. (1999) Debris avalanches. In "Encyclopedia of Volcanoes" (Sigurdsson et al. eds.), 617-626.

Wakita, K., Igawa, T., Takarada, S. and Fusejima, Y. (2008) Creation of seamless geological map of Japan at the scale of 1:200000 and its distribution on the web. Synthesiology, 1, 82-93.

Yamamoto, T., Takarada, S. and Suto, S. (1993) Pyroclastic flows from the 1991 eruption of Unzen volcano, Japan. Bull. Volcanol., 55, 166-175.

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Education

Ph.D., Graduate School of CAGS in September 1989-July 1993.
M. Sc., Graduate School of CAGS in September 1985-July 1988.
B.Sc., Wuhan College of Geology in September 1981 - July 1985.

Professional experience

- Professor and Vice-President of the Chinese Academy of Geological Sciences (CAGS) since July 2011. Mainly engaged in mapping thrust systems in the central Qiangtang Block, northern Tibetan Plateau.
- Professor and Head of the Science of Technology Division of the CAGS in June 2011-April 2007. From 2007 to 2010 joins the fourth phase of the International Deep Profiling across the Himalaya and Tibetan Plateau (INDEPTH-IV) as a Chief geologist.
- Professor and Vice-Director of the Institute of Geomechanics, CAGS in March 2007-April 2000. Completes in 2000-2002 the Geological mapping of the Damxung Rectangle at a scale 1:250000 and the geological survey of active faults and geological hazards along the Golmud-Lhasa Railway in 2001-2005.
- Professor and Head of the Science of Technology Division of the CAGS in March 2000-November 1997. In 1998-2000 joins the third phase of the International Deep Profiling across the Himalaya and Tibetan Plateau (INDEPTH-III) as CAGS leading Geologist.
- Visiting Professor of the Syracuse University in January-April, 2000, mainly engaged in studying tectonics of the Tibetan Plateau along the INDEPTH profiles together with Professor Doug Nelson.
- In 1997-1998, engaged in the study of tectonics and metallogenesis of the Yanshan Orogenic Belt, North China Craton at the Institute of Geomechanics, CAGS.

Professional activities

- Deputy Editor in Chief of the *ACTA Geoscientica Sinica* since July 2017.
- Member of the Science and Technology Committee of the China Geological Survey since 2015.
- Member of the Science and Technology Consultant Committee of the Ministry of Land and Resources of China since 2012.
- Deputy Editor in Chief of the Chinese Journal of Geomechanics in 2002-2008.
- Member of the National Review Committee of China Earthquake Reports in 2002-2007.

Publications (selection)

Wu Zhenhan, Zhao Zhen, Patrick J. Barosh, Ye Peisheng, 2016. Early Cretaceous tectonics and evolution of the Tibetan Plateau. *ACTA Geologica Sinica*, 90(3): 847-857.

Wu Zhenhan, Patrick J. Barosh, Ye Peisheng, Hu Daogong, 2015. Late tectonic framework of the Tibetan Plateau. *Journal of Asian Earth Sciences,* 114(2105): 693-703, dx.doi.org/10.1016/j. jseaes.2014.11.02.

Danian Shi, **Zhenhan Wu,** Simon L.Klemperer, Wenjin Zhao, Guangqi Xue, Heping Su, 2015. Receiver function imaging of crustal suture, steep subduction, and mantle wedge in the eastern India-Tibet continental collision zone. *Earth and Planetary Science Letters,* 414(2015): 6-15, http://dx.doi.org/10.1016/j.epsl.2014.12.055.

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Wu Zhenhan, Ye Peisheng, Patrick J. Barosh, Hu Daogong, Zhao Wenjin, Wu Zhonghai, 2009. Late Oligocene-Early Miocene Thrusting in Southern East Kunlun Mts., Northern Tibetan Plateau. *Journal of Earth Sciences,* 20(2): 381-390.

Wu Zhenhan, Patrick J. Barosh, Wu Zhonghai, Hu Daogong, Zhao Xun and Ye Peisheng, 2008. Vast early Miocene lakes of the central Tibetan Plateau. *Geological Society of America Bulletin,* 120 (9/101326-1337, Doi:10.1130/B26043.1

Wu Zhenhan, Patrick J. Barosh, Lianjie Wang, Daogong Hu, Wei Wang, 2008. Numerical modeling of stress and strain associated with bending of an oil pipeline by a migrating pingo in the permafrost region of the northern Tibetan Plateau. *Engineering Geology,* 96(1-2): 62-77

Wu Zhenhan, Patrick J. Barosh, Daogong Hu, Zhonghai Wu, Ye Peisheng, Liu Qisheng and Zhou Chunjing, 2005. Migrating pingos in the permafrost region of the Tibetan Plateau, China and their hazard along the Golmud-Lhasa railway. *Engineering Geology,* 79: 267-287

Hu Daogong, **Wu Zhenhan**, Jiang Wan, et al., 2005. SHRIMP zircon U-Pb age and Nd isotopic study on the Nyainqentanglha Group in Tibet. *Science in China (Series D),* 35(2): 156-162

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Wu Zhenhan, Hu Daogong, Ye Peisheng, Zhao Xun, Liu Qisheng, 2004. Thrusting of the North Lhasa Block in the Tibetan Plateau. *ACTA Geologica Sinica*, 78 (1) : 246-259

Peter M. Blisniuk, Bradley R. Hacker, Johannes Glodny, Lothar Ratschbacher, Bi Siwen, **Wu Zhenhan**, Michael O. Mcwilliams and Andy Calvert, 2001. Normal faulting in central Tibet since at least 13.5Myr ago. *Nature*, vol.412, no.9, 628-632.

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Wu Zhenhan, Cui Shengqin, Zhu Dagang, Feng Xiangyang and Ma Yinsheng, 2000. Thermal evolution of plutons and uplift process of the Yanshan orogenic belt. *ACTA Geologica Sinica*, 74(1): 7-13.

Wu Zhenhan, Meng Xiangang, 1998. Gold-multimetal metallogenesis and tectonic control of ore deposits in the Yanshan intracontinental orogenic belt. Beijing: Geological Publishing House, 1-154 (in Chinese with English summary).

Cui Shengqin and **Wu Zhenhan**, 1997. On the Mesozoic and Cenozoic intracontinental orogenesis of Yanshan area, China. Proceeding of the 30th International Geological Congress. The Netherland: VSP, 14: 277-292.

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Education Background

- Postdoctoral research at School of Earth and Space Sciences, Peking University (2008- 2010)
- Doctoral study at School of Earth and Space Sciences, Peking University (2004- 2008)
- Postgraduate study at Xi'an Shiyou University (2001- 2004)
- Undergraduate study at Xi'an Shiyou University (1997- 2001)

Scientific Research Projects

- Nature of the Daheishan mafic-ultramafic complex from Yiwu area in East Junggar and comparative study on ophiolites in East Junggar and West Junggar, National Natural Science Foundation of China (Grant Nos. 4157021072), 2016-2019, project leader.
- Research on the continental and marine tectonics of South and East Asia (i.e. China and adjacent regions) and related map compilation, Geological Survey Project of China Geological Survey, 2015-2018, second director of the project.
- Ages, characteristics and tectonic implications of ophiolite from the south of Xiemisitai Mountain in West Junggar, Xinjiang, National Natural Science Foundation of China (Grant Nos. 41202159), 2013-2015, project leader

Representative articles published in recent five years (first author)

1- Zhao, L., He, G.Q., 2016. LA-ICP-MS U-Pb zircon age of dacite in Tailegula Formation and their constraints on the emplacement of the Darbut ophiolite in West Junggar. *Acta Scientiarum Naturalium Universitatis Pekinensis*, 52(5), pp. 871-880 (in Chinese with English abstract).

2- Zhao, L., He, G.Q., 2016. Stratigraphic Evidences for Tectonic Division of West Junggar and East Kazakhstan. *Xingjiang Geology*, 34(2), pp. 150-155 (in Chinese with English abstract).

3- Zhao, L., He, G.Q., 2014. Geochronology and geochemistry of the Cambrian (~518 Ma) Chagantaolegai ophiolite in northern West Junggar (NW China): constraints on spatiotemporal characteristics of the Chingiz–Tarbagatai megazone. *International Geology Review*, 56, pp. 1181-1196.

4- Zhao, L., He, G.Q., 2013. Tectonic entities connection between West Junggar (NW China) and East Kazakhstan. *Journal of Asian Earth Sciences*, 72(10), pp. 25-32.

5- Zhao Lei, He Guoqi, Zhu Yabing. 2013. Discovery and its tectonic significance of the ophiolite in the south of Xiemisitai Mountain, West Junggar, Xinjiang. *Geological Bulletin of China*, 32(01): pp. 195-205 (in Chinese with English abstract).