Science cases for an IDIS proto-type

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The evolution of planetology

The astrophysical approach

The Earth science approach

} 21st century planetology

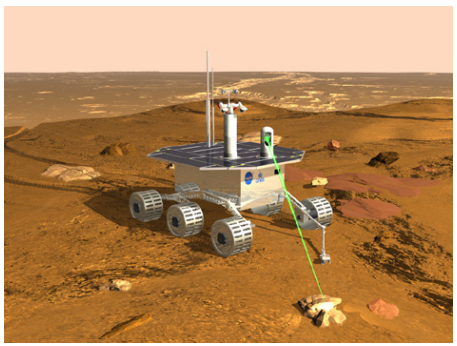
This evolution could be reflected in the choice of IDIS ‘show-case’

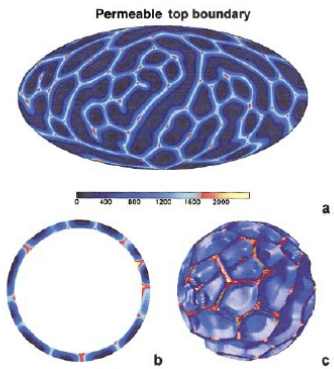
The question

Observations

Experimental simulation

Theoretical modelling





The data

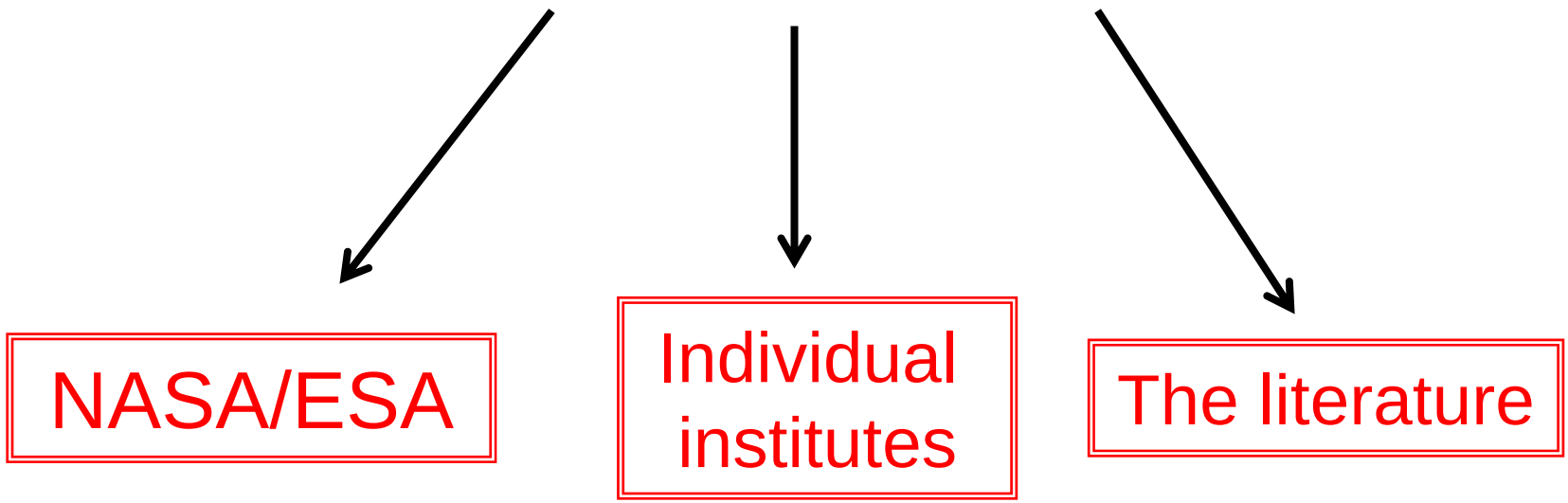
The data

To what extent should one distinguish ‘raw’ data sets from ‘treated’ or ‘derived’ data sets?

e.g. OMEGA data vs. derived mineralogy….?

gravity + topography = crustal thickness….

The data bases



DWG8 Planetary Interior and Composition

Science cases

- Large scale compositional gradients
- Planetary volcanism and tectonics
- Internally produced magnetism

DWG8 Planetary Interior and Composition

Science cases

- Large scale compositional gradients

- Planetary volcanism and tectonics

Science case 1) Compositional gradients in the solar syster

Questions	Requirements and suggestions	Target	Interactions
Are there systematic gradients of Fe/Si; volatile/refractory; (ice)/silicate/metal; oxidation states: at the scale of the solar system ? at the scale of Jovian moons ?	•Sample return •Internal structure: crust(icy or silicate)/mantle (solid or liquid) / core: seismology; radar; geodesy •Comparison with meteorites •Process of core formation	Mercury Mars Asteroids Europa	•DWG3+5 •DWG4+9
•If there are large scale compositional gradients, what does that tell us about formation mechanisms?	•Models of solar system formation		
•How do surface rocks compare in composition to the (deep) interior? (Vertical compositional gradients)	•Surface mineralogy and composition •Models of differentiation and large scale movement.	Mars Moon Titan	•DWG3+5 •DWG4+9
•What is the role of surface alteration? (composition of the atmosphere, volatiles etc...)	•Surface mineralogy and composition (Remote sensing and in-situ measurements) •Effect of atmosphere on signal and mechanisms	Mars Moon Titan	•DWG3+5 •DWG4+9
•Role of distribution of dust through global "weather systems".	•Circulation models and observations	Mars	•DWG1 •DWG3+5
•Giant planets - Is there a silicate (rocky) core? If so, how big?	•Equations of state at very high pressure (ab-initio calculations and shock experiments) •Seismology	Jupiter Exoplanets	•DWG6+7 •DWG2

Science case 2) Planetary volcanism and tectonics

Questions	Requirements and suggestions	Target	Interactions
•Why is there plate tectonics on Earth, but not other planets?	•Phase relations and partial melting reactions (P, T, composition) with particular accent on cryovolcanism •Determine nature of heat sources (internal radioactive decay/tidal) and quantify rate of heat loss. •Quantify role and dynamics of solid (and maybe liquid) state convection.	Venus Mars	
•How can we explain the spatial and temporal evolution of volcanism?		Io Mars Moon Titan	
•What are the implications for the chemical differentiation of the planetary system (mantle - crust -atmosphere)?	•Geochemical constraints (including meteorite collections) •Numerical modelling	Mars Moon Titan	•DWG3+5 •DWG4+9
•Resurfacing of planetary surfaces through volcanism	•Surface mineralogy, composition, craters, …. •Internal structure (seismometers…) •Direct evidence for deep liquid layers on icy planets	Europa Io Venus	•DWG3+5
•Link to tectonic features observed at the surface	•Morphology of surface volcanoes •Experimental constraints on rheological properties	Mars Titan Venus	•DWG3+5 •DWG6+7

A science case for the IDIS prototype?

Chemical distribution in the solar system

….. too vast a subject?

A science case for the IDIS prototype?

Focus on a well defined part of the solar system?

….. Mars, the moon

Not forgetting that from a scientific perspective what we are interested in are processes, which are not 'object specific'

Nor forgetting that IDIS should support but not try and anticipate initiatives by individual scientists

A science case for the IDIS prototype?

Objective: Quantifying the Martian geochemical reservoirs

Lots of data (old/new/to come)

European scientists heavily involved

At the meeting point of astrophysical and Earth science approaches

A science case for the IDIS prototype?

Objective: Quantifying the Martian geochemical reservoirs

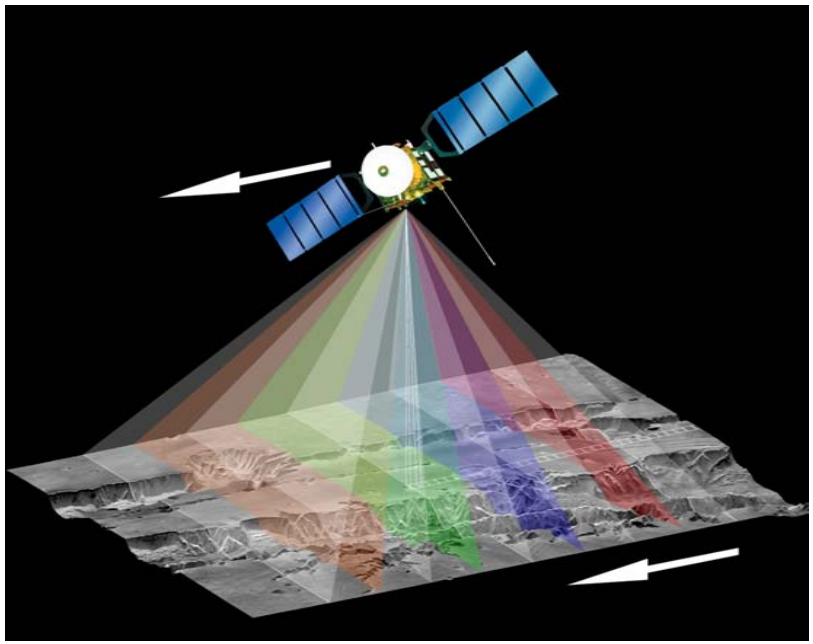
a) Surface-atmosphere interaction/surface composition

b) Tectonics/volcanism/internal composition

c) The bulk composition

Needed data and data sets

a) Geological mapping of the surface
(composition/mineralogy)



PDS/PSA data archives
Ground-based observations

Needed data and data sets

b) Some understanding of the primary (magmatic) and secondary (alteration) processes:

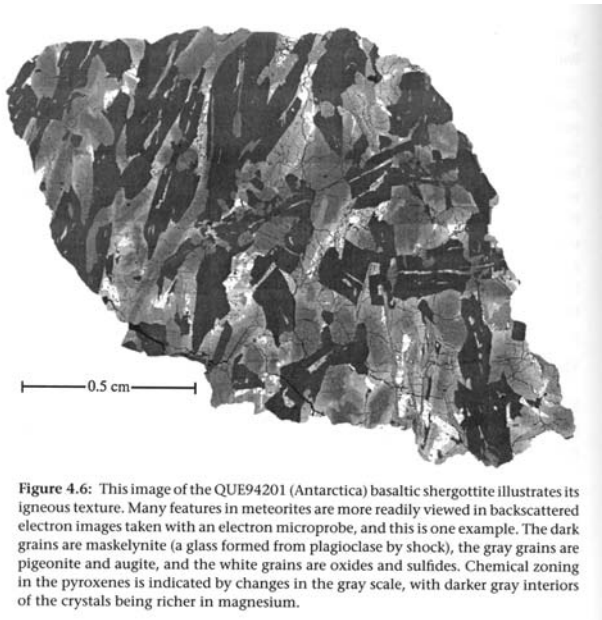


Figure 4.6: This image of the QUE94201 (Antarctica) basaltic shergottite illustrates its igneous texture. Many features in meteorites are more readily viewed in backscattered electron images taken with an electron microprobe, and this is one example. The dark grains are maskelynite (a glass formed from plagioclase by shock), the gray grains are pigeonite and augite, and the white grains are oxides and sulfides. Chemical zoning in the pyroxenes is indicated by changes in the gray scale, with darker gray interiors of the crystals being richer in magnesium.

Geoscience-type data bases (geochemical characterization, experimental data)

Needed data and data sets

c) Constraints on the internal structure

Primary data:

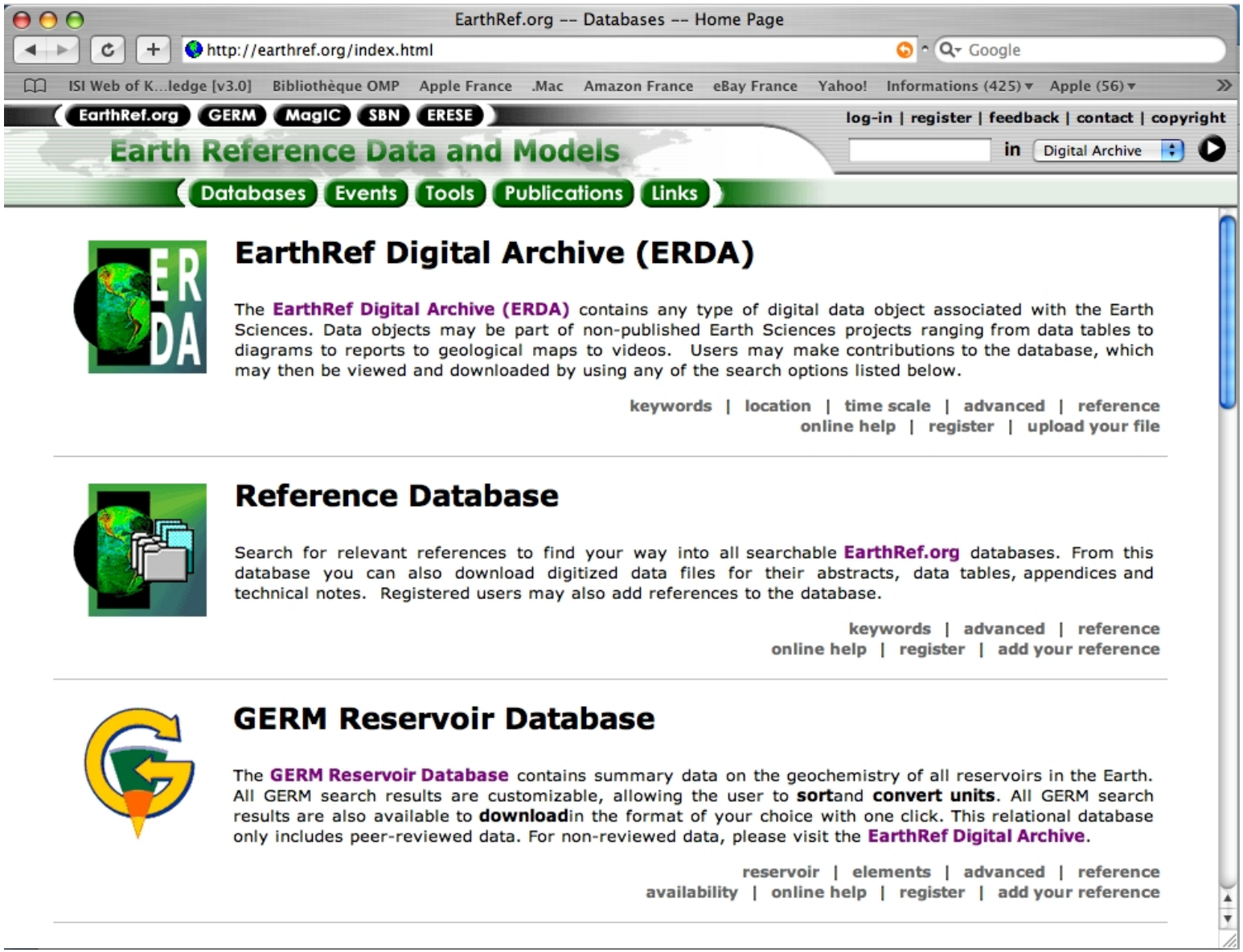
- Gravity data
- Topography (as map or spherical harmonic models)

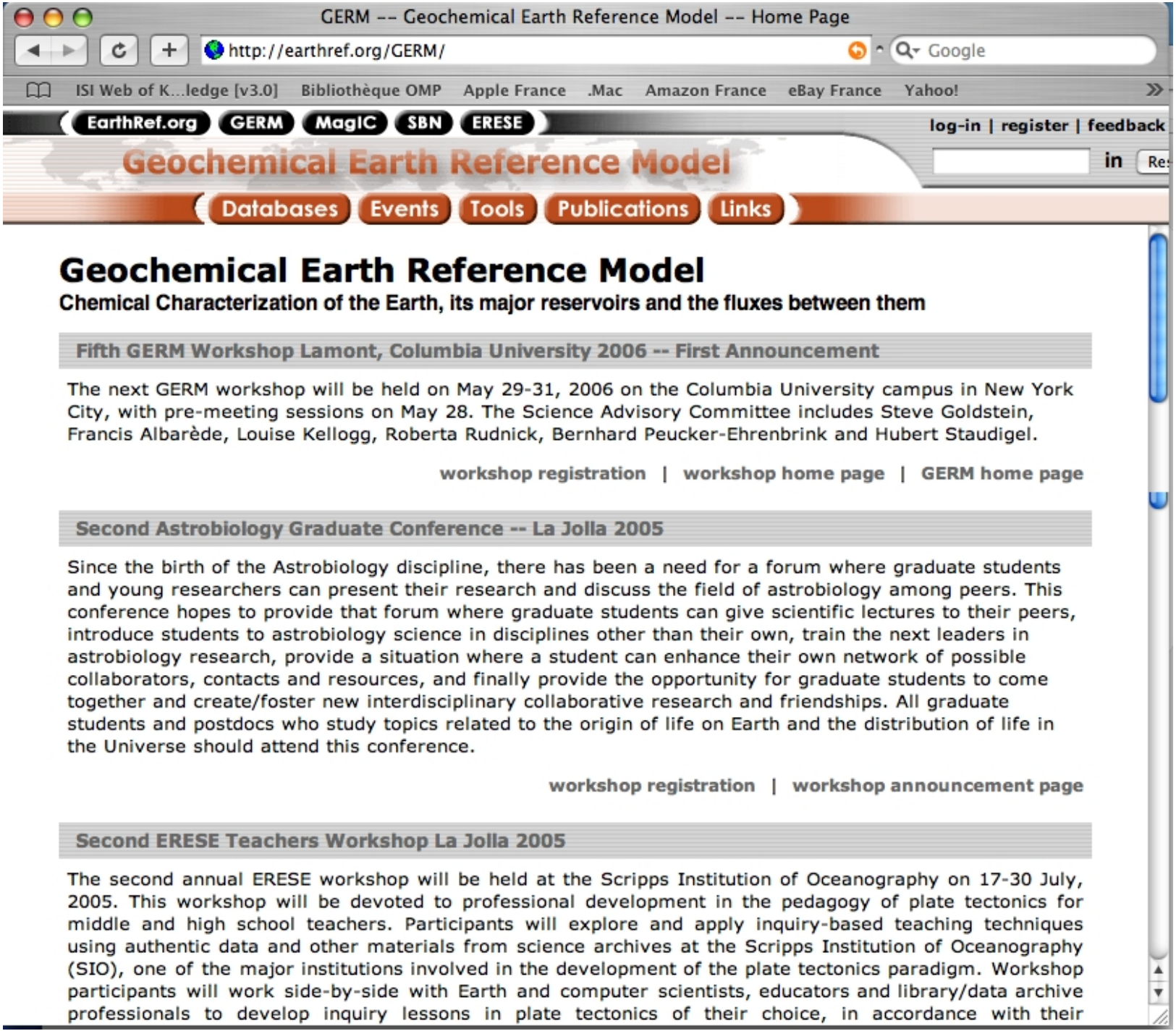
Derived data:

- Crustal thickness models
- Profiles of density, compressibility, shear modulus, T
- Convection models

Diverse data bases

Current solutions (geoscience data bases)





Geochemical Earth Reference Model

Chemical Characterization of the Earth, its major reservoirs and the fluxes between them

Fifth GERM Workshop Lamont, Columbia University 2006 -- First Announcement

The next GERM workshop will be held on May 29-31, 2006 on the Columbia University campus in New York City, with pre-meeting sessions on May 28. The Science Advisory Committee includes Steve Goldstein, Francis Albarède, Louise Kellogg, Roberta Rudnick, Bernhard Peucker-Ehrenbrink and Hubert Staudigel.

workshop registration | workshop home page | GERM home page

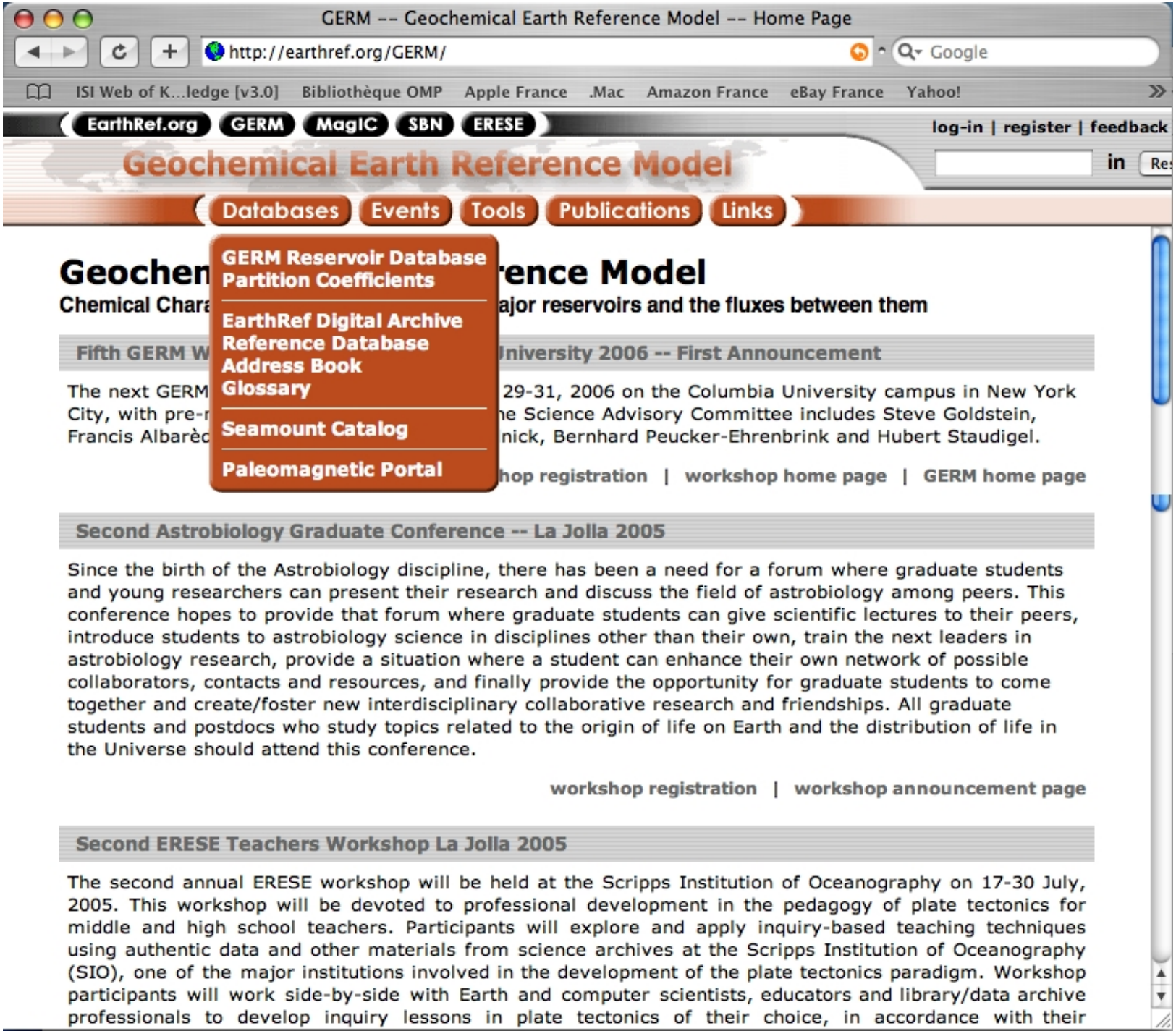
Second Astrobiology Graduate Conference -- La Jolla 2005

Since the birth of the Astrobiology discipline, there has been a need for a forum where graduate students and young researchers can present their research and discuss the field of astrobiology among peers. This conference hopes to provide that forum where graduate students can give scientific lectures to their peers, introduce students to astrobiology science in disciplines other than their own, train the next leaders in astrobiology research, provide a situation where a student can enhance their own network of possible collaborators, contacts and resources, and finally provide the opportunity for graduate students to come together and create/foster new interdisciplinary collaborative research and friendships. All graduate students and postdocs who study topics related to the origin of life on Earth and the distribution of life in the Universe should attend this conference.

workshop registration | workshop announcement page

Second ERESE Teachers Workshop La Jolla 2005

The second annual ERESE workshop will be held at the Scripps Institution of Oceanography on 17-30 July, 2005. This workshop will be devoted to professional development in the pedagogy of plate tectonics for middle and high school teachers. Participants will explore and apply inquiry-based teaching techniques using authentic data and other materials from science archives at the Scripps Institution of Oceanography (SIO), one of the major institutions involved in the development of the plate tectonics paradigm. Workshop participants will work side-by-side with Earth and computer scientists, educators and library/data archive professionals to develop inquiry lessons in plate tectonics of their choice, in accordance with their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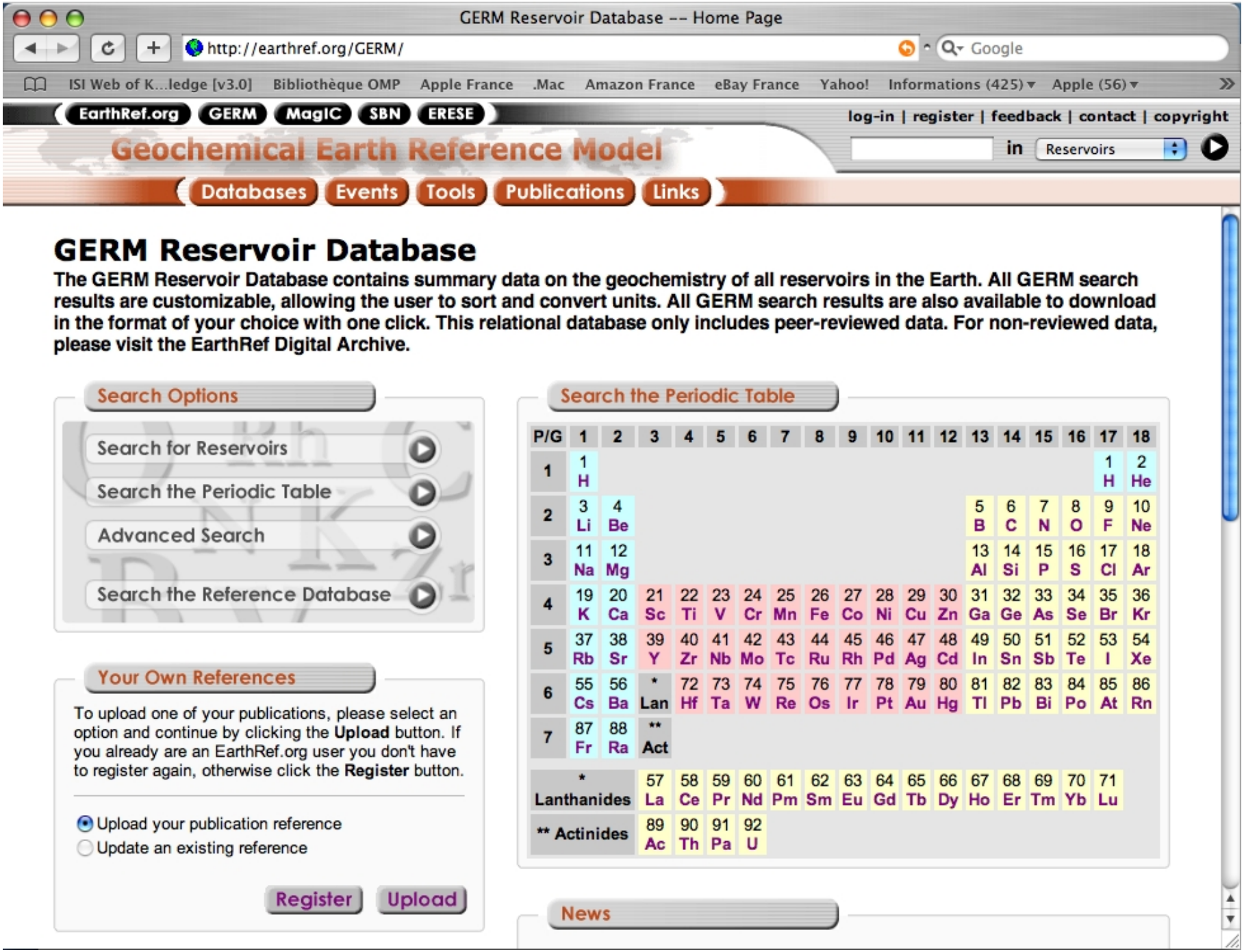
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The GERM Reservoir Database contains summary data on the geochemistry of all reservoirs in the Earth. All GERM search results are customizable, allowing the user to sort and convert units. All GERM search results are also available to download in the format of your choice with one click. This relational database only includes peer-reviewed data. For non-reviewed data, please visit the EarthRef Digital Archive.
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7 87 Fr 88 Ra ** Act
* Lanthanides 57 La 58 Ce 59 Pr 60 Nd 61 Pm 62 Sm 63 Eu 64 Gd 65 Tb 66 Dy 67 Ho 68 Er 69 Tm 70 Yb 71 Lu
** Actinides 89 Ac 90 Th 91 Pa 92 U
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			IC Meteorites
			IIAB Meteorites
			IIC Meteorites
			IID Meteorites
			IIE Meteorites
			IIF Meteorites
			IIG Meteorites
			IIIAB Meteorites
			IIICD Meteorites
			IIIE Meteorites
			IIIF Meteorites
			IVA Meteorites

GERM Reservoir Database

Database development and maintenance by the PACER Team

GERM Database Search Results Save as ... Sort by ... Units ...

Reservoir	Z	Element	Value	Median	SD	Low	High	N	Unit	I	Reference	Source(s)
Zagami Shergottite	47	Ag	37						ppb	I	Laul et al. 1972	
Zagami Shergottite	79	Au	2.1						ppb	I	Laul et al. 1972	
Zagami Shergottite	83	Bi	1.1						ppb	I	Laul et al. 1972	
Zagami Shergottite	48	Cd	71						ppb	I	Laul et al. 1972	
Zagami Shergottite	55	Cs	336						ppb	I	Laul et al. 1972	
Zagami Shergottite	49	In	22.2						ppb	I	Laul et al. 1972	
Zagami Shergottite	77	Ir	0.1						ppb	I	Laul et al. 1972	
Zagami Shergottite	37	Rb	6						ppm	I	Laul et al. 1972	
Zagami Shergottite	34	Se	330						ppb	I	Laul et al. 1972	
Zagami Shergottite	81	Tl	11						ppb	I	Laul et al. 1972	
Zagami Shergottite	30	Zn	55						ppm	I	Laul et al. 1972	

Back

				CO Chondrites	
				CR Chondrites	
				CV Chondrites	
			Enstatite Chondrites	Qingzhen	
			Forsterite Chondrites		
			Kakangariites		
			Ordinary Chondrites	CAI Inclusions	
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				H Chondrites	
				L Chondrites	
				LL Chondrites	
				Type F Aggregates	
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	Photosphere				
	Solar Wind				
	Solar Wind				
Universe					
Galaxies					
Stars					

EarthRef Who's Who Listing

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- WWW site and Database Management -- **Anthony Koppers**, Scripps Institution of Oceanography, UCSD

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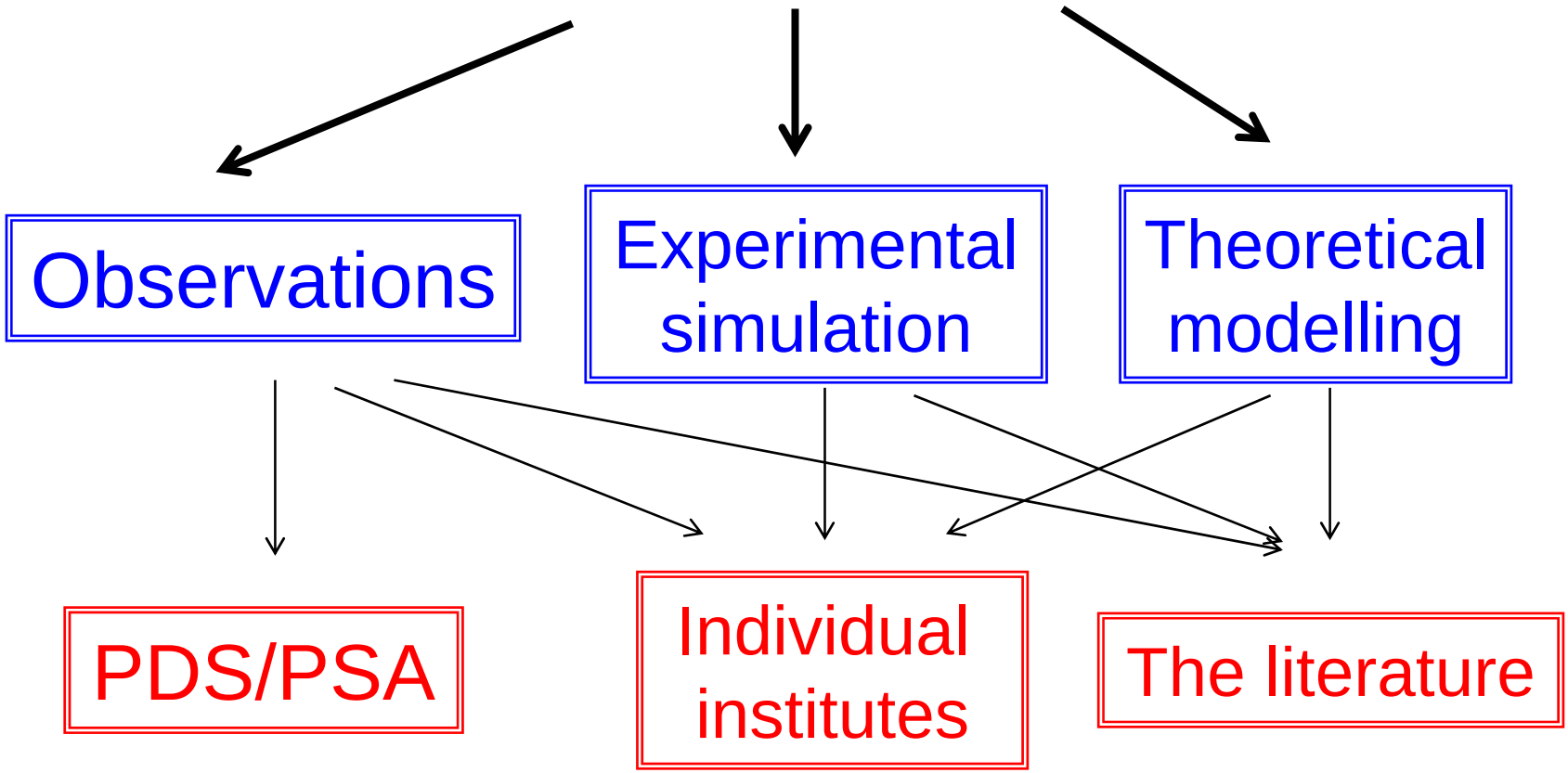
- Partition Coefficients and Modeling Tools -- **Roger Nielsen**, Oregon State University

Quantifying the Martian geochemical reservoirs

a) Surface-atmosphere interaction/surface composition

b) Tectonics/volcanism/internal composition

c) The bulk composition



Other ideas for science cases (ISSI)

Chemical variability and planet building processes in the early solar system.