



OneGeochemistry

Enabling a coordinated online global network of multiple distributed geochemical repositories and databases

Kerstin Lehnert (Columbia University, USA); Lesley Wyborn (Australian National University), Dominik Hezel (Goethe-Universität Frankfurt); Alexander Prent (Curtin University); Kirsten Elger (GFZ Potsdam), ter Maat, Geertje (Universität Leiden); Klöcking, Marthe (Universität Göttingen); Klump, Jens (CSIRO)

Geochemistry

Scientific & Societal Relevance

- **Geochemistry is fundamental to understanding past, present, and future processes in natural systems.**
 - Evolution of the Earth system, solar system, and universe.
 - Societally relevant topics: environment, resources (minerals, energy, groundwater), geohealth, ocean, agriculture.
 - Potential role in all 17 Sustainable Development Goals (SDGs) set in 2015 by the UN General Assembly as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity.
 - SDG#6: Clean Water and Sanitation
 - SDG#7: Affordable and Clean Energy
 - SDG#8: Decent Work and Economic Growth
 - SDG#9: Industry, Innovation and Infrastructure
 - SDG#13: Climate Action
 - SDG#15: Life on Land
- **Acquisition and analysis of geochemical data is pervasive in the Earth, environmental, and planetary sciences.**

Geochemistry

Diverse &
Complex

- Geochemistry research is diverse: multiple groups from multiple organizations and multiple funding types vary radically in source, discipline, size, subject, and longevity.
- Geochemistry data is complex: there is an incredible diversity of data types and techniques to measure those data types, and few standards for formats and metadata to describe provenance.

Geochemical Data

Fragmented & Un-
FAIR



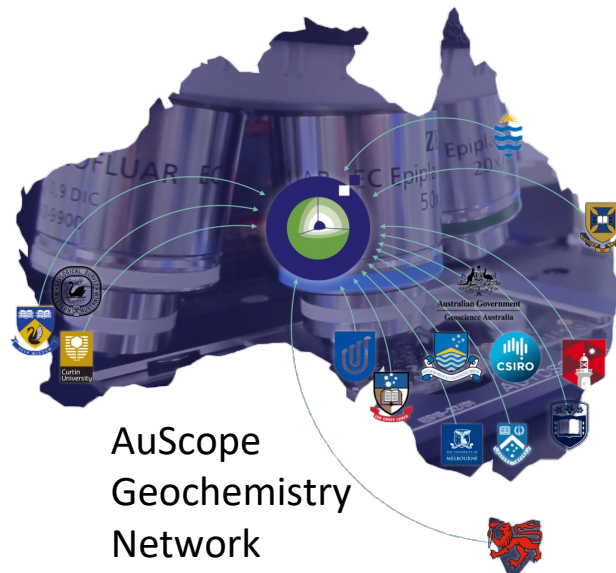
- The Geochemical data landscape is fragmented.
 - Geochemical data lack common data schemas, formats, vocabularies, which makes it hard to find, access, and reuse them.
 - Geochemical databases tend to be built in thematic, institutional, national, or programmatic silos.
 - Geochemical databases are uncoordinated and analyses can be duplicated within them, making global merging of datasets complex and leading to competition.
- *We need the silos to seamlessly come together to harness the wealth of geochemical data in support of basic and applied science.*



Geochemical Data Action needed!

- Data volumes are rapidly growing due to advancements in analytical instrumentation.
- Researchers need access to comprehensive, global data stores to solve the 'Grand Challenges' in science and for society.
- In response to Open Access policies and science demands, even more geochemical database systems are emerging at national, programmatic, and subdomain levels.

Evolving Networks National & Regional



Australia

EPoS MULTI-SCALE LABORATORIES

from MACRO- to MICRO- and NANO- SCALES

OBJECTIVES

1. The organisation of a coherent and collaborative network of solid Earth Science laboratories;
2. The implementation of dedicated Data Services that will allow to collect, preserve and share available and emerging laboratory data on the properties and processes controlling rock system behaviour at multiple scales for re-usability and interoperability with other solid Earth Science data;
3. The development of a Trans-national Access (TNA) program, that will increase European state-of-the-art solid Earth science laboratories attractiveness for researchers and contribute to increased researcher's mobility, cooperation and exchange.

EPoS EUROPEAN PLATE OBSERVING SYSTEM www.epos-ip.org

Europe



Germany

EarthChem IEDA

Home About Support & Services Data Repositories & Syntheses Sample Services News Contact Us

Community-driven preservation, discovery, access, and visualization of geochemical, geochronological, and petrological data

Get Data Contribute Data Support & Services

United States

We Need a Global Network: OneGeochemistry



- The international Geochemistry community needs to jointly define the required, globally-agreed standards and best practices that will enable world-wide interoperability, reuse and open sharing of geochemical data.
- We also need to develop governance of the network and the standards and best practices for FAIR geochemical data.

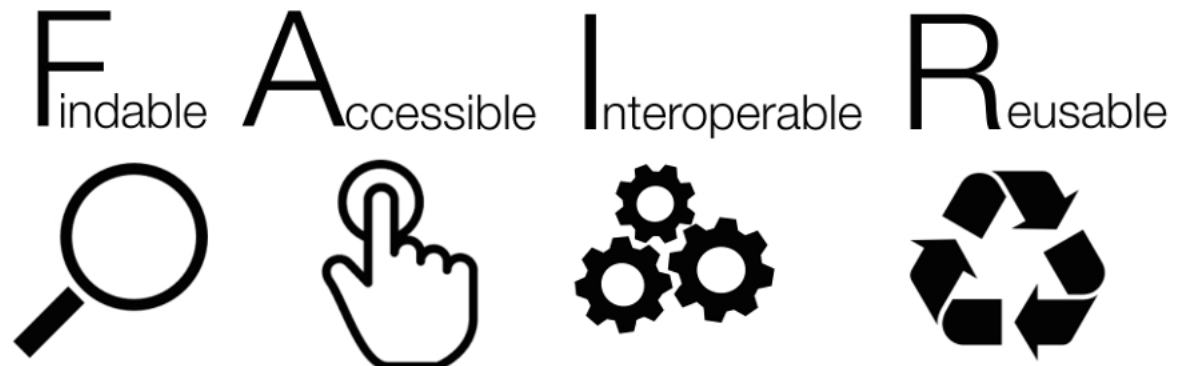
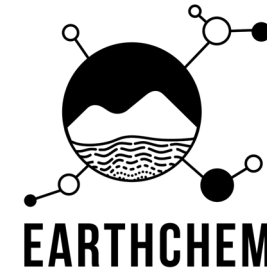


Image credit: Sungya Pundir, Wikimedia Commons CC BY-SA 4.0

(Wilkinson et al., 2016)

OneGeochemistry Status

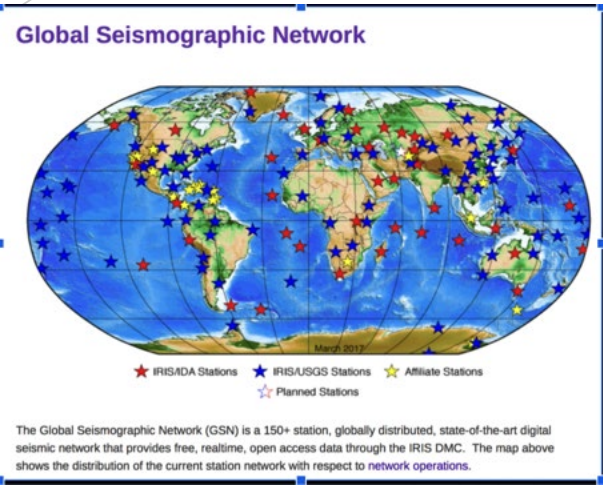
- Started in 2018
- Global participation
- Organizational structure and governance to be developed



OneGeochemistry Vision

- A distributed architecture, where geochemical data are available globally using standard web services.
- A coordinated data federation that ensures complementarity of data resources to minimize duplication and maximize comprehensiveness.
- A sustainable data infrastructure of that guarantees persistent access to a wealth of FAIR geochemical data.

It won't be easy, but it has been done!!!



Get data Share Tools Inside GBIF

GBIF | Global Biodiversity Information Facility

Free and open access to biodiversity data

OCCURRENCES SPECIES DATASETS PUBLISHERS RESOURCES

Search

WHAT IS GBIF? ABOUT GBIF SPAIN



Crystallographic Information Framework

The International Union of Crystallography is the sponsor of the **Crystallographic Information Framework**, a standard for information interchange in crystallography.

The acronym CIF is used both for the *Crystallographic Information File*, the data exchange standard file format of Hall, Allen & Brown (1991) (see [Documentation](#)), and for the *Crystallographic Information Framework*, a broader system of exchange protocols based on data dictionaries and relational rules expressible in different machine-readable

manifestations, including, but not restricted to, Crystallographic Information File and XML.

Earth System Grid Federation

An [open source](#) effort providing a robust, distributed data and computation platform, enabling world wide access to Peta/Exa-scale scientific data.

[Learn more >](#)

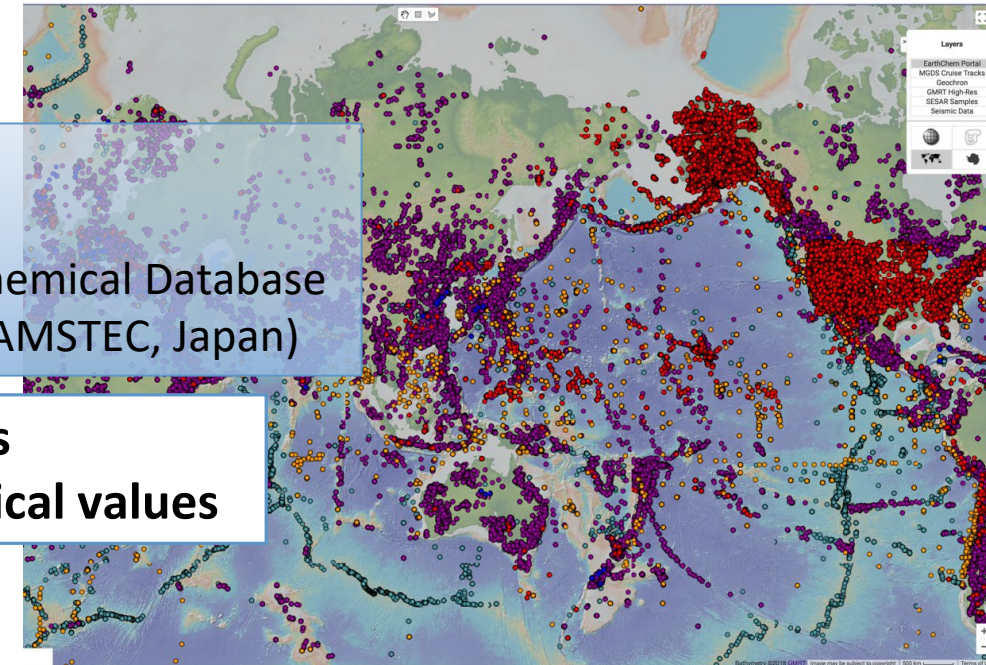
Learning from the Past

The EarthChem Portal (ECP) has been an early attempt to deliver an international geochemical data network.

- The ECP demonstrated the benefits and impact of networking and integrating geochemical data resources.
- Its technology does not scale to the growing data volumes and user demands in the era of data science.
- Participating geochemical databases did not have the resources to implement required technology.
- It lacked formal governance to ensure coordination.

PetDB (USA)
GEOROC (Germany)
USGS National Geochemical Database
DARWIN/GANSEKI (JAMSTEC, Japan)

> 1 million samples
> 30 million analytical values



OneGeochemistry

Next Steps

- Seek funding for a full-time coordinator to work with participants on gathering requirements and information on existing systems.
- Develop organizational structure and governance.
- Continue engagement events
 - Upcoming workshop sponsored by the Geochemical Society.
 - Upcoming events @ EGU 2022 & Goldschmidt 2022.

An invitation
to participate!

Contact any of the current participants to join the initiative!

- ❖ Kerstin Lehnert (EarthChem, Astromat, Osiris-Rex) lehnert@ldeo.columbia.edu
- ❖ Kirsten Elger (GFZ Potsdam) kelger@gfz-potsdam.de
- ❖ Marthe Klöcking (DIGIS/GEOROC) marthe.kloeking@uni-goettingen.de
- ❖ Geertje ter Maat (EPOS) g.w.termaat@uu.nl
- ❖ Lesley Wyborn (Australian National University) lesley.wyborn@anu.edu.au
- ❖ Alexander Prent (Auscope Geochemistry Network) alexander.prent@curtin.edu.au
- ❖ Jens Klump (Auscope) jens.klump@csiro.au
- ❖ Dominik Hezel (MetBase) dominik.hezel@em.uni-frankfurt.de