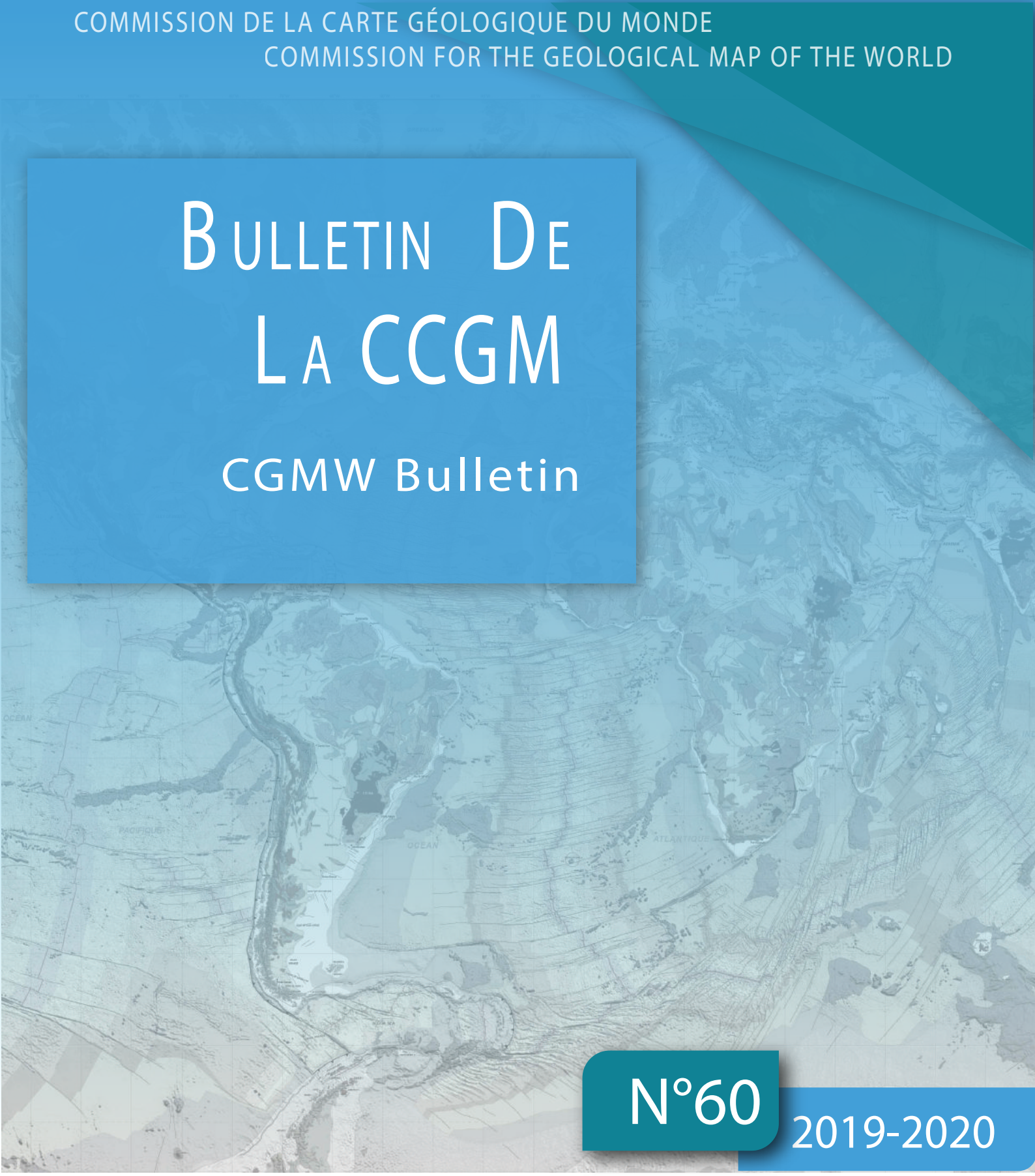
COMMISSION DE LA CARTE GÉOLOGIQUE DU MONDE
COMMISSION FOR THE GEOLOGICAL MAP OF THE WORLD

BULLETIN DE LA CCGM

CGMW Bulletin



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2019-2020

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FOREWORD

The current global coronavirus COVID-19 pandemic that is transforming our lives is making us increasingly aware, if there were still a need, of the globalization of major issues, whether they be health-related, environmental or economic. Beyond local, regional or national needs, they make us aware of the need for a global reading of major challenges. This also concerns the solid Earth, the knowledge and understanding of which allow better management of resources (water, minerals, energy, soil) and a better anticipation and mitigation of natural hazards, all essential components of our lives.
While regional and national geological surveys and their partners produce the knowledge necessary to take into account these issues at the scale of these territories, the Commission for the Geological Map of the World (CGMW) has been producing continental-scale geoscientific maps for more than a century to meet the growing needs related to global issues. These maps are of interest to public authorities as well as to academia, economic actors and the civil society. The published documents are made available through the CGMW website and they can also be viewed on the OneGeology portal.

Because of the outbreak of the global COVID-19 pandemic, the 36th IGC scheduled to be held in March 2020 had to be cancelled and along with it, our General Assembly. We will soon inform our members about the date and venue of the next General Assembly. Our last Bureau meeting took place as a webinar the 1st December 2020.

During the last two years, the CGMW has been very active and several map projects were completed. Among them, we would like to highlight: the *Geological Map of South America at 1:5M*; the *Tectonic Map of the Arctic at 1:5M*; the *Structural Map of the Caribbean at scale 1:4M*…
The major currently ongoing projects are: the *Quaternary Map of Europe at 1:2.5M*; the *World Map of Orogens at scale 1:35M*; the *Structural Map of the Indian ocean at 1:20M*; the *Quaternary Map and the Metamorphic and Magmatic Map of the Middle East at 1:5*M; the *Metamorphic Map of the East Mediterranean at 1:5M*…
The CGMW just started two new ambitious projects: 1) The *Geological Map of the World at scale 1:5M*. This project will integrate the geological maps of continents and oceans, which have been produced under supervision of the CGMW, and construct a new seamless and digital geological map of the world. This project is part of the IUGS-DDE (Deep-time Digital Earth) program. CGMW is a founding member of the DDE and is in charge specifically of the Geological Mapping Group, which is a think tank dedicated to the future of geological maps. 2) The *Tectonic Map of the World at scale 1:5M* under the supervision of the VSEGEI.

More than a century after its creation, the CGMW continues its mission of producing global geoscientific maps. This is possible thanks to the support and annual contributions of statutory members, grants from IUGS and UNESCO, and sponsoring from geological surveys or industry on specific projects. The sales of CGMW-produced maps (printed and/or digital and GIS based) and attached booklets contribute to the financing.

We invite all interested parties to join with us to explore new concepts of geoscientific maps and associated databases to better respond to the current global challenges and to provide better services to users.

Thank you for your support.

PRÉFACE

La pandémie mondiale actuelle de coronavirus COVID-19 transforme nos vies et nous rend conscients, s'il en était encore besoin, de la mondialisation des grands enjeux, qu'ils soient sanitaires, environnementaux ou économiques. Au-delà des besoins locaux, régionaux ou nationaux, ils nous sensibilisent à la nécessité d'une lecture globale des enjeux majeurs. Cela concerne également la Terre solide dont la connaissance et la compréhension permettent une meilleure gestion des ressources (eau, minérales, énergie, sol), et une meilleure anticipation et atténuation des risques naturels.
Alors que les Services géologiques régionaux et nationaux et leurs partenaires produisent les connaissances nécessaires pour prendre en compte ces enjeux à l'échelle de ces territoires, la Commission de la Carte Géologique du Monde (CCGM) produit des cartes géoscientifiques à l'échelle continentale depuis plus d'un siècle pour répondre aux besoins croissants liés aux enjeux mondiaux. Ces cartes intéressent les pouvoirs publics, le monde académique, les acteurs économiques et la société civile. Les documents publiés sont disponibles via le site web de la CCGM et peuvent également être consultés sur le portail OneGeology.

En raison de l'éclosion de la pandémie mondiale de COVID-19, la 36ème IGC prévue pour mars 2020 a dû être annulée et avec elle notre Assemblée Générale. Nous informerons prochainement nos membres de la date de la prochaine Assemblée Générale. Notre dernière réunion du Bureau s'est déroulée sous la forme d'un webinaire le 1er décembre 2020.

Au cours des deux dernières années, la CCGM a été très active et plusieurs projets cartographiques ont été achevés. Parmi eux, nous voudrions souligner : la *carte géologique de l'Amérique du Sud au 1:5M*; la *carte Tectonique de l'Arctique à 1:5M*; la *carte Structurale de la Caraïbe à l'échelle 1:4M*…
Les grands projets actuellement en cours sont : la *carte du Quaternaire de l'Europe au 1:2.5M*; la *carte mondiale des Orogènes à l'échelle 1:35M* ; la *carte structurale de l'océan Indien au 1:20M*; la *carte du Quaternaire et la carte métamorphique et magmatique du Moyen-Orient à 1:5M*; la *carte métamorphique de la Méditerranée Orientale au 1:5M*.
La CCGM vient de démarrer deux nouveaux projets ambitieux : 1) La *carte géologique du Monde à l'échelle 1:5M*. Ce projet intégrera les cartes géologiques des continents et des océans, qui ont été produites sous la supervision de la CCGM, et construira une nouvelle carte géologique numérique du monde. Ce projet fait partie du programme IUGS-DDE (Deep-time Digital Earth). La CCGM est membre fondateur de la DDE et est spécifiquement en charge du Geological Mapping Group, qui est un groupe de réflexion dédié à l'avenir des cartes géologiques. 2) *La carte Tectonique du Monde à l'échelle 1:5M* sous la supervision du VSEGEI.

Plus d'un siècle après sa création, la CCGM poursuit sa mission de production de cartes géoscientifiques mondiales. Ceci est possible grâce au soutien et aux contributions annuelles des membres statutaires, aux subventions de l'IUGS et de l'UNESCO, et au parrainage des Services géologiques ou de l'industrie sur des projets spécifiques. La vente de cartes et de livrets produits par la CCGM (imprimées et/ou numériques et SIG) contribue à son financement.

Nous invitons toutes les parties intéressées à se joindre à nous pour explorer de nouveaux concepts de cartes géoscientifiques et de bases de données associées, afin de mieux répondre aux défis mondiaux actuels et de fournir de meilleurs services aux utilisateurs.

Merci pour votre soutien.

Pierre NEHLIG, CGMW Secretary General

CGMW Bureau / *Bureau CCGM*

2020 Bureau Meeting / *Réunion du Bureau 2020*

After the cancellation of IGC 36 in New Delhi due to the COVID19 pandemic, we had to cancel the CGMW Bureau and General Assembly. Lockdown rules accelerated the generalization of videoconferences, which are now routine to us.
The success of our Extraordinary Bureau meeting last 1st of December 2020 might be the starting point for a new organization of meetings that could be more frequent, more focused and, at the same time, more international. We by this way want to foster the involvement of the Heads of the sub-commissions, which are *de facto* part of the Executive Committee of CGMW, to the daily activities of the Commission.
The new projects that have just been launched - in particular in the framework of the DDE program, in which the CGMW is in charge of the production of the 1:5M digital map of the world - will indeed require more frequent consultation of the CGMW Continental and Thematic sub-Commissions. In a broader sense, it would be convenient if any item of the agenda could be listed in advance prior to the meetings, thus avoiding unnecessarily redundancy in tiring videoconferences. On the other hand, the negligible cost will enable us to make our exchanges easier.
An annual videoconference meeting should be interspersed between the biannual meetings held regularly during the IGCs and at UNESCO in Paris alternatively.

Our CGMW General Assembly will be postponed to a later date in 2021.

Changes of CGMW Bureau Members / *Changements du Bureau de la CCGM*

Submitted to the approval of CGMW Bureau Members and the ratification by the Bureau Meeting on December 1rst, 2020.

Subcommissions	Previous position / Resignations	Name	Nomination	
			New position	Name
Metallogenic Maps	President	Eduardo Zappettini	President	Martín Gozalvez
	Secretary General	Martín Gozalvez	Secretary General	Xiomara Cazañas
Seafloor Maps	Secretary General	Yves Lagabrielle	Secretary General	Javier Escartin
Africa	Secretary General	J.P Milesi	Secretary General	Anna Nguno
	Deputy Secretary General	-	Deputy Secretary General	Rokhaya Samba
N. Eurasia	Secretary General	Sergei Shokalsky	Secretary General	Tatiana Tolmacheva
N. Eurasia	Secretary General	Sergei Shokalsky	Secretary General	Tatiana Tolmacheva

Resignations and nominations taking effect in December 2020 - BUREAU			
	Outgoing	**Nomination**	
		Name	**Organisation/Country**
Deputy Secretary General	Bruno Vrielynck	Nadine Ellouz-Zimmermann	IFP energies nouvelles

CGMW Bureau Members / *Membres du Bureau CCGM*

COMMISSION DE LA CARTE GEOLOGIQUE DU MONDE (CCGM)
COMMISSION FOR THE GEOLOGICAL MAP OF THE WORLD (CGMW)

President: Dr. Manuel PUBELLIER Secretary General: Dr. Pierre NEHLIG
Deputy Secretary General: Dr. Nadine ELLOUZ-ZIMMERMANN Advisor: Dr. Peter MILES

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Summary of the activities of CGMW Sub-commissions for the period 2019-2020

Résumé des activités des Sous-commissions de la CCGM pour la période 2019-2020

Regional Sub-commissions

Africa

- **Projects in progress:**
  - Tectonic Map of Africa at 1:5M

North and Central America

- **Projects completed:**
  - Tectonic Map of the Arctic (TeMAr): map released in April 2019

- **Projects in progress:**
  - Structural Map of the Caribbean (Estimated completion – January 2021)

South America

- **Projects in progress:**
  - Geology, Tectonics and Mineral Resources of the Amazonian Craton 2.5 M scale (March 2018 – November 2022).

- **Projects completed:**
  - Geologic and Mineral Resources Map of sheet NA.21 – Tumucumaque, 1:1M sacale (SIG – South America 1:1M scale Project) (August 2014 – November 2020).

- **New proposal:**
  - Metallogenic map of the Amazonian Craton (1:2,500,000)

  Evandro Klein (coordination) and Felipe Tavares (Geological Survey of Brazil- CPRM) and other Collaborators indicated by the Subcommission of Metallogenic Maps (E. Zappettini and M. Gozalvez) 2022 -2025.

Antarctica

- **Projects in progress:**
  - Tectonic Map of Antarctica, 2-nd Edition and Explanatory Notes (Date of Launching: 2016; Date of Completion for 2021)

- **New proposal:**
  - Precambrian of Antarctica (the map will show Precambrian assemblages of Antarctica, ages and origin of protolith, ages of metamorphic events, geodynamic settings, etc).

South and East Asia

- **Projects in progress:**
  - IGMA10000 (launched in 2014) had been reviewed by CGMW, and modifications are underway. IGMA10000 is expected be published next year.
  - International Tectonic Map of East and South Asia (ITMESA5000, launched in 2016) draft (2020) is in progress. It is expected to be completed by the end of next year and published in 2022.

Northern Eurasia (*see Tectonic maps*)

Europe

- **Projects in progress:**
  - 1:2.5 Ma International Quaternary Geological Map of Europe and Adjacent Areas (IQUAME 2500). (2011, planned to finish in 2024)
  - EMODnet Geology Phase 4 (EU project, DG MARE): Continuation to build web-enabled GIS-maps of the pre-Quaternary and Quaternary geology and Geomorphology of the European Seafloor. Start: 9/2019, Phase will be finished 9/2021 Will be continued in Phase 5
  - Mediterranean Karst Aquifer Map (MEDKAM) in the context of KARMA=Karst Aquifer Resources availability and quality in the Mediterranean Area; EU PRIMA – Partnership for research and innovation in the Mediterranean area). Further details see report of Commission on Hydrogeological Maps

- **Projects completed:**
  - EMODnet Geology Phase III in April 2019

- **New proposal:**
  - EMODnet Geology Phase 5, is planned to start 9/2021, > 30 coastal countries in Europe + Caspian Sea countries, Estimated date of finishing: 9/2023. Proposal to EU submitted July 2020,

Middle East

- **Projects in progress:**
  - Metamorphic map of the Middle East, (Feb. 2019 to Dec. 2021)
  - Second edition of the Geological map of the Middle East
  - Magmatic map of the Middle East
  - Quaternary map of the Middle East

- **New proposal:**
  - Geo-hazard map of the Middle East

Oceania

Thematic Sub-commissions

Metallogeny

- **Projects completed:**
  - Metallogenic Map of Central America and the Caribbean – Launched November 20th 2020

- **New proposal:**
  - Metallogenic Map of the World 1:25M. Coordinated by the Subcommission, support by SEGEMAR. Participants: proposed: M. Gozalvez, S. Cherkasov, E. O. Zappettini. Open to other interested participants around the world

Geophysics

- **Projects in progress:**
  - World Digital Magnetic Anomaly Map (WDMAM) – (new ed. 2021-2022)

Magmatism and metamorphism

- **Projects in progress:**
  - The Metamorphic map of the Middle East.
  - The Metamorphic map of the NE Mediterranean.

Hydrogeology

- **Projects in progress:**
  - KARMA-MEDKAM (10/2019-09/2022)

Within the EU-funded project "Karst Aquifer Resources availability and quality in the Mediterranean Area – KARMA" the first consistent and detailed Mediterranean Karst Aquifer Map and Database (MEDKAM) will be prepared; the map will be based on the existing World Karst Aquifer Map (WOKAM) and extending the International Hydrogeological Map of Europe (IHME) to the north African part of the Mediterranean by hydrogeologic interpretation of the International Geological Map of Europe, supported by the CGMW subcommission for Europe.

  - Hydrogeological Map of the ECOWAS region (05/2019-03/2022)

A hydrogeological base map, along with thematic (aquifer productivity) and advocacy maps (urban groundwater) will be elaborated –under coordination of UNESCO-IHP– by BGR, BGS, BRGM, EAWAG, IGRAC, in close cooperation and interaction with AMCOW, ECOWAS, ABN and IAH. The maps will raise awareness of the potential risks and benefits of groundwater development to decision-makers in the region, for presentation at the World Water Forum in Dakar 2022.

Sea Floor

- **Projects in progress:**
  - Structural Map of the Indian Ocean 2019 - 2021 (revised).

Progress on the Indian Ocean map has been affected by Pandemic lockdowns. With the IGC delayed to August 2021 there is time to complete the map. Updates submitted via CGMW, namely the Somali Basin, have been included. Work is now on merging new and old elements, which is taking more time than anticipated.

- The World Ocean Map: this compilation is actually a harmonization of the Sea Floor maps of CGMW. Rather than a printed version, this map will be a part of the Geological map of the World at scale 1:5M. Some useful information will be added.

Tectonics

- **Projects in progress:**
  - The Tectonostratigraphic Atlas of the Arctic includes geological and geophysical materials (geological, structural and paleogeographic maps, stratigraphic charts, correlated seismic profiles, etc.) for the Eurasian continental margin of the Arctic Ocean and adjacent waters of the Arctic basin from the western margin of the Barents Sea to the Chukchi uplift. In January 2020, the Tectonostratigraphic Atlas of the Eastern Arctic was completed and published both in Russian and in English. Currently, the preparation of the Tectonostratigraphic Atlas of the Western Arctic is underway. The Tectonostratigraphic Atlas of the Eastern Arctic (with additions) will be published in early 2021 by Springer as a book “Tectonics of the Arctic”.

- **Projects completed:**
  - The Tectonic Map of the Arctic (TeMAr) at 1:5M scale. The map is accompanied by a set of additional digital maps and diagrams reflecting the deep structure of the region (a zoning scheme of potential fields, the Earth's crust types map, maps of the Earth's crust and sedimentary cover thickness, tectonic zoning of the basement scheme, as well as the deep transarctic geological and geophysical section), ensures the integrity of the cartographic representations of the geological structures of the deep-water areas of the Arctic basin, shelf and its continental margin, and reflects the consolidated understanding of the international geological community about the tectonic structure of this territory and its geodynamic development.
  - The Tectonic Map of the Arctic was published at 1:10M scale along with an Explanatory Note "Scientific contributions to the Tectonic map of the Arctic", by the CGMW in February 2019.

- **New proposal:**
  - The new Tectonic Map of the World at 1: 35 M scale. This project was initiated by the CGWM and is supported by the Deep Time Digital Earth (DDE) Program. Technical preparation of the Tectonic Map will be carried out at A. P. Karpinsky Russian Geological Research Institute (VSEGEI) in St. Petersburg.

Natural Hazards

- **Projects in progress:**
  - Asia-Pacific Region Geological Hazards Information System (https://ccop-gsi.org/gsi/geohazard/)

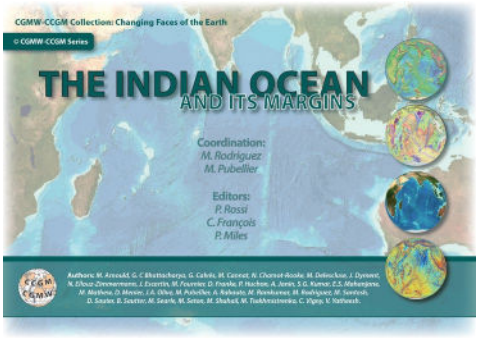
Launched date: March 2020. Estimated date of completion: 2025.

- **Projects completed:**
  - Geologic Map of Volcanoes in Japan (1:200,000) (Launched date: March 2020) https://gbank.gsj.jp/volcano/vmap/volcano20/volcano.html

CGMW mapping programs for the period 2020-2021
Projets de cartes CCGM pour la période 2020-2021

2020 - Maps and documents printed

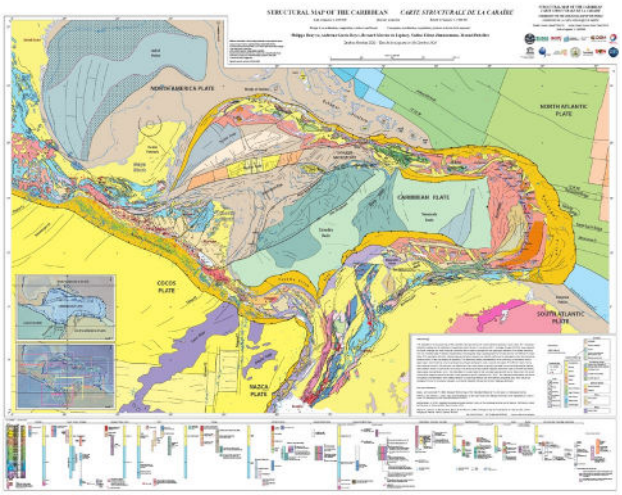
- Booklet of the Geology of "**the Indian Ocean and its margins**". It is the first of a new series of booklets attached to a geological map. More than an explanatory notebook, it brings recent science to the map users.



2021 - Maps and documents to be printed and / or digitally accessible

- Pubellier, M., Nehlig, P., Vrielynck, B., Rossi, P., François, C., and Sautter, B., International Geological Maps: Bridging Nations, Jour. Geol. Soc. India, Vol .97, Issue 2, Feb. 2021.

- **The Structural Map of the Caribbean at 1:20 M:**



This map is also a new concept of structural map which aims at encompassing the geology and the structures. It is a geologic map offshore and a homogenous reprocessing of Gravity and Magnetic data which serves as a basis for mapping the different crustal types offshore. The links between the land and marine features was largely discussed during meetings.

- **The Geological Map of South America at 1:5 M**. This map is a CGMW success story, by the remarkable coordination between the different countries of South America. It is also an example for the coming DDE project.

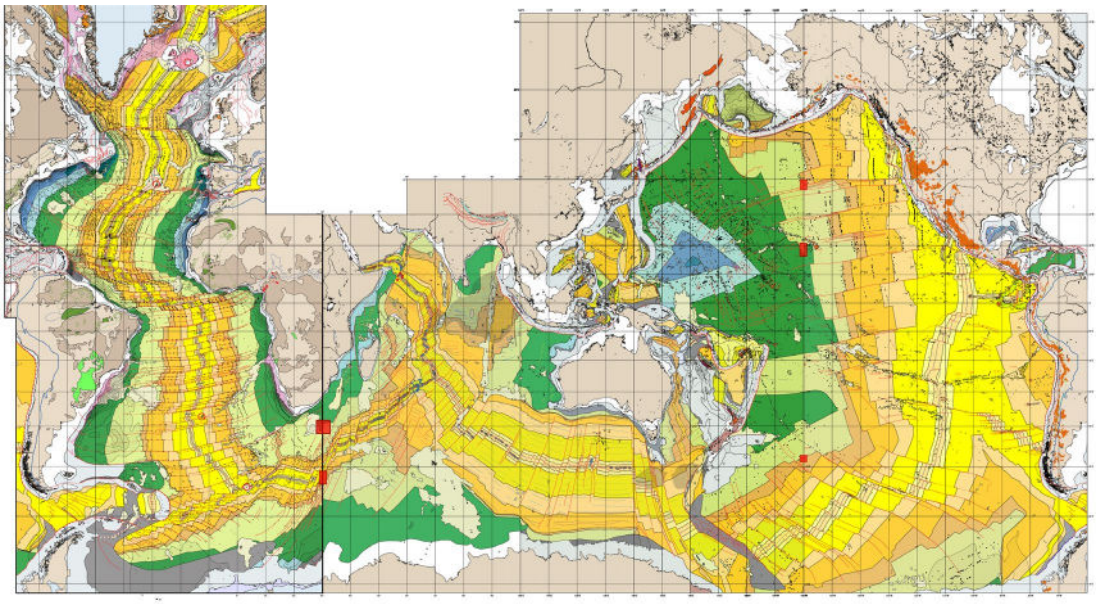
- **The Structural Map of the Eastern Pacific Ocean**: this is the 2nd map of the Pacific which complete the Map of the Pacific Ocean, and will be a milestone for the Map of the World Ocean to be finished by the end of 2020.

Maps in progress

- The World Map of the Orogens: IGCP 667 Project. This is a completely new type of map which will represent the location and the key elements of a mountain belt, as overlying layers. The user-friendly and ludic map will be useful for teaching even in places where the digital access is limited.
  In addition a paper on the project is completed and will be submitted to the IUGS Journal Episodes.
- The International Quaternary Map of Europe Map of Quaternary in Europe (IQUAME) at 1:5 M
- The 2nd edition of the International Geological Map of the Middle East at 1:5 M (IGMME)
- The Quaternary Map of the Middle East at 1:5 M
- The Metamorphic and Magmatic Map of the Middle East at 1:5 M, as separate layer for the IGMME
- 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 designed to be available online on the OneGeology portal.
- The Structural Map of the Indian Ocean 1:40 M (2nd edition)
- The Metamorphic map of the East Mediterranean
- The 2nd edition of the World Digital Magnetic Anomaly Map (WDMAM) jointly with IUGG

Global projects

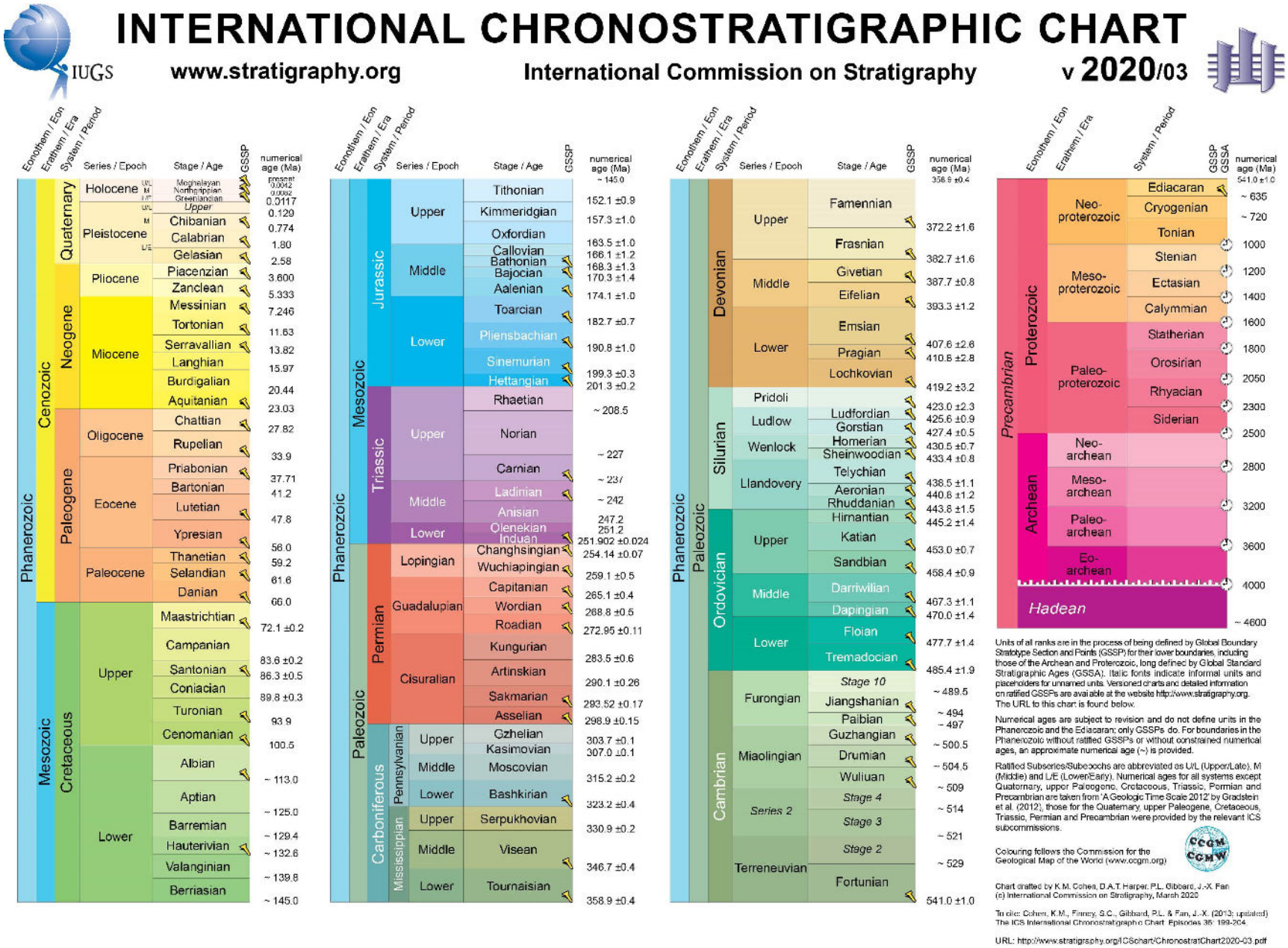
- The new CGMW-DDE (Deep-time Digital Earth) project, under the *aegis* of IUGS (IUGS Big Science Program DDE), is co-funded by the Chinese Academy of Geological Sciences (CAGS). The DDE initiative aims at harmonizing global digital Earth data and secure compatible and interoperable databases, which might transform Earth Sciences and lead to innovation in understanding the Earth's evolution. The CGMW World 5M project which started in Fall 2020 aims at constructing a digital geological map of the world at a scale 1:5M, which is an essential support to construct a data platform aligned with the vision and mission of the IUGS Big Science Program . This project will (1) integrate at a scale 1:5M the international geological maps of continents and oceans, which have been produced under supervision of the CGMW, (2) establish the legend system and adequate database for the map, and (3) construct a new seamless and digital geological map of the world at the scale 1:5M. The database of this new geological map of the world at the scale of 1:5M will follow the international standards, and will allow to produce new geoscientific products like global maps of magmatic rocks, metamorphic rocks and sedimentary basins. In practice, if most of the continental geological maps at 1:5M already exist, these maps are neither harmonized in terms of legends and database, nor in terms of stratigraphic cuts and trans-boundary connections of structural continuities. This will require a robust collaborative work in Geology and Geomatics.
- The digital Structural Map of the World Ocean at 1:20M scale.



- World Map of Sediment Thickness: From source to sink during critical tectonic periods.

2020 INTERNATIONAL CHRONOSTRATIGRAPHIC CHART

CHARTE CHRONOSTRATIGRAPHIQUE INTERNATIONALE 2020


INTERNATIONAL CHRONOSTRATIGRAPHIC CHART
IUGS
www.stratigraphy.org
International Commission on Stratigraphy
v 2020/03
Eonothem / Eon
Erathem / Era
System / Period
Series / Epoch
Stage / Age
GSSP
numerical age (Ma)
Phanerozoic
Cenozoic
Quaternary
Holocene
Meghalayan
Northgrippian
Greenlandian
0.0042
0.0082
0.0117
Upper
0.129
Pleistocene
Chibanian
0.774
Calabrian
1.80
Gelasian
2.58
Neogene
Pliocene
Piacenzian
3.600
Zanclean
5.333
Miocene
Messinian
7.246
Tortonian
11.63
Serravallian
13.82
Langhian
15.97
Burdigalian
20.44
Aquitanian
23.03
Paleogene
Oligocene
Chattian
27.82
Rupelian
33.9
Eocene
Priabonian
37.71
Bartonian
41.2
Lutetian
47.8
Ypresian
56.0
Paleocene
Thanetian
59.2
Selandian
61.6
Danian
66.0
Mesozoic
Cretaceous
Upper
Maastrichtian
72.1 ±0.2
Campanian
83.6 ±0.2
Santonian
86.3 ±0.5
Coniacian
89.8 ±0.3
Turonian
93.9
Cenomanian
100.5
Lower
Albian
~ 113.0
Aptian
~ 125.0
Barremian
~ 129.4
Hauterivian
~ 132.6
Valanginian
~ 139.8
Berriasian
~ 145.0
Mesozoic
Jurassic
Upper
Tithonian
152.1 ±0.9
Kimmeridgian
157.3 ±1.0
Oxfordian
163.5 ±1.0
Middle
Callovian
166.1 ±1.2
Bathonian
168.3 ±1.3
Bajocian
170.3 ±1.4
Aalenian
174.1 ±1.0
Lower
Toarcian
182.7 ±0.7
Pliensbachian
190.8 ±1.0
Sinemurian
199.3 ±0.3
Hettangian
201.3 ±0.2
Triassic
Upper
Rhaetian
~ 208.5
Norian
~ 227
Carnian
~ 237
Middle
Ladinian
~ 242
Anisian
247.2
Lower
Olenekian
251.2
Induan
251.902 ±0.024
Paleozoic
Permian
Lopingian
Changhsingian
254.14 ±0.07
Wuchiapingian
259.1 ±0.5
Guadalupian
Capitanian
265.1 ±0.4
Wordian
268.8 ±0.5
Roadian
272.95 ±0.11
Cisuralian
Kungurian
283.5 ±0.6
Artinskian
290.1 ±0.26
Sakmarian
293.52 ±0.17
Asselian
298.9 ±0.15
Carboniferous
Pennsylvanian
Upper
Gzhelian
303.7 ±0.1
Kasimovian
307.0 ±0.1
Middle
Moscovian
315.2 ±0.2
Lower
Bashkirian
323.2 ±0.4
Mississippian
Upper
Serpukhovian
330.9 ±0.2
Middle
Visean
346.7 ±0.4
Lower
Tournaisian
358.9 ±0.4
Paleozoic
Devonian
Upper
Famennian
372.2 ±1.6
Frasnian
382.7 ±1.6
Middle
Givetian
387.7 ±0.8
Eifelian
393.3 ±1.2
Lower
Emsian
407.6 ±2.6
Pragian
410.8 ±2.8
Lochkovian
419.2 ±3.2
Silurian
Pridoli
423.0 ±2.3
Ludlow
Ludfordian
425.6 ±0.9
Gorstian
427.4 ±0.5
Wenlock
Homerian
430.5 ±0.7
Sheinwoodian
433.4 ±0.8
Llandovery
Telychian
438.5 ±1.1
Aeronian
440.6 ±1.2
Rhuddanian
443.8 ±1.5
Ordovician
Upper
Hirnantian
445.2 ±1.4
Katian
453.0 ±0.7
Sandbian
458.4 ±0.9
Middle
Darriwilian
467.3 ±1.1
Dapingian
470.0 ±1.4
Lower
Floian
477.7 ±1.4
Tremadocian
485.4 ±1.9
Cambrian
Furongian
Stage 10
~ 489.5
Jiangshanian
~ 494
Paibian
~ 497
Miaolingian
Guzhangian
~ 500.5
Drumian
~ 504.5
Wuliuan
~ 509
Series 2
Stage 4
~ 514
Stage 3
~ 521
Terreneuvian
Stage 2
~ 529
Fortunian
541.0 ±1.0
Precambrian
Proterozoic
Neo-proterozoic
Ediacaran
~ 635
Cryogenian
~ 720
Tonian
1000
Meso-proterozoic
Stenian
1200
Ectasian
1400
Calymmian
1600
Paleo-proterozoic
Statherian
1800
Orosirian
2050
Rhyacian
2300
Siderian
2500
Archean
Neo-archean
2800
Meso-archean
3200
Paleo-archean
3600
Eo-archean
4000
Hadean
~ 4600
Units of all ranks 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). Italic fonts indicate informal units and placeholders for unnamed units. Versioned 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 U/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 (www.ccgm.org)
CCGM CGMW
Chart drafted by K.M. Cohen, D.A.T. Harper, P.L. Gibbard, J.-X. Fan
(c) International Commission on Stratigraphy, March 2020
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/ChronostratChart2020-03.pdf

CGMW FINANCIAL STATEMENTS */ BILANS FINANCIERS CCGM*
2018, 2019, 2020

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

YEAR 2018 FINANCIAL STATEMENT

ACCUMULATED RESERVES (01/01/18) **197 952.93 €**

INCOME 2018

Membership fees	68 841.87 €	
Subsidies (IUGS,IGCP)	6 449.70 €	
Mapping sponsoring	3 919.40 €	
Publication sales	48 762.63 €	
TOTAL I		127 973.60 €
Financial income and account interest	5 821.69 €	
TOTAL II		5 821.69 €
TOTAL I + II		**133 795.29 €**

EXPENSES 2018

Map production	66 555.03 €	
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		187 522.26 €
Change loss	158.47 €	
TOTAL IV		158.47 €
TOTAL III + IV		**187 680.73 €**

BALANCE 2018 (TOTAL I + III - TOTAL III + IV) **- 53 885.44 €**

CLOSING BALANCE (31/12/18) **144 067.49 €**

Investment for Globe = 49 607.33 €

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

YEAR 2019 FINANCIAL STATEMENT

ACCUMULATED RESERVES (01/01/19) **144 030.72 €**

INCOME 2019

Membership fees	57 310.42 €	
Subsidies (IUGS,TOTAL)	5 278.28 €	
Mapping sponsoring	8 688.81 €	
Publication sales	47 416.61 €	
TOTAL I		118 694.12 €
Financial income and account interest	6 873.25 €	
TOTAL II		6 873.25 €
TOTAL I + II		**125 567.37 €**

EXPENSES 2019

Map production	21 818.76 €	
Purchase of Maps and Documents	1 187.50 €	
Sales costs - Marketing - Web	2 224.12 €	
Participation to international and national exhibitions & events	8 279.99 €	
Meetings, missions	3 416.54 €	
Postage, phone, fax, internet	7 885.01 €	
Bureautics	3 685.19 €	
Office rent, supplies & maintenance	16 972.31 €	
Financial taxes	- €	
Banking fees	2 313.47 €	
Salaries and social contributions	30 918.17 €	
TOTAL III		98 701.06 €
Change loss	179.59 €	
TOTAL IV		179.59 €
TOTAL III + IV		**98 880.65 €**

BALANCE 2019 (TOTAL I + III - TOTAL III + IV) **26 686.72 €**

deferred expenses/income

CLOSING BALANCE (31/12/19) **170 717.44 €**

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

YEAR 2020 FINANCIAL STATEMENT

ACCUMULATED RESERVES (01/01/20) **169 896.28 €**

INCOME 2020

Membership fees	67 476.50 €	
Subsidies (IUGS,TOTAL)	4 050.70 €	
Mapping sponsoring	36 910.74 €	
Publication sales	39 390.30 €	
TOTAL I		147 828.24 €
Financial income and account interest	- 8 392.15 €	
TOTAL II		- 8 392.15 €
TOTAL I + II		**139 436.09 €**

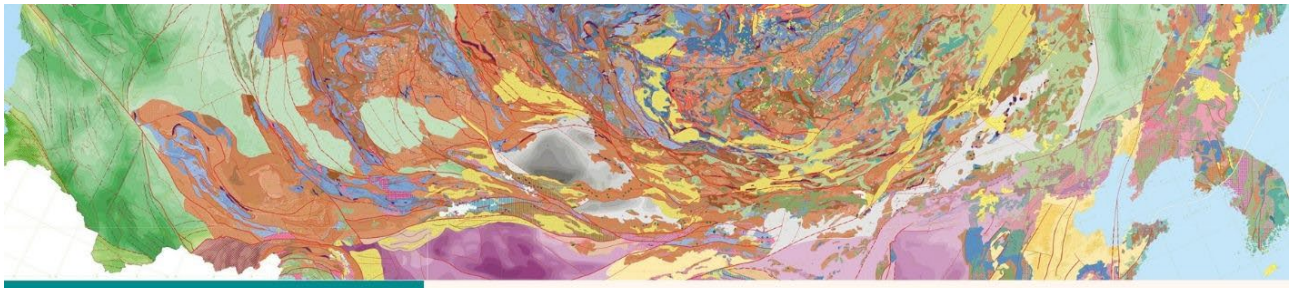
EXPENSES 2020

Map production	20 654.60 €	
Purchase of Maps and Documents	- €	
Sales costs - Marketing - Web	3 679.01 €	
Participation to international and national exhibitions & events	7 398.04 €	
Meetings, missions	1 524.73 €	
Postage, phone, fax, internet	6 851.84 €	
Bureautics	4 140.11 €	
Office rent, supplies & maintenance	19 606.65 €	
Financial taxes	1 130.00 €	
Banking fees	1 886.03 €	
Salaries and social contributions	32 716.50 €	
TOTAL III		99 587.51 €
Change loss	273.51 €	
TOTAL IV		273.51 €
TOTAL III + IV		**99 861.02 €**

BALANCE 2020 (TOTAL I + III - TOTAL III + IV) **39 575.07 €**

CLOSING BALANCE (31/12/20) **209 471.35 €**

UNCONSOLIDATED



SERGEY P. SHOKALSKY

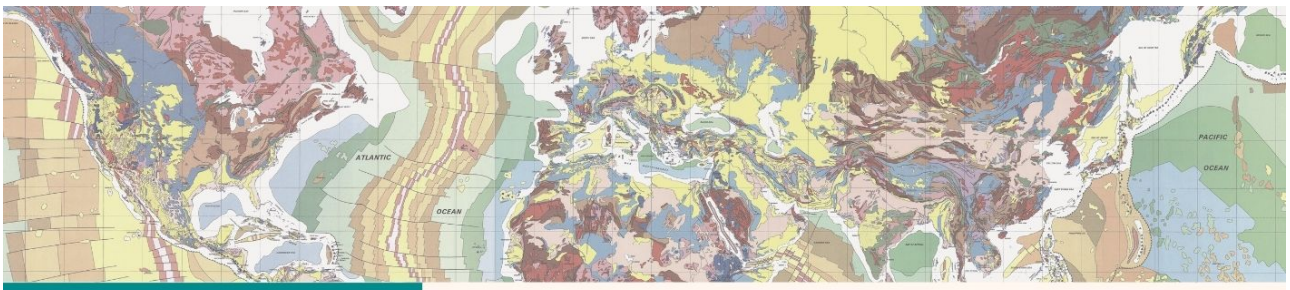
Sergey Shokalsky

We were informed with deep regret by the Russian Geological Research Institute (VSEGEI) that on May 5, 2020, our colleague Dr. Sergey P. Shokalsky, Secretary General of the CGMW Sub-Commission for Northern Eurasia passed away at the age of 68.

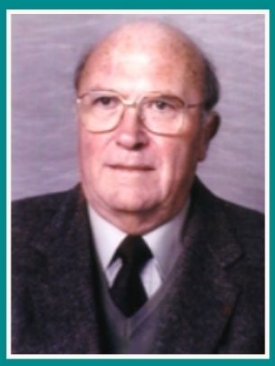
Sergey Shokalsky was a well-known Russian geologist, one of the most active participants in a number of large international projects. He was born the 26th May 1952 at Frunze Kirgizia (now Bishkek Kyrgyzstan). In 1990 he graduated with a PhD in Mineralogy and Geology from the Institute of Geology and Geophysics of the Russian Academy of Sciences at Novosibirsk. His main research interests were geological mapping, cartography, regional geology, tectonics, metallogeny of the western part of Central Asian Folded Belt. He wrote or participated to more than 50 scientific publications on geological correlation of sedimentary formations, magmatic and metamorphic complexes, tectonics and development of the Altay-Sayan region and problems of State geological mapping, and development of regional and federal GIS.

From 1976 to 2000 he participated to West-Siberian geological expeditions and since 2000, Sergey Shokalsky was the Head of Department of Legends for Russian State Geological Maps at VSEGEI. He worked at the CGMW as the Secretary General of Sub-Commission for Northern Eurasia since 2004 and the following important maps were compiled with his direct participation: the International Geological Map of Asia at 1:5M scale (2013); the Tectonic Map of Northern Central Eastern Asia and surrounding areas at 1:2M scale (2014) and the Tectonic Map of Arctic at 1:5M scale (2019).

The bright memory of this outstanding scientist and wonderful person will forever remain in our hearts.



JEAN AUBOUIN



Jean Aubouin

Jean Aubouin sadly left us on December 19th aged 92. Jean Aubouin had an outstanding career of scholar. He was inducted as CGMW President during the General Assembly held at the 26th International Geological Congress (IGC) of Paris, July 1980. He completed his term in 1992, during the 29th IGC held in Kyoto. He was the 3rd president after the 19th GA of Algiers in 1952 where the Commission was entirely reorganized and gradually reached its current form. He was President of the French Academy of Sciences from 1989 to 1990, President of the "Institut de France". He had been member of the Executive Committee of IUGS and had been in charge of the 26th IGC held in Paris. He also held important responsibilities at French Geological Survey (BRGM), the Centre National d'Etudes Spatiales (CNES), the IFREMER and others.

Among the milestones marking his presidency, we can mention the official registration of the Commission by the French Authorities in 1980, which gives it a legal framework. The creation of a "Sea-floor Maps" sub-commission which responds to the importance taken by the Global tectonics. The 3rd edition of the « Geological Map of Africa in 6 sheets », completely reshaped and published between 1985 and 1990. The conception and realization of the 1st Geological Map of the World (1990) whose need was felt for educational purposes; for the first time, the geology of the continents and the geology of the oceans appear together with contiguous areas.

Above all, he was Professor at the University Pierre & Marie Curie (Paris), and he had the incredible enthusiasm to deliver brilliant lectures on the geology of the whole world. Those of us who had the chance to attend them remember how energizing these lectures were.

He was one of the first to see how the geological observations on each continent could be explained by global models at a crucial time when continental drift supplanted the geosynclines. He had the ability to link geological observations offshore particularly in the deep trenches of Japan, Tonga-Kermadec, and Central America, and onshore and thus was able to shape early the evolutions of continental margins from the opening of the oceans to their closure and integration into mountain belts. As a research leader, he not only participated to DSDP (Deep Sea Drilling Project) investigations in Central America, but also launched and coordinated research project in the Andes, the Mediterranean and the Tethys, as far as the Western Pacific. His global syntheses of regional geology particularly in cordilleras linked to subduction zones, and Tethyan belts, as well as in structural geology in terms of superimposed tectonics, remain crucial in the knowledge of the evolution of the Earth.

A highly talented geologist, a world renowned academic, an esteemed and accessible personality, Jean Aubouin, with his 12-years presidency, left a lasting mark on the Commission. We shall all in the geoscience community remember him vividly.

ANNEX

Resumes of new CGMW Bureau Members

ANNEXES

Curricula vitae des nouveaux Membres du Bureau

Nadine ELLOUZ - ZIMMERMANN

Born on 12 June 1954
French Citizen, 3 childrens
Tel.: 0033(6)12896719;
Email: NNEllouz1@gmail.com

RETIRED IN JANUARY 2020

Structural Geology, Geodynamics, fault and Basin Modeling

RESEARCH INTERESTS and PROFESSIONNAL EXPERIENCE

Speciality: Research scientist at IFPEN since 1989

- Structural Geology- evaluation and synthesis from passive to Fold-and-Thrust Belts: field, drilling, geophysical acquisitions and interpretation (onshore/offshore)
- Structural and basin 3D analogic / numerical modeling
- Fluid and petroleum migration : from sampling to analytic synthesis - source to reservoir rocks for HC, Water and CO_2

Scientific thematics

- Geodynamics of margins and transcurrent plate boundaries, onshore and offshore (North Caribbean, Pakistan, India, Emirates, Greenland..)
- Thermo-mechanical evolution of the lithosphere, from continental rupture to collision. Transitions between strike-slip and convergent plate boundaries
- Impact of structural heritage on tectonic architecture in convergent and transpressive margins - Numerical and analogue modelling.
- Analysis and Modelling of the structural dynamics and fluids migration (water,CO_2 and HC) at basin and fault scale- Petroleum system evaluation
- P/T Variation at reservoir and fault scale, impact on local deformation , mud volcanism, diapirism, diagenesis
- Climate/Eustatism variations, induced diagenesis in reservoirs from chemical properties of migrating/expelled fluids

Case studies

- ***Complex structural areas (Onshore/offshore):*** *(1)FTB:* Carpathians (Ukraine, Romania), Balkans (Bulgarie), Himalayas (Pakistan, India, Bangladesh), Rockies and Colorado Plateau (Utah-USA), Oman Range (Emirates), Atlas (Morocco, Tunisia), Verkhoïansk (Russia), Haïti & Cuba (West Indies), Parras Basin(Mexico), Hérault (France).
- ***Accretionary Prisms*** *:* Makran (Pakistan-Iran), Sicile (Italy), Barbados (West Indies), Sinu (Colombia)
- ***(1) Margins; (2)Volcanic Margins; and basins with (3) strong diapirism or (4) gravity-driven tectonics*****:** (1) Niger, Mediterranean (Africa-Europe), Gascogne Gulf (France Spain), Arabian & Western/Eastern Indian margins; (2) Greenland, N. Atlantic, Morocco and Argentina; (3) Caspian sea, black sea, south China sea, Lower Saxony salt, Dniepr Donetz Basins and (4) Niger, Indus, Al Bata, Magdalena & Paleo-Ganga deltas.
- ***Fluid/fault interactions and processes:*** Basin and Ranges, Colorado plateau in Utah, Sicily, Sulaiman /Kohat/Potwar Ranges & Makran (Pakistan), Assam/Surma Ranges (India), Greenland, Haiti.
- ***Offshore campaigns:*** **Haiti-BGF** (Chief) **2015**; **Haiti-SIS (**Co-chief) **2012 and 2013** geophysical and coring acquisition(Haïti); **CHAMAK (**Chief) **2004,** geophysical and coring acquisition (Makran-Indus, Pakistan); CARAMBA **2001**, Barbados Prism**.**
- ***Drilling experiences:*** (*1) N-E Ireland*: design and drilling and well logging (2 wells in 2005) for Antrim Company. Objectives: characterization of basalt acoustic signature for optimization of acquisition and processing sequences for future campaigns, *(2) Plateau du Colorado (Utah):* Well drilling design and preparation for drilling the travertines related to Little Grand Wash Fault activity *(*Green-River-Utah USA) (3) submission of the Haiti-DRILL Amphibious IODP/ICDP proposal for drilling Transfer faults zones (EPGF/OSF) and study their mechanical properties and how fluid migration impact on seismicity in transfer fault systems.

Responsabilities in International & National Commissions

- 1998 – 2004: Direction of the GDR Marges (6 years), National Research Group for Margins exploration, member of Euromargins - European Group for Margin Research Exploration
- 2010 – 2011: Member (2 years) and Expertise at ANR National French Agency for Research

- 2004 – 2014: Member (10 years) and expertise at CNFH, Evaluation of research projects for National Fleet French Commission for offshore campaigns
- 1993- 2002: Member of the steering committee of the Peritethys consortium, and contributor for publications of the program.

Education

- 1984: PhD Geology-Geodynamics, Université of Paris VI "Étude de la subsidence des bassins de Tunisie Orientale", direction X. Le Pichon
- French, English, Russian, Arabic (dialectal)

Scientific dissemination

More than 50 papers, and around 150 presentations and extended abstracts in international revues. Author or participant to the construction of numerous geological and tectonic maps, Atlas, internal reports. Leader or participation to working groups for evaluation and modelling of continental margins, accretionary prims, fold-and-thrust Belts and their petroleum potential.

Leroy S., **Ellouz-Zimmermann N.,** Corbeau J. , Rolandone F. , Mercier De Lepinay B F, Meyer B., Momplaisir R., Granja J.L., Battani A., Burov E B, Clouard V., Deschamps R., Gorini C., Hamon Y., Le Pourhiet L., Loget N., Lucazeau F., Pillot D., Poort J., Tankoo K., Cuevas J.L., Alcaide J.F., Jean Poix C., Mitton S., Rodriguez Y., Schmitz J., Munoz Martin A. and HAITI-SIS Team - Evidence of left-lateral active motion at the North America-Caribbean plate boundary – *presented at AGU Fall Meeting 2014 - San Francisco.*

In preparation for Special publication Volume of Tectonophysics on "Tectonics of Oblique Plate Boundary Systems:

Ellouz-Zimmermann N., Hamon, Y., Deschamps R., Battani A., Darnault R., Schmitz J., Momplaisir R., Leroy S., Mercier de Lépinay B. Tectono- sedimentary 3D evolution along the transpressive boundary of NW Haiti. Some constraints on fault propagation along oblique convergent N. Caribbean Plate boundary. *Presented at AGU Fall Meeting 2014 - San Francisco*

Battani A., Ruffine, L[2]., **Ellouz-Zimmermann N.,** Monnin, C[3]., Leroy, S[4]. A Pore Fluid Study in the Transform Fault System of Western Haiti: Investigating Geochemical Processes and Hydrologic Pathways of the Fluids. *Presented at AGU Fall Meeting 2014 - San Francisco*

Frery E. , Jean-Pierre Gratier J.P. , **Ellouz-Zimmerman N**. , Loiselet C., Braun J., Deschamps P. Blamart D. , Hamelin B. , Swennen R. Episodic circulation of CO_2-enriched fluids along faults: evidence from the study of travertines in Utah (USA). *Submitted to Tectonophysics* **2015**.

Ellouz-Zimmermann N., Leroy S., De Lépinay B., Momplaisir, R. **(2012)** Integrated evaluation of earthquake dynamics in Haiti: from the past to the future. *AAPG-ER* Newsletter December 2012

Gratier, J.-P.; Frery, E.; Deschamps, P.; Røyne, A. ; Renard, F. ; Dysthe, D.; **Ellouz-Zimmerman, N**. ; Hamelin, Hamelin B., **(2012).** How travertine veins grow from top to bottom and lift the rocks above them: The effect of crystallization force. *Geology ,* 2012, Vol. 40 Issue 11, p1015

Caley T., Malaize B., Zaragosi S., Rossignol L., Bourget J., Eynaud F., Martinez P., Giraudeau J., Charlier K**.**, **Ellouz-Zimmerman N.** (2011) New Arabian Sea records help decipher orbital timing of Indo-Asian monsoon, *Earth and Planetary Science Letters*, 308, 433-444.

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Bourget J., Zaragosi S., **Ellouz-Zimmermann N.,** Mouchot N., Garlan T., Schneider J.L., Lanfumey V., Lallemant S. (2011) Turbidite system architecture and sedimentary processes along topographically complex slopes: The Makran convergent margin, *Sedimentology*, 58, 376-406.

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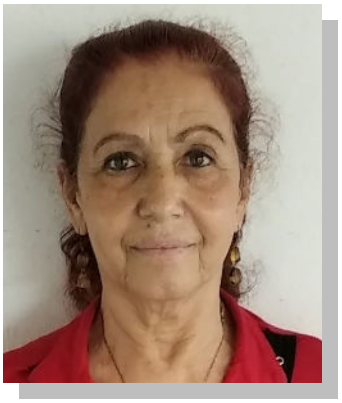

Education:

- Graduated as Geological Engineer at Baku University, Azerdbaizhan (1983)
- Dr. in Geological Sciences. Faculty of Geology, University of Barcelona, Spain (2000)

Professional experience:

- Development of metallogenic research related to the mineral resources of Cuba: isotopic studies, mineral chemistry, fluid inclusions, mineralogy and others to establish genesis, propose a deposit model and assess its economic potential;
- Evaluation of Mineral Potential and DB of mineral resources of Cuba in GIS.
- Technical advisor in gold evaluation projects at INGEOMIN of the Bolivarian State, Bolivarian Republic of Venezuela (2007 -2009).
- Researcher in an evaluation project of the potential of Ni, Al and others, in Moa – Baracoa, Cuba (2009-2010).
- Principal Investigator and Head of the Metallogenic Map of Cuba project at 1: 250,000 (2011-2014).
- Head of the project for the study of magmatism in the Isle of Youth and its implications with the metallogeny of the territory (2015-2016).
- Co-author of the Metallogenetic Map of Central America and the Caribbean prepared under the auspices of the Association of Geology and Mining Services of Ibero-America and the Commission of the Geological Map of the World (2018-2020).
- Assistant Professor at the Faculty of the Instituto Superior Minero Metalúrgico (ISMM) of Moa and the University of Pinar del Río.
- President of the IX Cuban Congress of Geology of the Fourth Earth Sciences Convention (2011).
- Member of the Cuban Society of Geology (SCG) and the National Union of Engineers and Architects of Construction of Cuba (UNAICC).

Awards:

- "Shapers of the Future" medal (1989).
- Scientific-Technical Award for her participation in the "Geology of Cuba course for everyone" (2009)
- "Ana Luisa Betancourt" award (2010).

Selected publications

Cazañas Díaz, X., Torres Zafra, J. L., Lavaut Copa, W., Cobiella Reguera, J. L., Capote Marrero, C. R., González Acosta, V., López Kramer, J.M., Bravo Patterson, F., Llanes Castro, A.I., González Castellanos, D., Ríos Araújo, Y., Ortega Rodríguez, Y., Yasmany Torres, R., Pantaleón Vento, G. Torres La Rosa, M. y Figueroa Guanche, D., 2017. Memoria Explicativa del Mapa metalogénico de la República de Cuba a escala 1:250.000.

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Education

1990	BSc, University of Barcelona, Spain
1996	Ph.D., Woods Hole Oceanographic Institution, USA
2011	Habilitation a Diriger des Recherches (HDR), Université de Paris VII, France

Selected professional Affiliation/Experience

Since 2019/09, Associated Professor (*Professeur attaché*) at ENS (Paris, France)
2011-2015, Associate Editor in *G-cubed* for Theme "*Oceanic Detachment Faults*"
2017-Present, Head of Marine Geosciences Group at IPGP (Paris, France)
2017-Present, Associate Editor of *JGR – Solid Earth*
2015-Present, Associate Editor of *G-cubed*
1999-2011, Research Scientist (CR1), Senior Scientist since 2011 (DR2), CNRS, Paris, France
2002 - Present, Adjunct Scientist, Woods Hole Oceanographic Inst., Wood Hole, USA
2006, Oct - 2007, Dec, Visiting Scientist, Harvard University, Cambridge, & MIT (USA)
2006, July-Sep, Invited Professor, Universitat de Girona, Girona, Spain
2000, June, Visiting Investigator, Woods Hole Oceanographic Institution, Woods Hole, USA.
1999, Jan.- Oct., Postdoctoral Researcher, CSIC-IJA, Barcelona, Spain
1998, June - 1999, January, Postdoctoral researcher, CNRS, Paris, France.
1996, Sep. – 1998 June, Postdoc, U. Durham & Edinburgh U. (UK).

Supervision (in addition to 10 MSc, and >10 undergraduate advisees)
PostDocs: A. Hughes, 2019-2021 (ANR Project)
F. Fontaine, 2005-2008. Present position: CNRS Research Scientist, CNRS/IPGP (France)
Cedric Hamelin, 2010-2012. Present position: U. Bergen, Post-Doc. (Norway)
PhDs: J. Aubry, PhD, "Earthquake rupture speed, from slow to supershear", ENS/IPGP, started: 9/2016
Diane Bonnemains, PhD, "Oceanic Detachment faults, MAR ", IPGP, Started: 9/2013, Def. 19/5/2017.
T. Barreyre, PhD IPGP, 2010-13 (Def. 7 Nov 2013). Present position: WHOI (Institutional Post-Doc)
D. Dusunur, IPGP PhD, 2006-08, 12th June 2008. Present position: Istambul Tech. Inst., Turkey.

Selected funded projects as PI:

2018-2021	ANR SerSurf –	452973€
2017	IPGP AO 2017 – Submarine faulting hazards	10000€
2017	SUBSAINTES'17 Cruise support (CNRS/IFREMER)	40000€
2013	ODEMAR'13 cruise support (CNRS/IFREMER)	28500€
2012-2013	Dassault Systemes Contrat: 3D mapping of "La Lune" shipwreck. Contract to Coronis Computing (Spain) & IPGP	35000€
2012	*Caldera 2012 - Eurofleets* – Vent mapping in the Santorini Caldera. (***Co-PI***) EU Comission Grant N° 228344	15,970€, 9 shiptime days
2011-2015	*Do symmetric & asymmetric MAR segments have different geochemical signatures?;* NSF award#1061206 (PI: C. Langmuir; ***CoPI***):	650.000$, Shiptime 30 days

Selected oceanographic cruises:

23 oceanographic cruises; 10 as chief- or co-chief scientist, 1 IODP cruise (Expedition 305).
Co-proponent of IODP 304 & 305 "Core Complex" Expeditions, and of "Atlantis" IODP Expedition 357

4/17 "SUBSAINTES", N/O l'Atalante, ROV Victor, AUV AsterX. Submarine neotectonics. **PI**
1-2/16 IODP Expedition 357 "Atlantis Massif: Serpentnization and Life". **Proponent**
12/13 "ODEMAR", N/O Pourquoi pas?, ROV Victor, AUV Abyss. Oceanic detachment faulting. **PI**
10/12 & 9/13, "CALDERA", RV Aegeo & ROV Hercules, Santorini Caldera survey. **PI.**
7/07, 8/09, 9/09,10/10 – "Bathyluck & MOMAR cruises", Lucky Strike hydrothermal field. **PI & Co-PI.**

Recent selected publications:

ORCID record : https://orcid.org/0000-0002-3416-6856
Full publication lists and associated citation metrics*:*
SCI/Publons: *https://publons.com/researcher/1744774/javier-escartin*; >4700 citations;
Google Scholar: *http://scholar.google.com/citations?user=zDcf8NwAAAAJ&hl=fr; >6550 citations.*

Marjanović, M., N. Fuji, S. C. Singh, T. Belahi, and J. Escartín, Seismic signatures of up- and down-going hydrothermal pathways along the East Pacific Rise between 9°16'N and 9°56'N, *J. Geophys. Res.*, 122 (12), 10241-10262, doi : 10.1002/2017JB015004, 2017.

*Bonnemains, D., J. Escartín, et al., Pervasive silicification and hanging wall overplating along the 13°20'N oceanic detachment fault, *Geochem. Geophys. Geosys.*, 18, doi:10.1002/2017GC006846, 2017.

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*Bonnemains, D., J. Carlut, J. Escartín, C. Mével, M. Andreani & B. Debret, Magnetic signatures of serpentinization at ophiolite complexes, *Gcubed*, 17, 2969-2986, doi : 10.1002/2016GC006321, 2016.

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Escartín, J., D. K. Smith, J. R. Cann, H. Schouten, et al., Central role of detachment faults in accretion on of slow-spreading oceanic lithosphere, Nature, 455, 790-794, 2008.

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Escartín, J., S. Allerton, P. Cowie, N. C. Mitchell, R. C. Searle, & P. A. Slootweg, Quantifying tectonic strain and magmatic accretion at a slow-spreading ridge-segment (Mid-Atlantic Ridge, 29°N), *J. Geophys. Res.*, 104, 10421-1437, 1999.

Main collaborators: M. Andreani & E. Martelat (U. Lyon), R. García & N. Gracias (U. Girona), A. Arnaubec (IFREMER), D. K. Smith (WHOI), J. Cann (U of Leeds), G. Hirth (Brown U.), D. J. Fornari (WHOI), C. Langmuir (Harvard U), F. Fontaine (CNRS), F. Leclerc (U. Nice), R. Sohn (WHOI), C. J. Macleod (U. Cardiff), B. John (U. Wyoming), S. Petersen (GEOMAR), J. Jamieson (U. St. Johns), T. Barreyre (U. Bergen), M. Cannat, C. Mével, C. Deplus, N. Feuillet & A. Le Friant (CNRS/IPGP), M. Moreira (U. Orleans), D. Brunelli (U. Modena)

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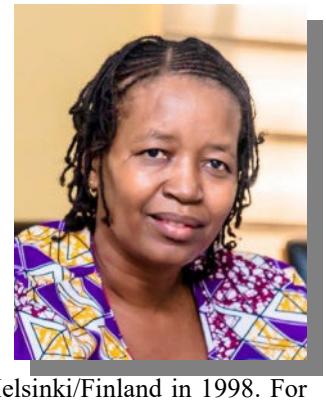

She obtained her Master of Science in Geology and mineralogy from the University of Helsinki/Finland in 1998. For the past 21 years, Mrs. Nguno has been working as a geologist in various positions at GSN. Her work experience includes but is not limited to:

• Coordinating geological mapping and research in collaboration with local and international research institutions and researchers

• Compilation of Geological maps

• Geoscience data management and

• GIS and Remote Sensing o the Hydrogeological Map of Namibia (1: 1000 000 scale), a joint project between the Department of Water Affairs, the Geological Survey and BGR (Germany);

• Digital compilation of the first version of the Metamorphic Map of Namibia (1: 1000 000 scale).

Involved in map compilation projects such as:
Since 2003, she has been involved in the Spatial Data Infrastructure (SDI) activities in Namibia and promotes Geoscience data management and standardization as well as Geoscience awareness in school and the public at large.

PROFESSIONAL ACTIVITIES DURING THE PAST DECADE TO PRESENT:

• Geoscience Council of Namibia, President,

• Geological Society of Africa, Councillor for Southern Africa,

• AU- African Mineral and Energy Resources Classification and Management System (AMREC / UNFC- AMREC), Technical Working Group;

• Member of the Namibia University of Science and Technology (NUST) Advisory Committee for the Bachelor of Geoinformation Technology programme,

• Trustees of Desert Research Foundation of Namibia (DRFN).

In the past, Mrs. Nguno served in various committee and technical working groups that include:

• Committee member of the National Spatial Data Infrastructure (NSDI) of Namibia

• Africa Union Commission (AUC) Geological and Mineral Information System (GMIS) Strategy -Technical Working Group (TWG);

• Namibia Planning Advisory Board (NAMPAB) member,

• Executive committee member of the Geoscience Information Consortium (GIC);

• Organisation of African Geological Surveys (OAGS) executive committee member (Past-President),

• Committee member of the Commission for the Management and Application of Geoscience Information (CGI), which is a Commission of the International Union of Geological Sciences (IUGS)

• Member, OneGeology (Global) Technical Working Group;

• Member, Faculty of Science Advisory Board, University of Namibia;

• Member, Regional Agricultural and Environment Innovations Network-Africa (RAEIN-Africa), which is a Southern African Network organisation promoting participatory development of appropriate science and technology for sustainable management of environmental and agricultural production systems;

• eGY-Africa secretary (eGY-Africa is a bottom-up initiative by African scientists and collaborators to address the digital divide problem).

PROFESSIONAL AFFILIATIONS

• Geological Society of Africa

• Geological Society of Namibia & Geoscience Council of Namibia

• African Association of Women in Geosciences (AAGW)

• Southern African Society for Quaternary Research (SASQUA) / NQUA-SACCOM

• GIRAF-Geoscience Information in Africa

• Commission for the Management and Application of Geoscience Information (CGI), which is a Commission of the International Union of Geological Sciences (IUGS).

PUBLICATIONS

Nguno A.K.,(2017). Functions of the Organization of African Geological Surveys (OAGS) as a member of the Geological and Mineral Information System (GMIS) Strategy Coordination Committee Infrastructure. The special symposium; Geology and Mineral information System (GMIS) Strategy to Domesticate the Africa Mining Vision at a Country Level. United Nation Economic Commission for Africa Publication, 07-11

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Nguno, A.k, & Schreiber U. (2008): Earth data Namibia- archival data given a new look In: International Geological Congress, Abstracts = Congres Geologique International, Resumes, 2008, Vol. 33 Published by: [International Geological Congress].

Nguno, AK. (2004) Kimberlite Indicator Minerals of the Gibeon Kimberlite Province (GKP), Southern Namibia: Their character and distribution in Kimberlite intrusions and fluvial sediments. Communs Geol.Surv. Namibia, 13, 33-42.

Nguno AK. (1999) Exploration for kimberlite using indicator minerals sampling method: A case study from Gibeon, Southern Namibia. Abstracts, Proceedings of Geodesa Workshop on World class Mineral Deposits in Eastern and Southern Africa, Dar es Salam Tanzania.

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Co-author

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She holds a Doctorate-Engineer Diploma in Applied Geology from the Cheikh Anta Diop University of Dakar (UCAD) after attending the Institute of Earth Sciences from which she graduated in 1993 with the diploma of Design geological engineer.

Dr Diène also holds a Specialized Training Diploma in Public Administration of Mines (CESAM) from the Ecole Nationale Supérieure des Mines de Paris and an **Executive MBA** in Finance and Advanced Management from the Polytechnic University of West Africa (UPOA) in Dakar. She also successfully completed the course on Regulation and Management of Mineral Resources at Curtin University, Western Australia, as part of the Australian Awards for Africa in 2011, and the course on "Mining Policy and Trade Negotiations" from the African Institute for Economic Development and Planning (IDEP) in 2012.

Director of Mining Prospecting and Promotion since April 2015, **Dr DIENE** has successively held the position of Head of the Documentation Center and Mining Cadaster of the Department of Mines and Geology (DMG), Head of the Mines and Quarries Division, Head of the Regional Department of Mines and Geology Dakar. **Dr Diène** is focal point of the Ministry in charge of Mines to the Directorate of Mines and Industry of ECOWAS, in the African-European Georesources Observation System (AEGOS) Project, at the Intergovernmental Forum on Mines, Metals and Development Sustainable and in the National Sustainable Development Commission.

She is a member of various non-profit and non-political associations: AIGIST, ASELFAE, Australia Awards Alumni Network, International Visitors Leadership Program (IVLP), Senegal Australian Awards Alumni Association.

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Russian Nationality

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EDUCATION

2014	Doctor of science, Geological Institute, Moscow, Russia
2001	PhD, Uppsala University, Dept. Palaeontology, Sweden
1997	Candidate of science, Russian Geological Research Institute, Russia

POSITIONS Current Position

2014 -	Scientific secretary, Russian Geological Research Institute (VSEGEI), Russia

Previous positions held

1989-1995	Geologist, scientist, senior scientist, Stratigraphy and Palaeontology Department, Russian Geological Research Institute (VSEGEI), Russia

FELLOWSHIPS, AWARDS AND PRIZES

2013	Honorary subsoil prospector, Russian Geological Research Institute (VSEGEI), Russia

MOBILITY

1997-2001	Palaeontology Department, Uppsala University, Sweden

PROJECT MANAGEMENT EXPERIENCE

2010-2019	Leader of several projects “Cambrian-Ordovician stratigraphy, biogeography and fossils of Urals and Kazakhstan”, Russian Foundation for Basic research (13-04-00629, 14-05-07027, 16-05-00530)
2005 (April-May)	Grant from Fellowship Norwegian Programme 2005/2006 for Northwestern Russia
2003–2002	Grants from Royal Swedish Academy of Sciences (KVA)

SUPERVISION OF GRADUATE STUDENTS AND RESEARCH FELLOWS

	Master’s students/ Ph.D./Postdocs	Name of faculty/department/centre, name of university/institution/country
2015-2018	Ph.D.	Stratigraphy and Palaeontology Department, Russian Geological Research Institute, Russia
2019-	Ph.D.	Stratigraphy and Palaeontology Department, Russian Geological Research Institute, Russia

ORGANISATION OF MEETINGS

2005-2019	Member of the Organising Committee of the Annual Sessions of the Paleontological Society of Russia
2012, 2019	Chair/head organizer of the Field Excursions on the Ordovician of the vicinity of St. Petersburg

COMMISSIONS OF TRUST IN ACADEMIC, PUBLIC OR PRIVATE ORGANISATIONS

2016 –	Member of the Editorial board of the journal «Stratigraphy and Regional correlation» (Russia) (https://www.springer.com/earth+sciences+and+geography/geology/journal/11506)

2018-	Deputy of the head Editor of the journal «Regional Geology and Metalogeny» (Russia) (http://www.vsegei.ru/en/rgm/)
2006 -	Reviewer for the international journals Journal of Geodynamics, Geobios, Geological Magazine, Palaeogeography, Palaeoclimatology & Palaeoecology, Lethaia.

MEMBERSHIPS OF ACADEMIES / SCIENTIFIC SOCIETIES / NETWORKS

2010 -	Voting member of the International Subcommission on Ordovician Stratigraphy (ISOS)
2014 -	Deputy-chairmen of the Russian Interdepartmental Stratigraphic Committee
2016 -	Chairmen of the Russian Commission on Regional stratigraphic schemes
2016 -	Deputy-chairmen of the Commission of Ordovician and Silurian stratigraphy of the Russian Interdepartmental Stratigraphic Committee
2020-	Member of the Nominating Committee of the International Union of Geological Sciences (IUGS)

Track record

The record of publications and presentations include 67 scientific publications in international journals and books, 1 book, more thyan 100 presentations (conferences).

Selected publications (2014-2019):

Degtyarev K.E., Tolmacheva T.Y., Tretyakov A.A. 2020. Siliceous–volcanic associations of the Northern Balkhash ophiolite Zone (Central Kazakhstan): Biostratigraphy, sedimentation and tectonic evolution in the Middle-Late Ordovician / Palaeogeography, Palaeoclimatology, Palaeoecology, Vol. 551.

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Tolmacheva, T., Egerquist, E., Meidla, T., Tinn, O. & Holmer, L. 2003. Faunal composition and dynamics in the Lower-Middle Ordovician of the East Baltic. Geological Magazine, 140 (1): 31-44.

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Tolmacheva, T., Danelian, T. & Popov, L. 2001. Evidence for 15 million years of continuous deep-sea biogenic sedimentation in early Palaeozoic oceans, Geology, 29 (8): 755-758.

Research monographs

Tolmacheva T.Yu. 2014. Biostratigraphy and biogeography of Ordovician conodonts of the western part of the Central Asian Orogenic Belt // ed. Alekseev A.S. Transactions of VSEGEI. New series. V. 356 St. Petersburg: VSEGEIV. 264 p. (in Russian)

COMMISSION DE LA CARTE GÉOLOGIQUE DU MONDE

COMMISSION FOR THE GEOLOGICAL MAP OF THE WORLD