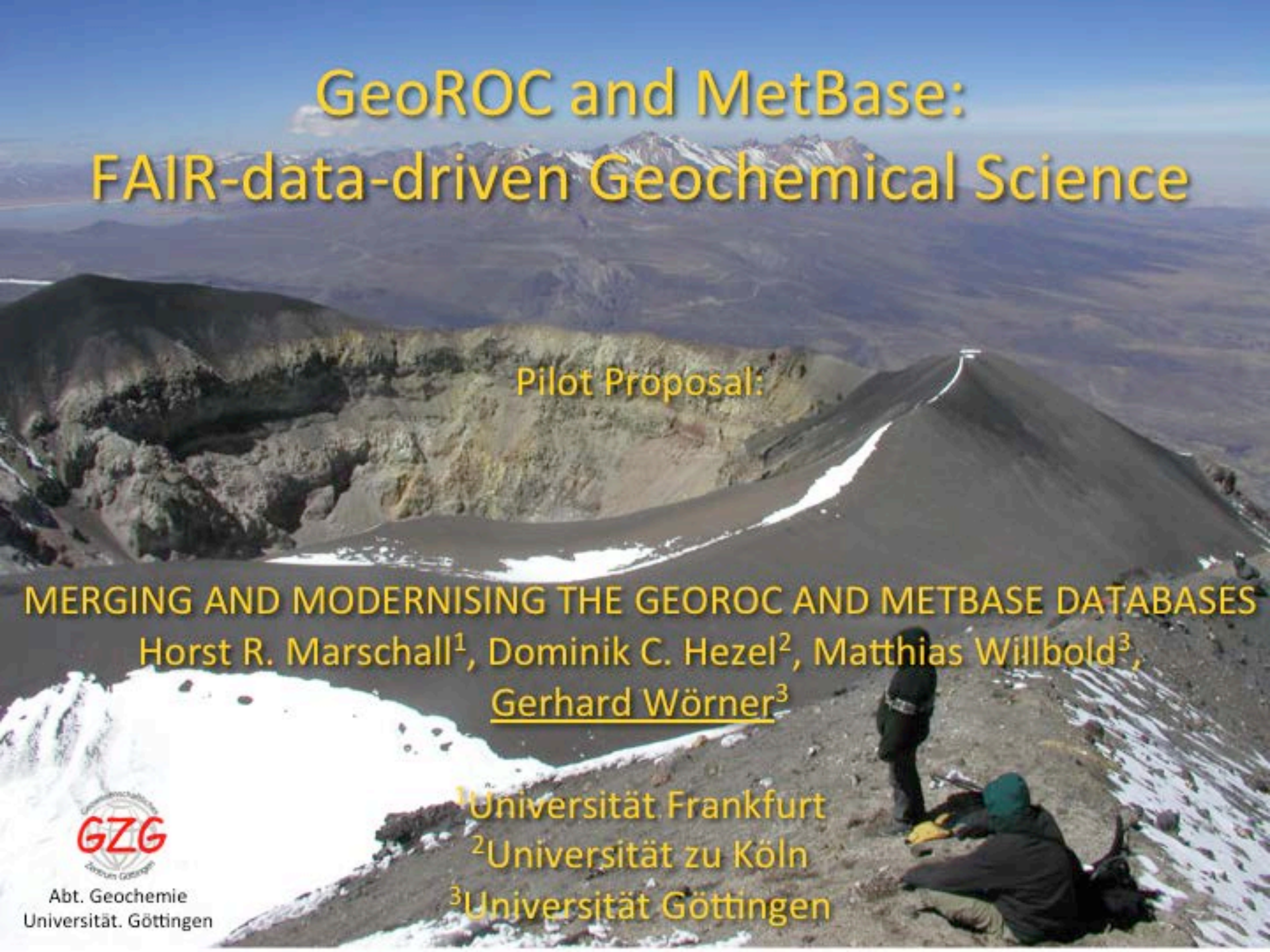
GeoROC and MetBase: FAIR-data-driven Geochemical Science



Pilot Proposal:

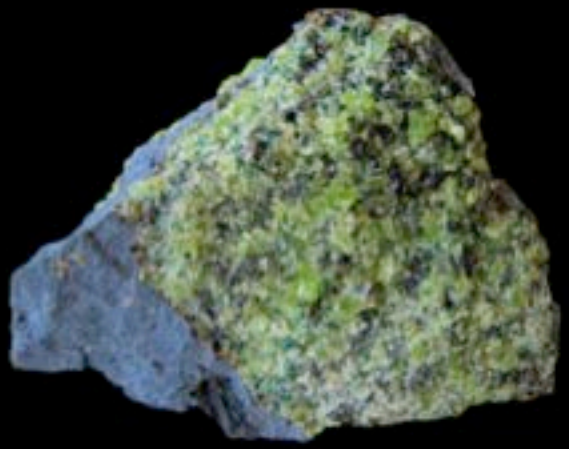
MERGING AND MODERNISING THE GEOROC AND METBASE DATABASES

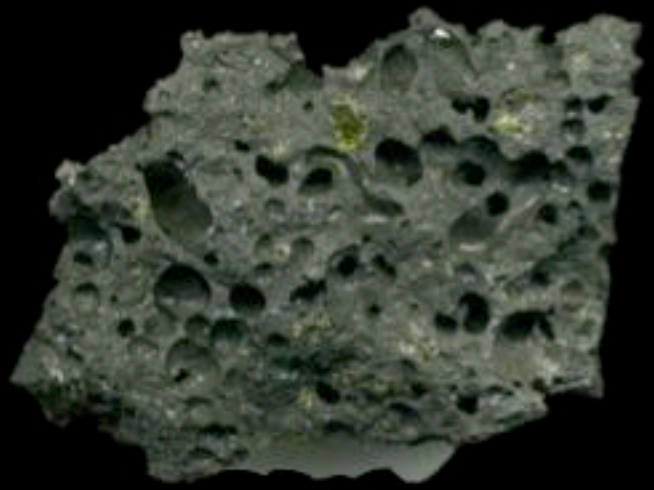
Horst R. Marschall[1], Dominik C. Hezel[2], Matthias Willbold[3], Gerhard Wörner[3]

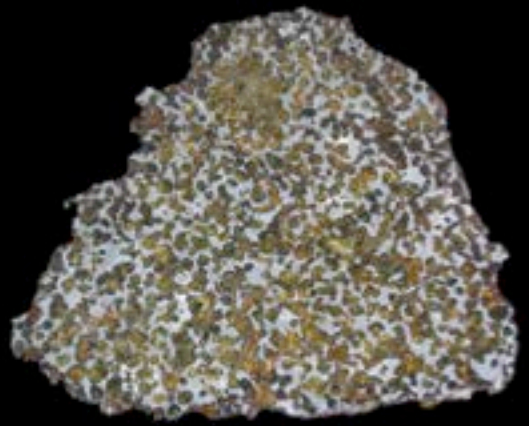
[1]Universität Frankfurt
[2]Universität zu Köln
[3]Universität Göttingen

GZG
Abt. Geochemie
Universität. Göttingen

From Rocks, Minerals and Meteorites







c. 5 cm

.. to high-tech labs

Why on Earth are we analysing so many old rocks ?


2900 km
Deep Earth
control on surface dynamics !
6378 km

What

type of data ?

Why

is it important ?

Where

do we need to go ?

MAX PLANCK INSTITUTE
FOR CHEMISTRY

Online-Service owned by
GeoPlatform UG,
the company behind MetBase

GEOROC
Geochemistry of Rocks of the Oceans and Continents

18,870	papers
570,720	rock and mineral samples
1,768,720	geochemical analyses
25,684,140	single data values

used and cited in thousands of publications

http://georoc.mpch-mainz.gwdg.de/georoc/

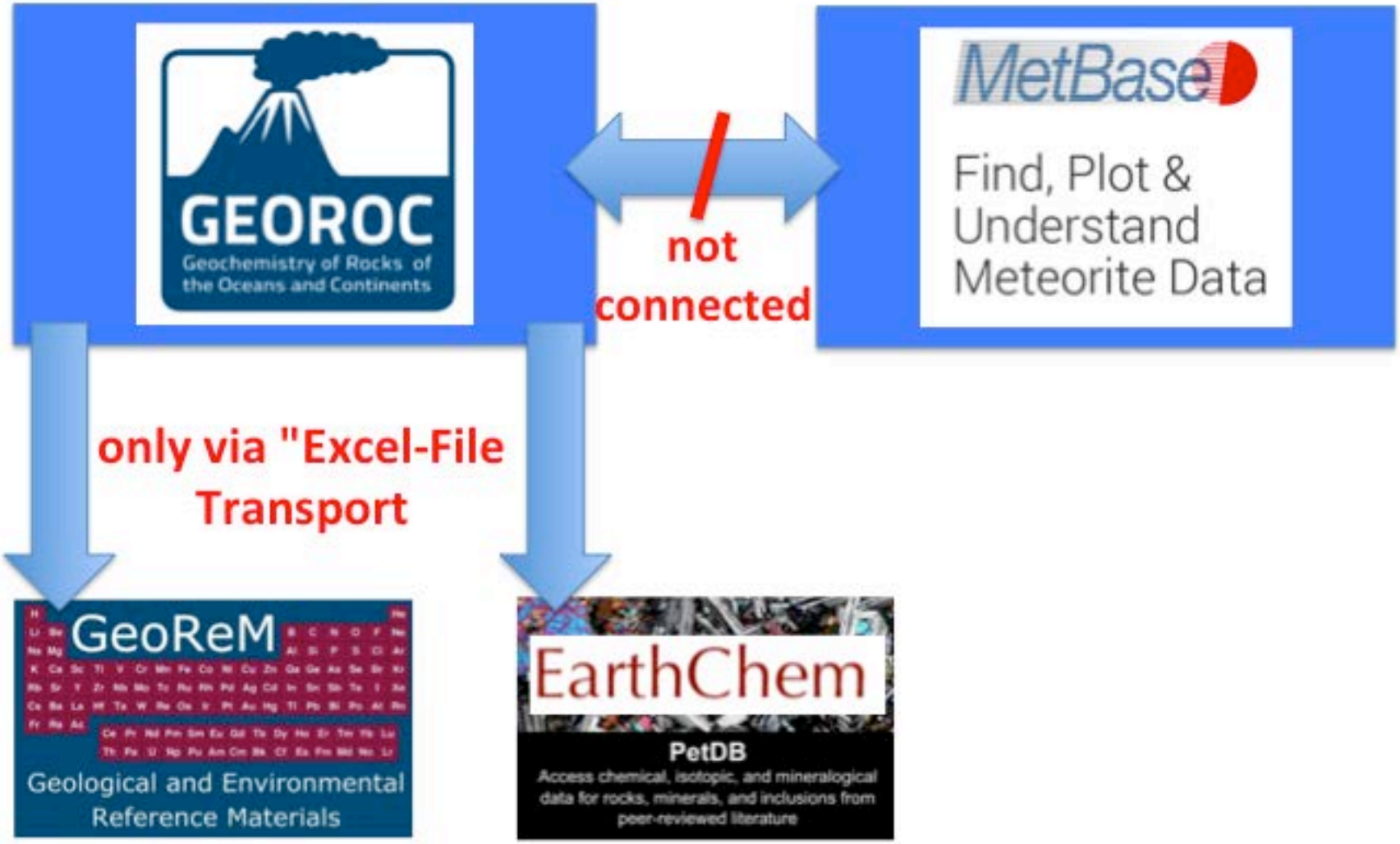
MetBase
Find, Plot & Understand Meteorite Data

world's largest web-interface for
meteorite and mineral compositional data:

1. access, plot, and analyse data
2. online cosmochemistry course
3. 90,000 indexed references

University Cologne Teaching Award
Meteoritical Society Service Award

https://metbase.org/


GEOROC
Geochemistry of Rocks of the Oceans and Continents
not connected
MetBase
Find, Plot & Understand Meteorite Data
only via "Excel-File Transport"
GeoReM
Geological and Environmental Reference Materials
EarthChem
PetDB
Access chemical, isotopic, and mineralogical data for rocks, minerals, and inclusions from peer-reviewed literature
MAX PLANCK INSTITUTE FOR CHEMISTRY
Hosted at the Lamont-Doherty Earth Observatory of Columbia University.
Part of the Interdisciplinary Earth Data Alliance Facility (IEDA).

not entirely FAIR
partly disconnected
not sufficiently interoperable
not user-friendly enough
data-base structure not up-to-date
data-input procedure needs improvement

Hosted at the Lamont-Doherty Earth Observatory of Columbia University. Part of the Interdisciplinary Earth Data Alliance Facility (IEDA).

What

type of data ?

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We analyse

major- and minor elements

(Si, Al, Fe, Mg, Ca, Na, K,..... Ti, P) trace elements ("the rest"),

and

stable and radiogenic isotopes

in rocks, minerals and meteorites

(and soil, water, sediments, fossils...)

since many decades, in many labs around the world, with many different methods

Stable Isotopes:

H/D Li Be B C N O

Mg Si S Cl

Ca Ti V Cr Mn Fe Cu Zn Se

Mo Ag Cd

Sr, Ba .....

Halogens

Radiogenic (long-lived) Isotopes):

K/Ar Rb/Sr Sm/Nd

Lu/Hf U-Th/Pb Re/Os

Radiogenic (short-lived) Isotopes:

U-Th Ra-(Ba) Rn-Pb

Cosmogenic Isotopes:

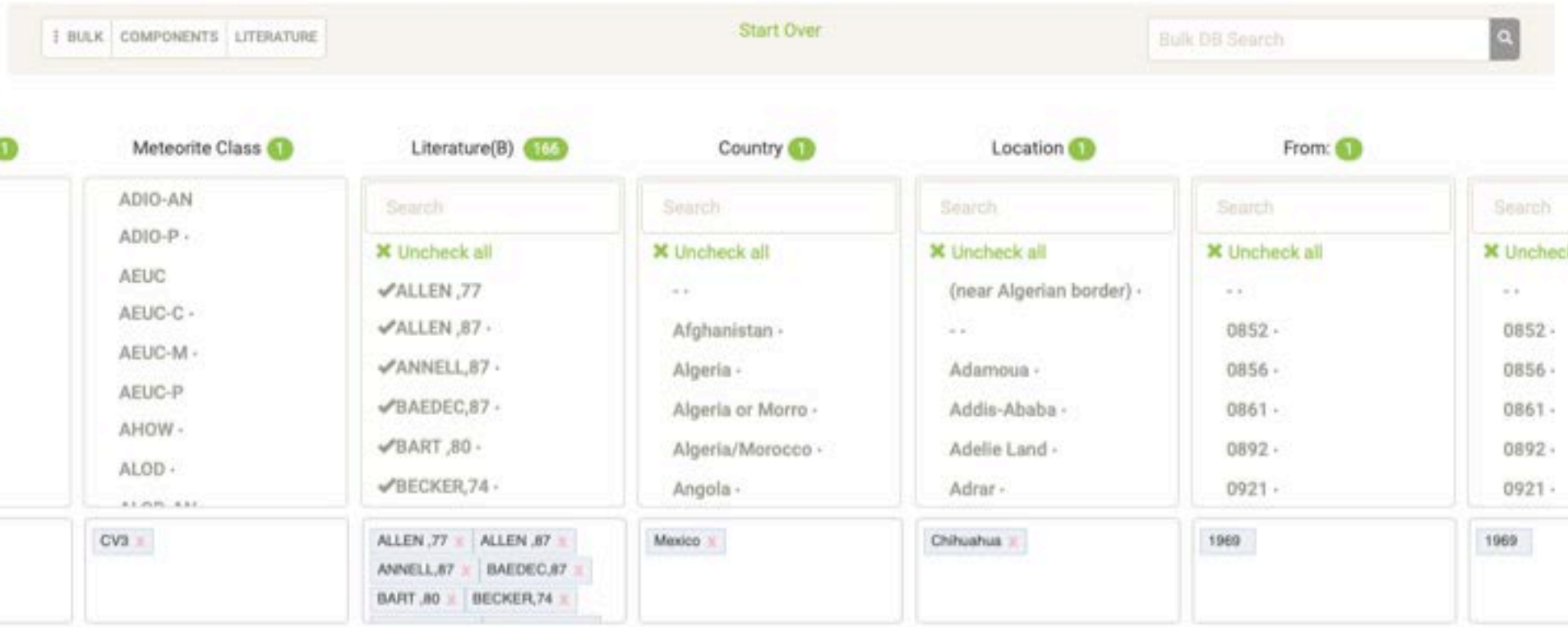
Be, C, Al, Cl, He, Ne, Ar

Research

MetBase

Find, Plot & Understand Meteorite Data

Earth
is made from meteorites



Research

MetBase

Find, Plot & Understand Meteorite Data

SCATTER | CATEGORY | REPORT | MAP | ...

Legend

CLASS METEORITE ... (Bulk)

CLASS METEORITE ... (Component)

X-Axis

ELEMENTS ISOTOPES ...

Nom: Mg Denom: 1

Unit: WT-% WT-PPM WT-PPB

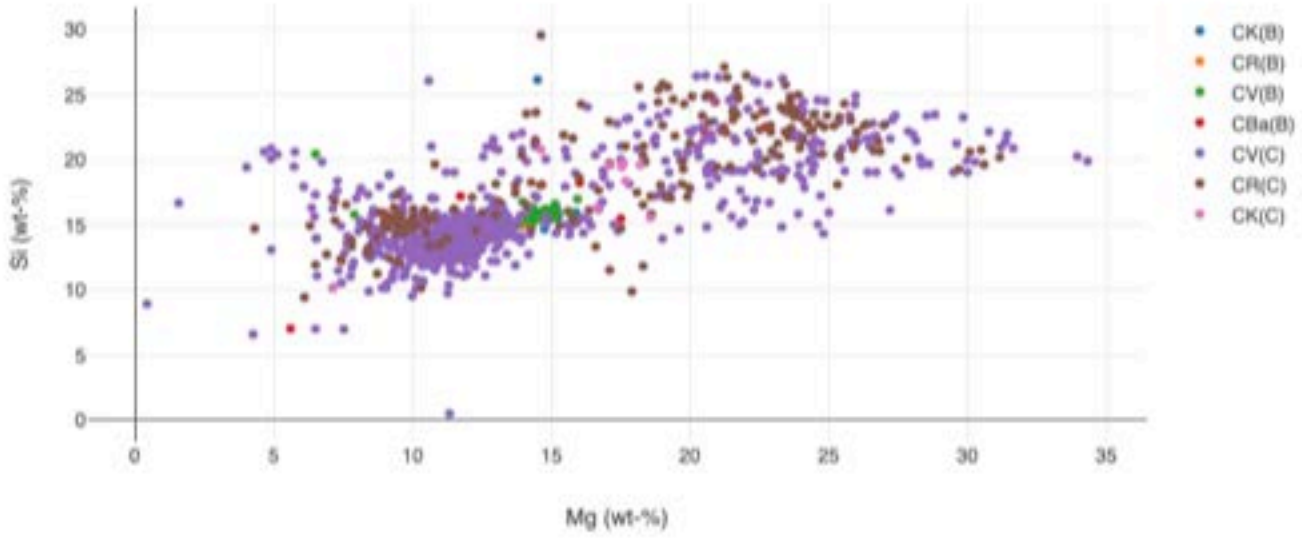
Y-Axis

ELEMENTS ISOTOPES ...

Nom: Si Denom: 1

Unit: WT-% WT-PPM WT-PPB

PLOT



Enlarge plot

What

type of data ?

Why

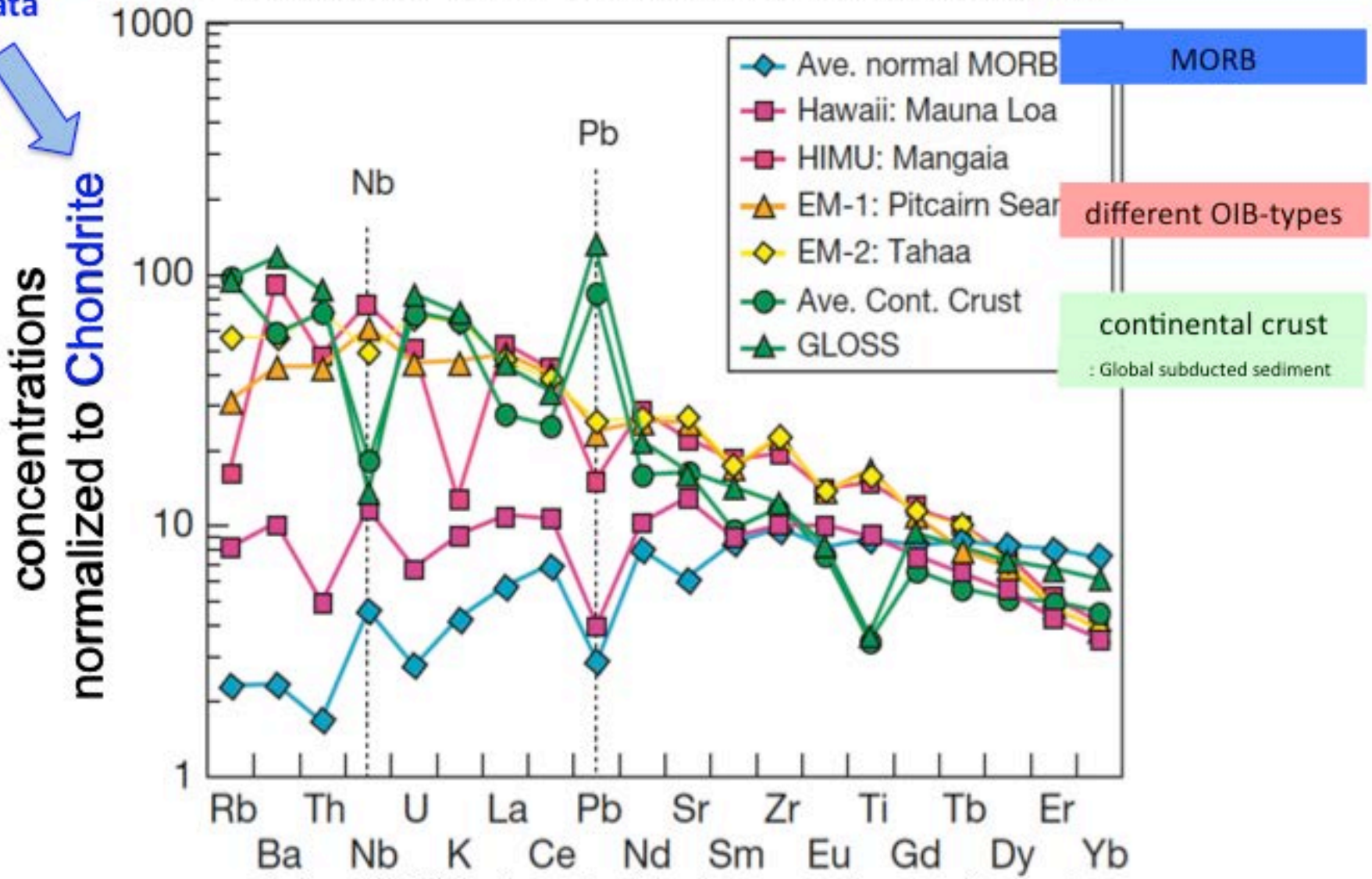
is GEORO important ?

important ?

Where

do we need to go ?

Basalts, basaltic (oceanic) and continental crust on Earth have VERY differen trace element patterns



Hofmann (1997) Mantle geochemistry: the message from oceanic volcanism. Nature review article vol. 385:219-224

Based on GEOROC data compilation

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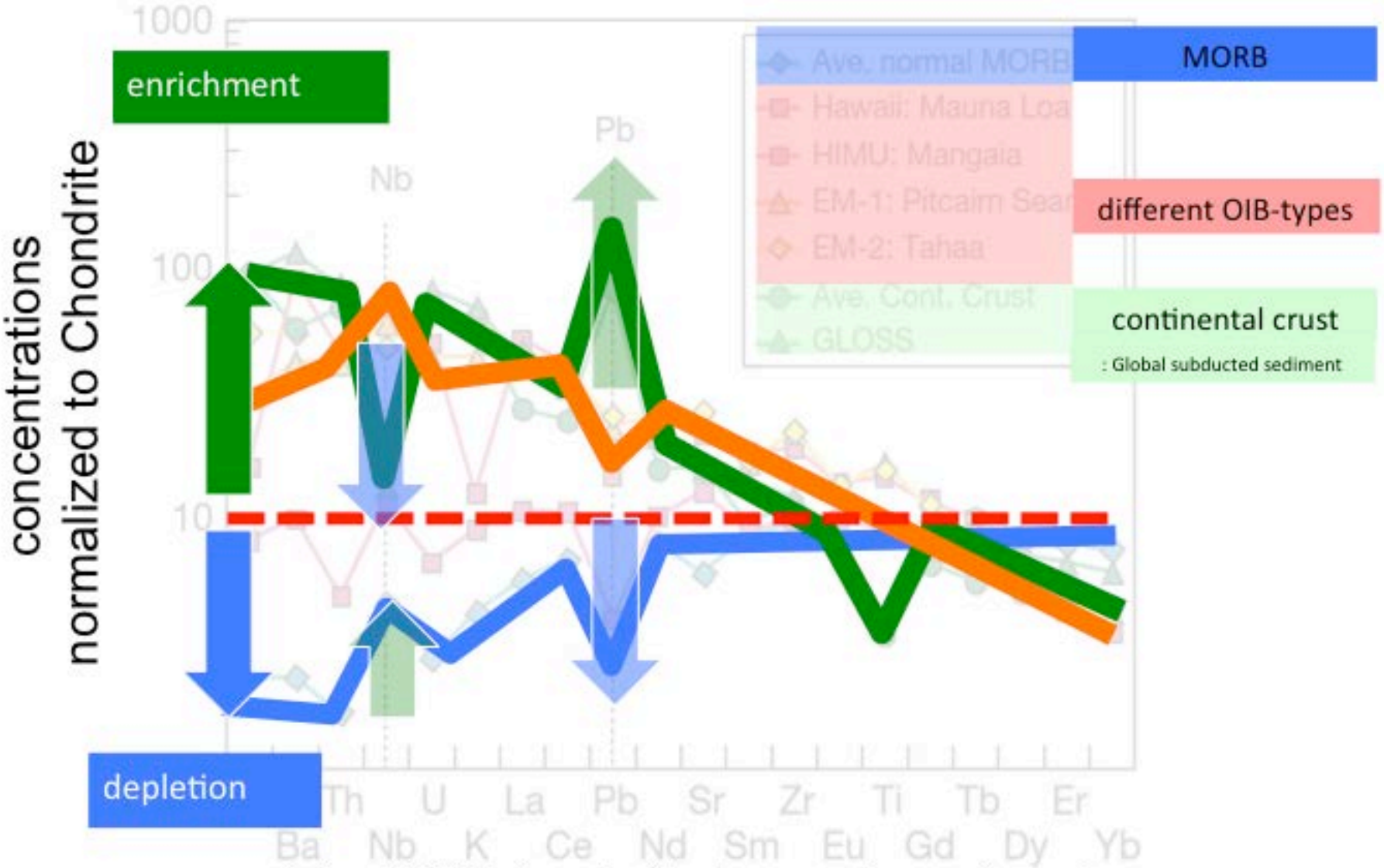

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Based on GEOROC data compilation

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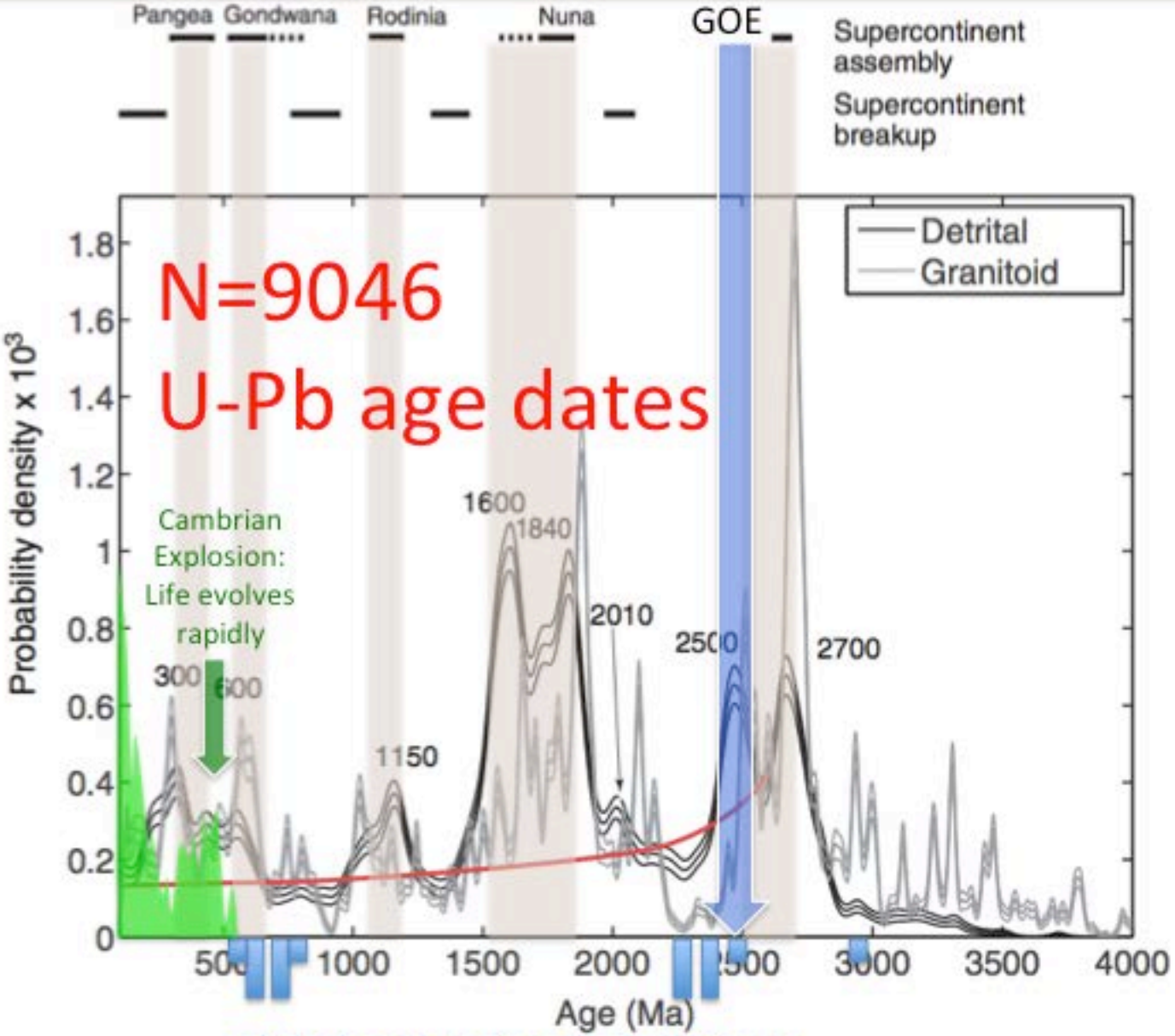
Understanding
HOW
continents formed on Earth
by processes DEEP inside our planet

Hofmann (1997) Mantle geochemistry: the message from oceanic volcanism.
Nature review article vol. 385:219-224

Based on GEOROC data compilation

When were continents formed on Earth ?



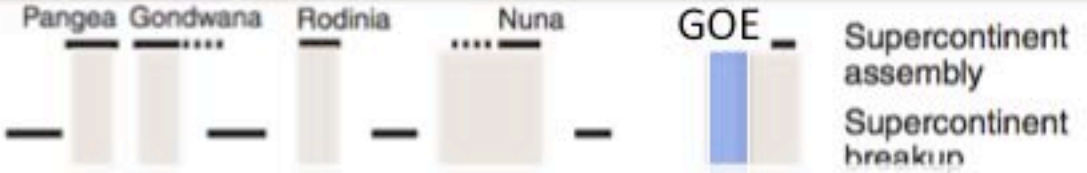
Geological Society of America Bulletin

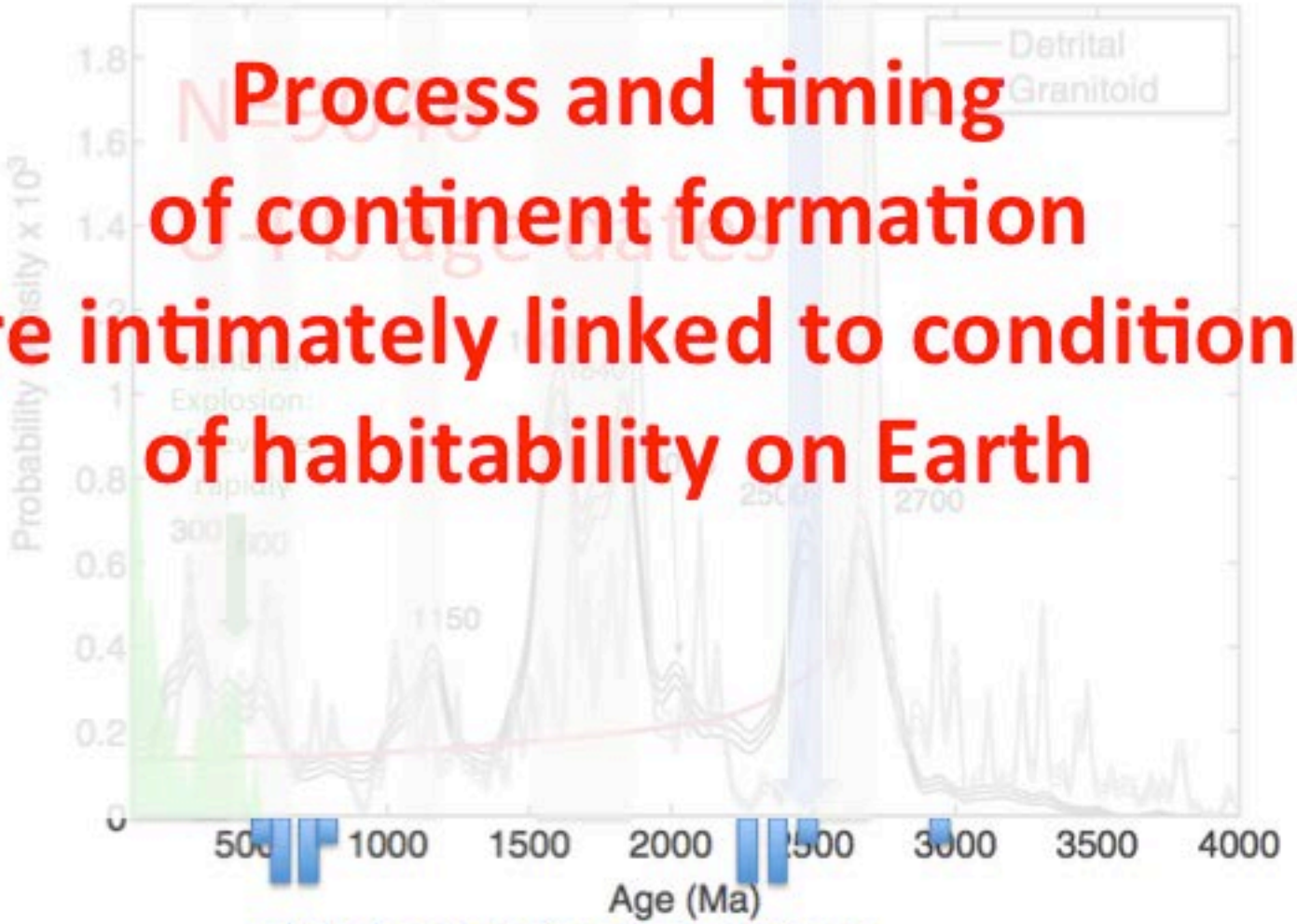
Episodic zircon ages, Hf isotopic composition, and the preservation rate of continental crust

Kent C. Condie, M.E. Bickford, Richard C. Aster, Elena Belousova and David W. Scholl

Geological Society of America Bulletin 2011;123; no. 5-6;951-957

When were continents formed on Earth ?





Process and timing of continent formation are intimately linked to conditions of habitability on Earth

global and regional glaciations

Applications:

examples and potential links to other NFDI-initiatives

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trace element fingerprinting and provenance of (human) artefacts

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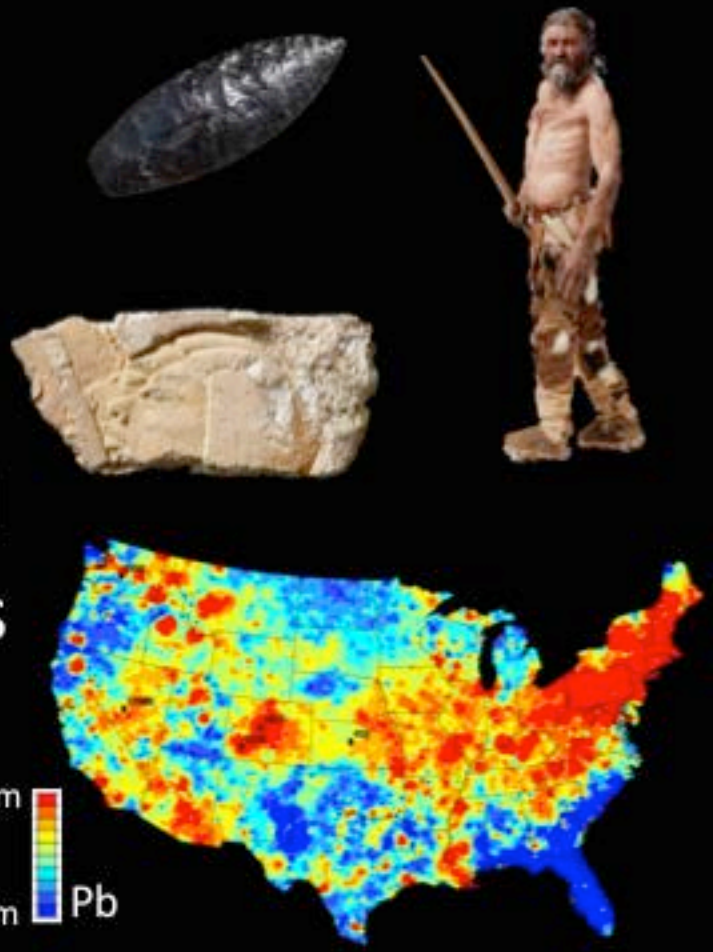
reference for soils and soil contamination



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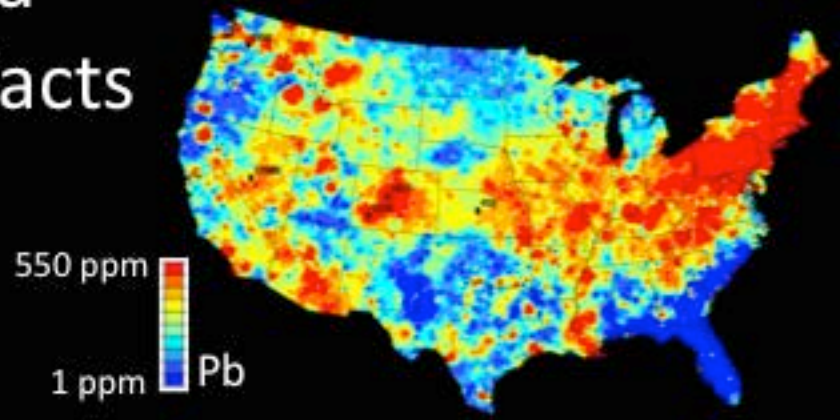

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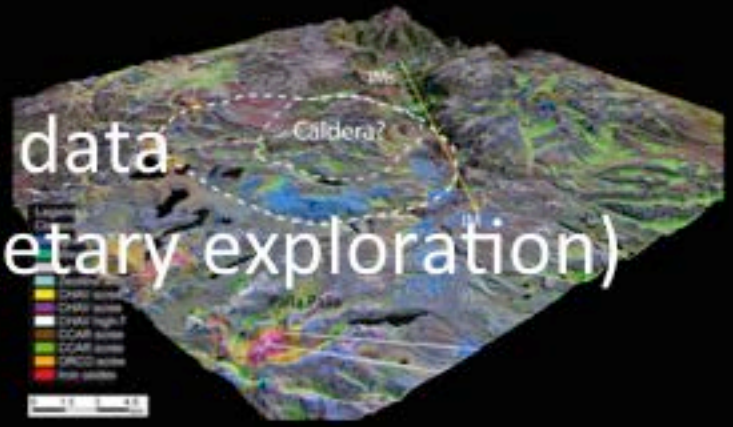

linking remote sensing spectral data to surface rock types (incl. planetary exploration)

What

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Our NFD$_4$Earth Pilot

- **relates to long-tail Earth system science data on Deep Earth and Deep Time**

it will ..

- link GEOROC and MetBase and harmonize database structure to achieve interoperability
- FAIR-conditions and apply international metadata-standards
  -> EarthChem (international), national Community, DFG
- address the challenge of migrating and making long-tail data interoperable
- develop data analysis and visualisation tools for GEOROC and MetBase
- provide advanced online-access to these services

and

- is intimately linked to a database initiative at University Frankfurt and a
- recently funded DFG-LIS-Project at Göttingen aiming to
  - restructure and update the GEOROC database,
  - develop new tools for data entry and
  - to link it other existing geochemical data bases
  - and rock sample archives

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