Proposal for the establishment of a Task Force
International Lithosphere Program (ILP) for 2021-2026

Lithospheric Heat Flow – Global Data Assessment Project

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[4] *School of Geography and Ocean Science, Nanjing University, Nanjing, China.*
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In a nutshell

Knowledge of lithospheric heat flow and its distribution across oceanic and continental domains provides a unique and critical foundation for understanding the planetary energy balance, the driving mechanisms of tectonic and geodynamic processes, and the thermodynamic conditions within the Earth's interior. Lithospheric heat flow is thus a fundamental parameter for a broad community of geoscientists dedicated to lithospheric and geodynamic studies. The proposed Task Force (TF) aims to organize and lead the assessment, revision and update of the existing global collection of heat flow data in a global collaborative approach. Thereby, the Task Force is aligned with the activities of the International Heat Flow Commission (IHFC; www.ihfc-iugg.org) of the IASPEI/IUGG, which has been fostering the compilation of the Global Heat Flow Database (GHFDB) since 1963 and has recently initiated a fundamental revision of the GHFDB.

I. Introduction

Heat-flow data have been appearing in the dispersed scientific literature for more than 100 years now. The GHFDB attempts to assess the quality and comprehensively collate those data into a single repository for free dissemination. Since its inception, the GHFDB has grown and evolved as the volume of data, the range of applied techniques and methods, and the understanding of heat transport processes and transient disturbances have evolved. Hence, the most recent iteration of the GHFDB comprises heat-flow data of varying quality, from many different authors, acquisition methods and origin (boreholes, deep-sea probe sensing, mines, and tunnels).

The GHFDB has developed through several iterations since its introduction in the early 1960s (e.g., Lee, 1963; Lee and Uyeda, 1965; Simmons and Horai, 1968; Jessop et al., 1976; Global Heat Flow Compilation Group, 2013.) The current version contains ca. 80.000 entries. Initially restricted to printed tables in the 1950s and 1960s, the IHFC adopted a digital database structure (with richer metadata) with the publication of Jessop et al. (1976). At that time, the heat-flow data compilation was made available, for the first time, in a 'computer-compatible format'. The database's principal philosophy was to provide the user with all the information necessary to allow assessment of the heat- flow data quality. However, the limitations of information technology at that time compelled the compilers of the database to extract the desired information from the original publications and condense the content into a database format allowing a maximum of 80 characters

for each heat-flow determination. The authors were aware that this limitation in characters hampered a complete description of each heat-flow measurement, and thus a thorough description of data quality (Fuchs et al., 2021). Nevertheless, the database structure defined by Jessop and co-workers has provided the foundation for all GHFDB compilations from that day until the present (Global Heat Flow Compilation Group, 2013; Lucazeau, 2019; IHFC, in prep.). The applicants on this proposal, and many of their collaborating colleagues, have recently redefined the GHFDB structure to take advantage of today's opportunities with respect to digitization, interoperability and FAIR and open data use (Fuchs et al., 2021). The new structure provides greatly expanded data capacity and many new data fields relative to the previous structure. Due to the many decades of global collection, many of the already existing **database fields, as well as all newly defined fields, lack entries in the database**. Since the database went through many custodianships, and methods and knowledge changed over time, the **status and the quality of the collected data is heterogeneous, frequently undocumented and thus questionable**. The development of the new database structure provides a timely opportunity to thoroughly repopulate the GHFDB to support the next generation of lithospheric research.

2. Objectives

Our goal is to organize a multi-national collaboration of volunteering scientists and institutions to scrutinize the global literature to extract and recompile all relevant heat-flow data and metadata. The **principal aim** is to quality assure the current database by screening the original literature for information and updating field entries that are wrong or missing according to the new metadata scheme. Thereby, we will support the IHFC in creating a comprehensive and authenticated database, including detailed metadata descriptions of each heat-flow datum's type and quality and by enabling interoperability with other data systems. **The second major aim** is to develop in parallel a new quality-ranking scheme that applies for any kind of lithospheric heat flow. To achieve these aims within the next five years, individual voluntary collaborators and self-organized clusters will be organized into three working groups. The first two working groups will manually screen publication by publication literature reporting continental (WG1) and oceanic (WG2) lithospheric heat-flow data. The IHFC has already prepared a comprehensive literature database. Working group three (WG3) will focus on defining and delivering the new quality-ranking scheme.

The objectives of our Task Force in detail are:

1- *Systematic assessment of global heat-flow data:*

Due to the reasons described above, the current GHFDB holds very limited metadata that would provide context for each heat-flow record. The Task Force and its collaborators will systematically review the existing entries of the GHFDB for completeness, consistency and correctness against the original heat flow literature. Missing data and metadata will be added; wrong data will be corrected. The Task Force will make a special effort to search for, extract and incorporate data from original/primary literature sources to replace existing GHFDB records derived from secondary data compilations in the past. Moreover, the collaborative approach and the broad community support by our international network will facilitate a systematic global literature survey to identify and incorporate additional heat-flow data not yet within the GHFDB. It is hoped that this collegiate approach will extend to collaborating industry partners to identify and release data from otherwise inaccessible industrial archives.

2- *Development of a quality-ranking scheme for heat-flow data*:

The new official GHFDB structure (Fuchs et al., 2021) defines new metadata fields that can be used to define precise, quality-oriented queries of the database. While users will be free to define their own queries of the global dataset, the Task Force aims to develop a recommended data quality ranking scheme to

provide an objective comparison of data quality across different ages, methods, origins, and lithospheric settings (continental versus oceanic.)

3. Cooperation

A single institution alone cannot handle the required reexamination and quality assurance of the entire global heat-flow dataset. However, international collaboration and a network of individual voluntary scientists, research institutions, service agencies, and industry partners can bring the TF proposal to life. Such a voluntary collaboration has been tested and successfully demonstrated during the redesign and development of the new GHFDB structure over the past months. The TF is strongly committed to the organization and coordination of an inclusive global collaboration of scientists, irrespective of their age, gender, socio-cultural background, religious beliefs, ethnic background, etc. Beyond pursuing the TF's main aims, we will also support the organization of the 7th International Meeting on Heat Flow and the Geothermal Field in 2022, where we will present the first results of this new initiative. Regular online and (when and where possible) physical presence workshops will be realized throughout the TF period. We also foresee ad hoc meetings as side events at major conferences and will organize at least one summer school cum major conference program (e.g. IUGG 2023 in Berlin). We are committed to implementing and coordinating the results of the proposed TF with other lithospheric TFs or research groups in the frame of the ILP and associated unions.

4. Outreach

This TF will provide a platform and a network for scientists at all stages of their careers to work on the reassessment of global heat-flow data and to discuss their findings on lithospheric heat flow at all spatial scales. The TF will proactively work to attract and enable lithospheric experts willing to share their expertise in continental or oceanic heat-flow analysis to improve our knowledge of lithospheric thermal structure and transport processes. Special outreach activities will include:

- Development of a dedicated web page for the TF project
- Publication of popular articles on heat flow and lithospheric heat transport
- Public geo-lectures on various occasions
- Community building at international conferences in relation to IUGG and IUGS
- Online community building and networking

5. Key partners for the proposed Task Force

In the proposed five-year Task Force project, the six TF leaders will foster collaboration and exchange of ideas and results among all participants and further into the community. The TF will promote networking tools and opportunities including participation in thematic workshops and/or sessions proposed to international conferences, training schools addressed to young researchers, and other dissemination activities.

The co-leaders of the proposed TF plan to collaborate closely with numerous researchers and institutions across the planet, most of whom are already long-standing partners of the proponents who have agreed to support the TF. The key collaborators are listed below; an extended network of another ca. 100+ researchers will be solicited for their support once the TF is established.

		Participant (alphabetic order)	**Institution**	**Country**
1	Dr.	Irina Artemieva	University of Copenhagen	Denmark
2	Prof.	Niels Balling	Aarhus University	Denmark
3	Dr.	Graeme Beardsmore	University of Melbourne	Australia
4	Prof.	Hugo Beltrami	St. Francis Xavier University	Canada
5	Dr.	Vladimir Cermak	Czech Academy of Sciences	Czech Republic
6	Dr.	Paolo Chiozzi	University of Genoa	Italy
7	Dr.	William Colgan	GEUS	Greenland
8	Prof.	Juan Contreras	Center for Scientific Res. and Higher Edu. at Ensenada	Mexico

9	Dr.	Francisco Cuesta-Balero	Memorial University of Newfoundland	Canada
10	Dr.	Dmitry Demezhko	Russian Academy of Sciences	Russia
11	Dr.	Ricarda Dziadek	Alfred-Wegner-Institute	Germany
12	Dr.	Orlando Miguel Espinoza-Ojeda	Michoacan University of Saint Nicholas of Hidalgo	Mexico
13	Dr.	Andrea Förster	GFZ Potsdam	Germany
14	Dr.	Sven Fuchs	GFZ Potsdam	Germany
15	Dr.	Christophe Galerne	Universität Bremen	Germany
16	Mr	Ed Gerner	Geoscience Australia	Australia
17	Dr.	Gianluca Gola	National Research Council of Italy	Italy
18	Prof.	Fidel González-Rouco	Complutense University of Madrid	Spain
19	Prof.	William D. Gosnold	University of North Dakota	USA
20	Dr.	Jiang, Guangzheng	State Key Laboratory of Lithospheric Evolution, Chinese Academy	China
21	Dr.	Valiya Hamza	National Obs.y o t Min. of Science, Techn. and Industry	Brazil
22	Prof.	Robert Harris	Oregon State University	USA
23	Mr	Marcus Haynes	Geoscience Australia	Australia
24	Prof. em.	Alan M. Jessop	Geological Survey of Canada	Canada
25	Dr.	Argo Joeleht	University of Tartu	Estonia
26	Dr.	Norbert Kaul	University of Bremen	Germany
27	Prof.	Mikhail Khutorskoy	Russian Academy of Sciences, Moscow, Russia	Russia
28	Prof.	Thomas Kohl	Karlsruher Institut für Technologie	Germany
29	Prof.	Ilmo T. Kukkonen	University of Helsinki	Finland
30	Prof.	Youngmin Lee	Korea Institute of Geoscience and Mineral Resources	Korea
31	Prof.	Shaowen Liu	Nanjing University	China
32	Dr.	Ignacio Marzan	Complutense University of Madrid	Spain
33	Dr.	Chris Matthews	University of Adelaide	Australia
34	Prof.	Christian Müller	Fielax	Germany
35	Dr.	Ana Maria Negredo Moreno	Complutense University of Madrid	Spain
36	Dr.	Raquel Negrete Aranda	Center for Scientific Res. and Higher Edu. at Ensenada	Mexico
37	Dr.	Florian Neumann	Center for Scientific Res. and Higher Edu. at Ensenada	Mexico
38	Dr.	Ben Norden	GFZ Potsdam	Germany
39	Dr.	Jeffrey Poort	Sorbonne University	France
40	Dr.	Dušan Rajver	Geological Survey of Slovenia	Slovenia
41	Dr.	Tim Rawling	AuScope Ltd	Australia
42	Dr.	Labani Ray	CSIR-National Geophysical Research Institute	India
43	Dr.	Maria Richards	SMU Geothermal Laboratory	USA
44	Prof.	Frédérique Rolandone	Sorbonne Université, CNRS-INSU, Institut des Sciences de la Terre Paris	France
45	Dr.	Sukanta Roy	CSIR-National Geophysical Research Institute	India
46	Prof.	Ladislaus Rybach	ETH Zürich, Institute of Geophysics	Switzerland
47	Prof.	Magdalena Scheck-Wenderoth	GFZ Potsdam	Germany
48	Dr.	Jared Smith	University of Virginia	USA
49	Dr.	Akiko Tanaka	Geological Survey of Japan	Japan
50	Dr.	Guzel Vakhitova	Bashkir State University	Russia
51	Prof.	Massimo Verdoya	University of Genoa	Italy
52	Dr	Joanne Whittaker	University of Tasmania	Australia
53	Dr.	Vladimir Zui	Unitary Republic Enterprise	Belorussia

Partner organizations:

- International Heat Flow Commission (IHFC, www.ihfc-iugg.org) of the IASPEI/IUGG

6. References

Fuchs, S., Beardsmore, G., Chiozzi, P., Espinoza-Ojeda, O.M., Gola, G., Gosnold, W., Harris, R., Jennings, S., Liu, S., Negrete-Aranda, R., Neumann, F., Norden, B., Poort, J., Rajver, D., Ray, L., Richards, M., Smith, J., Tanaka, A., Verdoya, M: (2021). A new database structure for the IHFC Global Heat Flow Database. International Journal of Terrestrial Heat Flow and Applied Geothermics, 4, 1, in print.

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Jessop, A.M., Hobart, M. A., & Sclater, J. G. (1976). The World Heat Flow Data Collection - 1975. Geological Survey of Canada, Earth Physics Branch, Geothermal Series, 5, 10. DOI 10013/epic.40176.d002

Lee, W.H.K. (1963). Heat flow data analysis. Reviews of Geophysics, 1(3), 449-479. DOI 10.1029/RG001i003p00449

Lee, W.H.K., & Uyeda, S. (1965). Review of Heat Flow Data. In Terrestrial Heat Flow (pp. 87-190): American Geophysical Union. DOI 10.1029/GM008p0087

Simmons, G., & Horai, K.-I. (1968). Heat flow data. 2. Journal of Geophysical Research (1896-1977), 73(20), 6608-6609. DOI 10.1029/JB073i020p06608

Curriculum vitae – Dr. Sven Fuchs

Current Positions:	Senior Scientist, Helmholtz-Centre Potsdam GFZ German Research Centre for Geosciences, Potsdam, GERMANY Section 4.8 Geoenergy
	Custodian of the Global Heat Flow Database of the International Heat Flow Commission (IHFC)
Contact:	phone: +49 331 288 1713 e-mail: fuchs@gfz-potsdam.de; heatflow@ihfc-iugg.org

Education and professional experience

Since 2016	Scientist, GFZ Potsdam, Section Geoenergy, Germany; *Marie Skłodowska-Curie-Fellow*, *DAAD Fellow*
2013 – 2016	Postdoc, Aarhus University, Lithosphere Geophysics Group, Denmark
2009 – 2013	Dissertation at the University of Potsdam (Dr. rer. nat.), Germany; Thesis title: '*Well-log based determination of rock thermal conductivity in the North German Basin*',
2007	Diploma in hydrogeology at Technical University of Berlin, Germany; Awarded thesis: '*Numerical process modelling of incident well flow during controlled overpumping for well development*'
2001 – 2007	Student of 'Geosciences and Applied Earth Engineering Sciences', focus on hydrogeology at Technical University of Berlin, Germany

Key responsibilities

Scheduled 2021	Group leader of 'Exploration of Thermal Geosystems' at GFZ
2021	Co-convener of the symposium "Towards 60 years of activity of the International Heat Flow Commission, Joint IAGA-IASPEI Joint Assembly, Hyderabad, India.
2020	Organizer of the Cermak7 Meeting (postponed to 2022)
Since 2019	Member of the International Heat Flow Commission (IHFC) and Custodian of the Global Heat Flow Database
Since 2017	Head of the GFZ Thermal Petrophysics Lab
Since 2017	Speakers committee, DGG working group 'Geothermics', German Geophysical Society

Five recent key publications by the proponent relating to the proposed TF

Fuchs, S., Beardsmore, G., Chiozzi, P., Espinoza-Ojeda, O.M., Gola, G., Gosnold, W., Harris, R., Jennings, S., Liu, S., Negrete-Aranda, R., Neumann, F., Norden, B., Poort, J., Rajver, D., Ray, L., Richards, M., Smith, J., Tanaka, A., Verdoya, M: (2021). ***A new database structure for the IHFC Global Heat Flow Database***. International Journal of Terrestrial Heat Flow and Applied Geothermics, 4, 1, in print.

Fuchs, S., Balling, N., Mathiesen, A. (2020). *Deep basin temperature and heat-flow field in Denmark – new insights from borehole analysis and 3D geothermal modelling*. Geothermics (IF 2018: 3.47), 83, 101818, doi: 10.1016/j.geothermics.2019.101722

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Curriculum vitae – Prof. Massimo Verdoya

Current Positions: Associate Professor; Università di Genova (Italy) - Dept. of Earth, Environment and Life Sciences (DISTAV)

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Education and professional experience

Since 2014	Professor at the University of Genoa
1993 – 2013	Researcher at the University of Genoa
1992	PhD in Geophysics
1985	MDc in Earth Sciences

Key responsibilities

Institutional activities

2014-2018	Vice-director of the Department of Earth, Environmental and Life Sciences (DISTAV), (University of Genoa)2010-2013 and since 2018: vice-coordinator of the B. Sc and M. Sc. Course in Geological Sciences (University of Genoa)
2008 - …	Supervisor of the IMAGEEN scholarship program (Italy, France, Spain, Morocco and Tunisia Cooperation Program)

Teaching

Since 1997	Lecturer of at the Genoa University
Since 2011	Board of the PhD. Course of Earth Sciences (University of Genova) (since 2011)
	Board of the International Master Course in Marine Geomatics at the "Istituto Idrografico" of the Italian Military Navy.
July 2003	Invited lecturer at the AIST, Higashi Tsukuba, Japan
May 2007	Invited lecturer at the University of Oujda, Morocco

Memberships and roles in international and national organizations

2019	Chairman of the International Heat Flow Commission of IASPEI
2018	Coordinator of the NW Branch of the Italian Geothermal Union (UGI)
2016 – 2020	Board of Directors of the International Geothermal Association (IGA)
2015 – 2019	Vice-Chairman of the International Heat Flow Commission
2003 – 2015	Board of the International Heat Flow Commission of the IASPEI (International Association of Seismology and Physics of the Earth Interior).

Organization of international scientific symposia

2021	Co-convener of the symposium "Towards 60 years of activity of the International Heat Flow Commission, Joint IAGA-IASPEI Joint Assembly, Hyderabad, India.
2020	Member of the scientific committee of the "Cermak-7" international conference
2019	Co-convener of the symposium "Advances in Terrestrial Heat Flow Measurement and Interpretation, 27th IUGG General Assembly, Montreal, Canada.
2018	Co-convener of the symposium "The Earth's thermal state from geophysics and geochemistry European Geoscience Union General Assembly 2018, Vienna, Austria
2017	Co-convener of the symposium "The Earth's thermal state and heat budget of crustal metamorphism" European Geoscience Union General Assembly 2017, Vienna, Austria
2016	Co-convener of symposium "Measurement, processing and interpretation of the Earth's thermal state: new developments and impact on the geo-community", European Geosciences Union General Assembly 2016, Vienna, Austria
2015	Convener of symposium "Subsurface Thermal Evaluation - Resources and Signals" 26th General Assembly of the International Union of Geodesy and Geophysics, Prague, Czech Republic

2015	Convener of symposium "Lithosphere Heat Flow and its Relationships with Tectonics, Seismicity and Crustal Fluid Circulation", 26th General Assembly of the International Union of Geodesy and Geophysics, Prague, Czech Republic
2000	Member of the Scientific Committee of the International Symposium e "Geothermics at the Turn of the Century", 3-7 April, 2000, Evora (Portugal).

Main Funded Projects

1990 -1992	EUROPEAN GEOTRAVERSE-EGT (RU component)
1997	MURST ex 40%: Structure, dynamics and evolution of the lithosphere (RU component)
1997-1998	EUROPROBE-SVEKALAPKO (European Science Foundation) (RU component)
2001-2002	IGCP Project No.428 Title: Past Climate Change Inferred from Borehole Temperatures (UNESCO) (PI)
2002	TRANSALP (RU component)
2004 PRIN	Seismicity, field stress and rheology in the Tyrrhenian-Apennines system. (RU component)
2002-2003	MIUR PNRA - WITRA: Geophysical data interpretation of the Wilkes Basin (RU component)
2002-2003	MIUR PNRA - TIMM: Tectonics and Interior of Mt Melbourne Area (RU component)
2004-2006	Italy-Morocco Scientific and Technological Cooperation Program, project n. 11: Evaluation des potentialités énergétiques des réservoirs hydrothermaux du Maroc septentrional et modélisation mathématique du transfert d'eau et de chaleur- (Italian Ministry of Foreign Affairs) (PI)
2008	PRIN – Geothermal resources of the Mesozoic basement of the Po basin (RU component)
2011-2012	MIUR PNRA - BABOC: International Aereogeophysical Exploration Under the East Antarctic Ice Sheet: the Northern Wilkes Subglacial Basin (RU component)

Five recent key publications by the proponent relating to the proposed TF

Fuchs, S., Beardsmore, G., Chiozzi, P., Espinoza-Ojeda, O.M., Gola, G., Gosnold, W., Harris, R., Jennings, S., Liu, S., Negrete-Aranda, R., Neumann, F., Norden, B., Poort, J., Rajver, D., Ray, L., Richards, M., Smith, J., Tanaka, A., **Verdoya, M:** (2021). *A new database structure for the IHFC Global Heat Flow Database.* International Journal of Terrestrial Heat Flow and Applied Geothermics, 4, 1, in print.

Pasquale, V**., Verdoya,** M., **Chiozzi**, P., 2017. *Geothermics, Heat Flow in the Lithosphere* (2nd Edition). SpringerBriefs in Earth Sciences, Springer International Publishing, pp. 139.

Verdoya M., Chiozzi P., Gola G., 2021. *Unravelling the terrestrial heat flow of a young orogen: The example of the northern Apennines*. Geothermics, 90, https://doi.org/10.1016/j.geothermics.2020.101993

Chiozzi P., **Verdoya M**., 2018. *Heat-flow anomaly and residual topography in the Mascarene hotspot swell (Indian Ocean)* Int J Earth Sci (Geol Rundsch), 107:35-51

Chiozzi P., Barkaoui A.E., Rimi A., **Verdoya M**., Zarhloule Y., 2017. *A review of surface heat-flow data of the northern Middle Atlas (Morocco).* Journal of Geodynamics 112, 58–71

Curriculum vitae – Prof. Shaowen Liu

Current Positions: School of Geography and Ocean Science, Nanjing University, China

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Education and professional experience

Since 2018	Professor of Marine Geology and Geophysics, Nanjing University, China
2016 – 2017	Visiting Associate in Geophysics, Seismological Laboratory, Caltech, USA
2013 – 2014	Visiting Associate Scientist, Lamont-Doherty Earth Observatory, Columbia University, USA
2006 – 2013	Associate Professor in Marine Geology and Geophysics, Nanjing University, China
2004 – 2006	Postdoctoral research in Marine Geology and Geophysics, Nanjing University, China
1999 – 2004	Ph.D. in Tectonics and Geophysics, Nanjing University, China
1995 – 1999	BSc. in Hydrogeology and Engineering Geology, Nanjing University, China

Key responsibilities

2019 – 2023	Member of International Heat Flow Commission (IHFC)-IUGG/IASPEI
Since 2018	Deputy Director, Key Laboratory of Coast and Island Development, Nanjing University
Since 2011	Deputy Chair, Department of Coastal Ocean Science, Nanjing University, China
Since 2012	Member of Geothermics Commission, Chinese Geophysical Society

PI of 4 projects supported by National Natural Science Foundation of China (NSFC), 4 projects supported by the Ministry of Science and Technology of China (MOST) and the Ministry of Education of China (MOE), and several contracts from Chinese Oil and Gas Companies of PetroChina, Sinopec and CNOOC.

Five recent key publications by the proponent relating to the proposed TF

Fuchs, S., Beardsmore, G., Chiozzi, P., Espinoza-Ojeda, O.M., Gola, G., Gosnold, W., Harris, R., Jennings, S., **Liu, S.,** Negrete-Aranda, R., Neumann, F., Norden, B., Poort, J., Rajver, D., Ray, L., Richards, M., Smith, J., Tanaka, A., Verdoya, M. (2021). **A new database structure for the IHFC Global Heat Flow Database**. International Journal of Terrestrial Heat Flow and Applied Geothermics, 4(1), in print.

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Liu, S.W., Lei, X., Wang, L.S. (2015). *New heat flow determinations in the northern Tarim craton, Northwest China*. Geophysical Journal International, 200(2):1196~1206. doi:10.1093/gji/ggu458.

Curriculum vitae – Prof. Robert Harris

Current Positions: Oregon State University

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Education and professional experience

Since 2011	Professor of Geophysics, Oregon State University
2005-2011	Associate Professor of Geophysics, Oregon State University, USA
2004-2005	Associate Professor of Geophysics, Instructor, University of Utah, USA
1999-2004	Assistant Professor of Geophysics, Instructor, University of Utah, USA
1998-1999	Postdoc, Massachusetts Institute of Technology, USA
1997-1999	Postdoc, University of Miami, RSMAS, USA
1996	Ph.D. Geophysics, University of Utah, USA
1992	M.Sc., Geophysics, University of Utah, USA

Key responsibilities

Since 2019	Vice Secretary/Treasurers, IUGG - International Heat Flow Commission
Since 2017	Integrated Ocean Drilling Program -JOIDES Resolution Science Operator Geophysics Lab Working Ground
2016-2020	GeoPRISMS steering committee
Since 2014	Member, Willamette University Native American Advisory Board
Since 2010	Manager U.S. Academic Marine Heat Flow Capability

Five recent key publications by the proponent relating to the proposed TF

Fuchs, S., Beardsmore, G., Chiozzi, P., Espinoza-Ojeda, O.M., Gola, G., Gosnold, W., **Harris, R.**, Jennings, S., Liu, S., Negrete-Aranda, R., Neumann, F., Norden, B., Poort, J., Rajver, D., Ray, L., Richards, M., Smith, J., Tanaka, A., Verdoya, M: (2021). *A new database structure for the IHFC Global Heat Flow Database.* International Journal of Terrestrial Heat Flow and Applied Geothermics, 4, 1, in print.

Hornbach, M. J., **Harris, R.** N., and Phrampus, B. J. (2020). *Heat flow on the U.S. Beaufort Margin, Arctic Ocean: Implications for ocean warming, methane hydrate stability, and regional tectonics*. Geochemistry, Geophysics, Geosystems, 21, e2020GC008933. https://doi.org/10.1029/2020GC008933

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Phrampus, B. J., **Harris, R. N.**, and A. M. Trehu (2017), *Heat flow bounds over the Cascadia margin derived from bottom simulating reflectors and implications for thermal models of subduction*, Geochem. Geophys. Geosyst., doi:10.1002/2017GC007077.

Curriculum vitae – Dr. Raquel Negrete-Aranda

Current Positions: Associate Professor, Geology Department, CICESE, Ensenada, México.

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Education and professional experience

Since 2014	Associate Professor, Geology Department, CICESE, Ensenada, México.
2012 - 2014	Postdoc, Scripps Institution of Oceanology, University of California San Diego, La Jolla, CA.
2009 - 2011	Postdoc, Geology Department. Earth Sciences Division, CICESE, Ensenada, México.
2008	PhD, CICESE, Ensenada, México.

Key responsibilities

Since 2014	Leader of the Tectonophysics and Heat Flow Laboratory in the Geology Department at CICESE´s Earth Sciences Division. Management of all heat flow related projects from proposals to actual heat flow surveys in various tectonic settings
Since 2015	Marine Heat Flow Leader in the following expeditions: R/V Alpha Helix 2015 expedition to the Northern Gulf of California (Wagner Basin). R/V Falkor 2018 Joint Expedition to the Pescadero Basin (Southern Gulf of California). R/V Falkor 2021 Joint Expedition to the Carmen, Farallon, and Pescadero Basins (Southern Gulf of California). R/V Hesperides 2021-2022 Joint Expedition to the Powel-Brake-Bransfield Rift in Antartica
Since 2015	Human resources formation. From teaching to mentoring graduate students and postdocs (Currently: 1 Postdoc, 3 PhD. students and 4 Master´s students)

Five recent key publications by the proponent relating to the proposed TF

Fuchs, S., Beardsmore, G., Chiozzi, P., Espinoza-Ojeda, O.M., Gola, G., Gosnold, W., Harris, R., Jennings, S., Liu, S., **Negrete-Aranda, R.,** Neumann, F., Norden, B., Poort, J., Rajver, D., Ray, L., Richards, M., Smith, J., Tanaka, A., Verdoya, M: (2021). *A new database structure for the IHFC Global Heat Flow Database.* International Journal of Terrestrial Heat Flow and Applied Geothermics, 4, 1, in print

Neumann, F*., **Negrete-Aranda, R**., Harris, R.N., Contreras, J., Sclater, J.G., and González-Fernández, A., **2017**, *Systematic heat flow measurements across the Wagner Basin, northern Gulf of California*: Earth and Planetary Science Letters, v. 479, p. 340–353, doi: 10.1016/j.epsl.2017.09.037.

Sclater, J.G., Hasterok, D., Goutorbe, B., Hillier, J., and **Negrete-Aranda, R**., 2014, *Marine Heat Flow*, *in* Harff, J., Meschede, M., Petersen, S., and Thiede, J. eds., Encyclopedia of Marine Geosciences, Dordrecht, Springer Netherlands, p. 1–16.

Negrete-Aranda, R., Cañón-Tapia, E., Brandle, J.L., Ortega-Rivera, M.A.,. Lee, J.K.W., and Hinojosa-Corona, A., 2010**.** *Regional orientation of tectonic stress and the stress expressed by post-subduction high-magnesium volcanism in Northern Baja California, México*: Tectonics and volcanism of San Borja volcanic field**.** Journal of Volcanology and Geothermal Research, V.192, 97-115

Negrete-Aranda, R., Cañón Tapia, E., **2008.** *Post-subduction volcanism in the Baja California Peninsula, México: The effects of tectonic reconfiguration in volcanic systems***.** Lithos. (2008) 10.1016/j.lithos.2007.08.013

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Education and professional experience

Since 2017	Senior Research Fellow; University of Melbourne, Australia
Since 2006	Technical Director; Hot Dry Rocks geothermal energy consultancy, Australia
2013–2016	Senior Researcher; National ICT Australia (now called Data 61), Australia
1998–2011	Research Associate, Lecturer, Senior Research Fellow; Monash University, Australia
1997–1998	Postdoctoral Research Fellow; Southern Methodist University, Dallas TX, USA
1990–1996	Doctor of Philosophy in Geophysics, thesis title, *The thermal history of the Browse Basin and its implications for petroleum exploration*; Monash University, Australia
1986–1989	Bachelor of Science (Geology/Geophysics) with honours; Monash University, Australia

Key responsibilities

Since 2017	Steering Committee Member, International Partnership for Geothermal Technology
Since 2016	Director, Australian Geothermal Association
2015–2019	Vice Secretary, International Heat Flow Commission
2011–2015	Member, International Heat Flow Commission
2007–2013	Director, International Geothermal Association

Five recent key publications by the proponent relating to the proposed TF

Fuchs, S., **Beardsmore, G.**, Chiozzi, P., Espinoza-Ojeda, O.M., Gola, G., Gosnold, W., Harris, R., Jennings, S., Liu, S., Negrete-Aranda, R., Neumann, F., Norden, B., Poort, J., Rajver, D., Ray, L., Richards, M., Smith, J., Tanaka, A., Verdoya, M: (2021). *A new database structure for the IHFC Global Heat Flow Database*. International Journal of Terrestrial Heat Flow and Applied Geothermics, 4, 1, in print.

Sass, J.H. and **Beardsmore, G.** (2020). *Heat Flow Determinations, Continental*. In: Gupta, H.K. (ed.), Encyclopaedia of Solid Earth Geophysics, Encyclopedia of Earth Sciences Series, Springer Nature Switzerland AG. DOI https://doi.org/10.1007/978-3-030-10475-7_72-1. 7pp.

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Popov, Y., **Beardsmore, G.**, Clauser, C. and Roy, S. (2016). *ISRM suggested methods for determining thermal properties of rocks from laboratory tests at atmospheric pressure*. Rock Mechanics and Rock Engineering, 49(10), 4179–4207. DOI: 10.1007/s00603-016-1070-5.

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