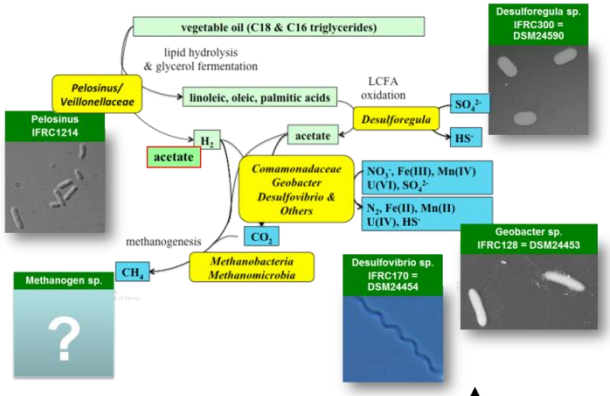
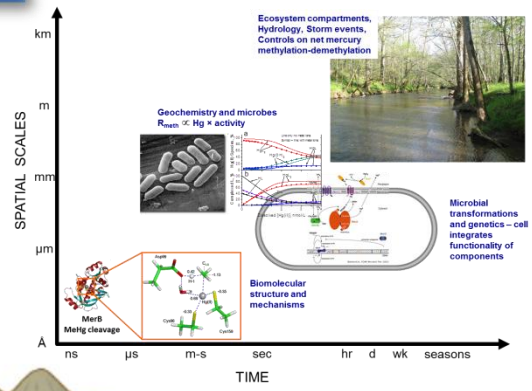
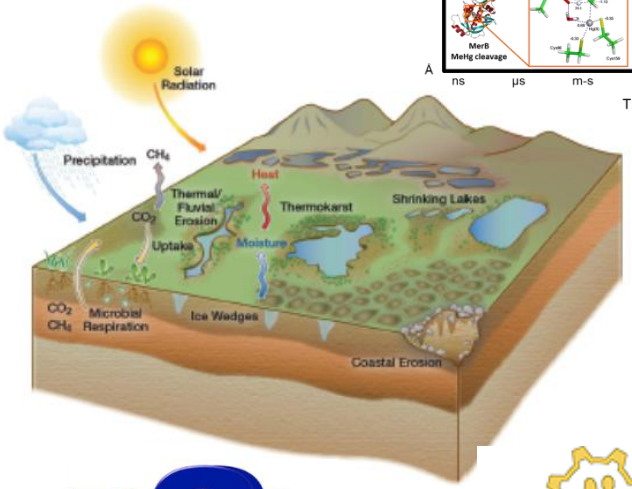
Domain Science Capabilities







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Chesapeake Bay Program-Knowledge Systems for Sustainability Coordination Meeting
CBP Office, Annapolis, MD
2-3 May 2013

ELSI FA
Ethical, Legal, and Social Issues Scientific Focus Area
Helping Mission-Inspired Science and Technology Achieve Their Societal Objectives

CBES
Center for BioEnergy Sustainability


Oak Ridge
Nashville
Knoxville
TENNESSEE
Memphis

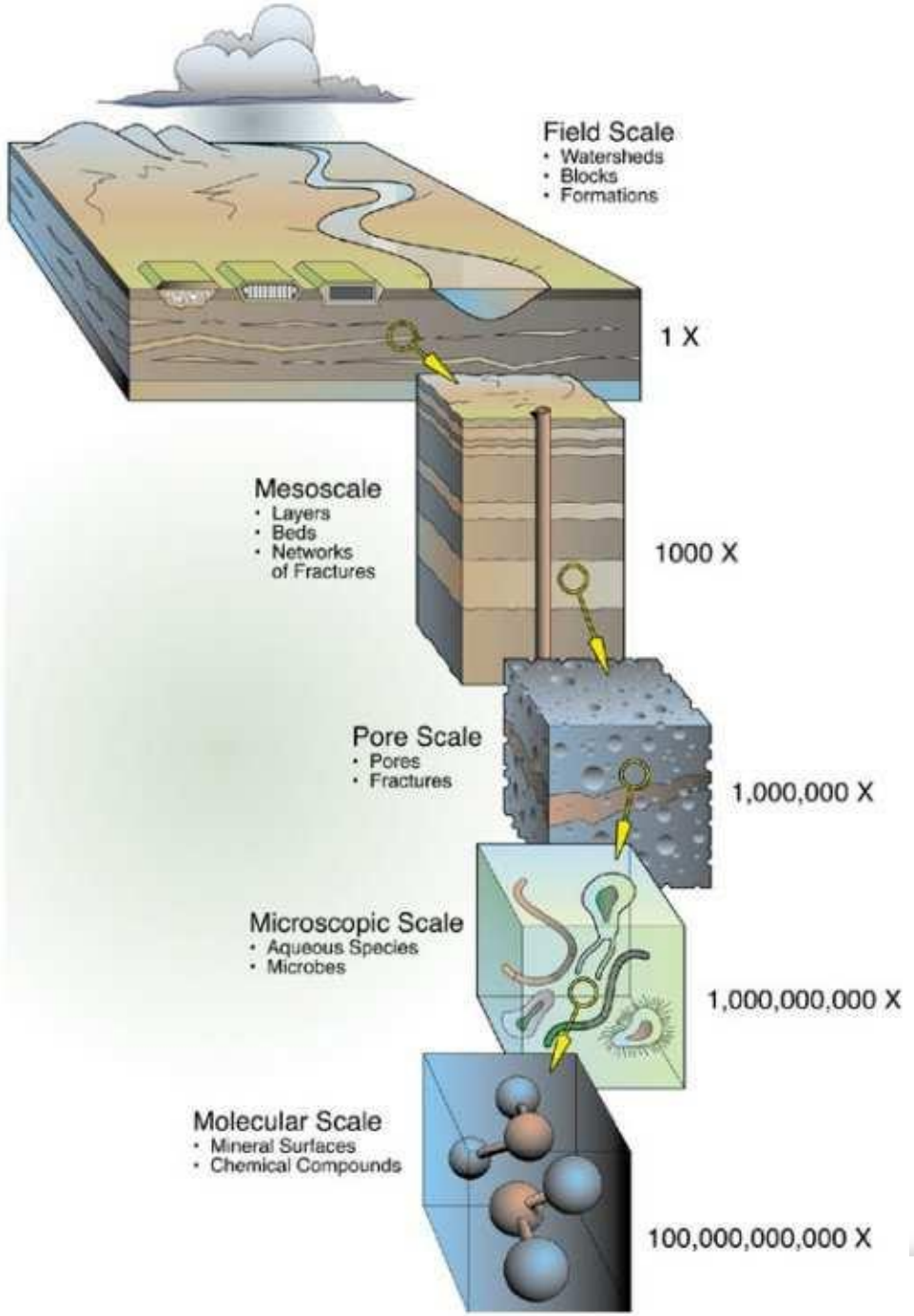
Disciplinary Strengths

- Biogeochemistry
- Environmental biotechnology
- Environmental chemistry
- Ecosystem studies
- Geosciences
- Hydrology
- Numerical simulation
- Science – Technology – Society nexus
- Data science
- Human health risk and environmental analysis
- Energy, water, ecosystem engineering

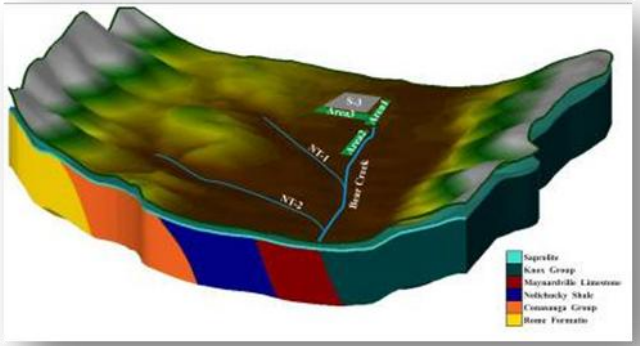
Understanding processes and issues of importance to the Earth's environmental and ecological systems

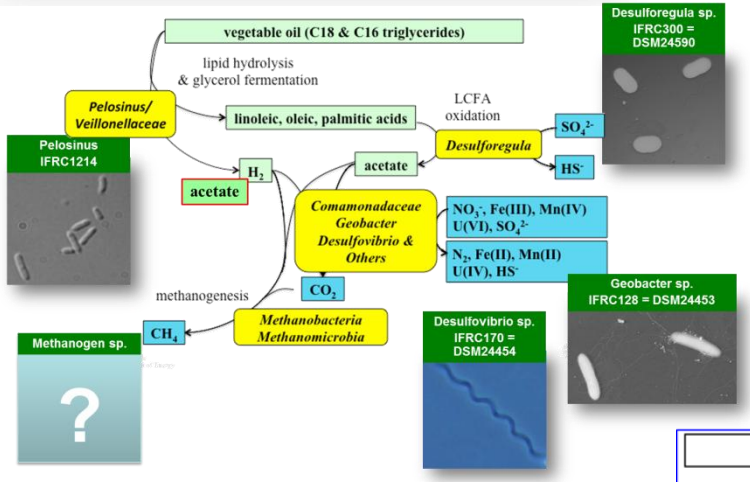
Domain Strengths

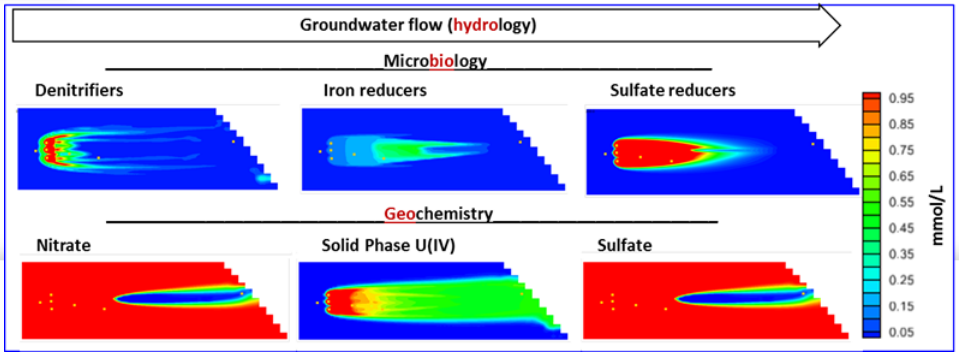
- Integrating capabilities
- Teaming with internal and external partnerships
- Work across scales
- Applying interdisciplinary approaches to provide sound scientific basis for
  - Issue analysis/ problem identification
  - Guiding policymakers
  - Advancing remediation technologies, evaluating success



Oak Ridge Integrated Field Research Challenge







Hg transformations from molecular to field scales

esd.ornl.gov/programs/rsfa/overview.shtml

SPATIAL SCALES

km

m

mm

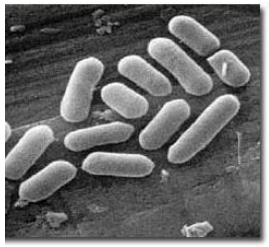
μm

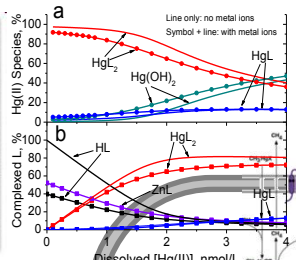
Å

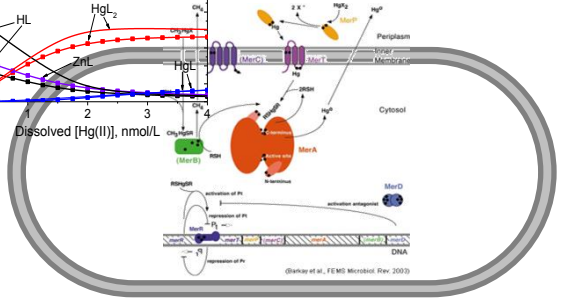
Ecosystem compartments, Hydrology, Storm events, Controls on net mercury methylation-demethylation

Geochemistry and microbes

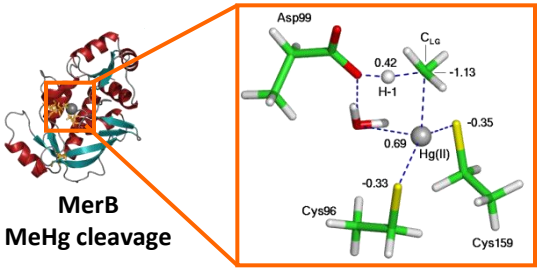
$R_{meth} \propto$ Hg × activity







Microbial transformations and genetics – cell integrates functionality of components



Biomolecular structure and mechanisms

ns μs m-s sec hr d wk seasons

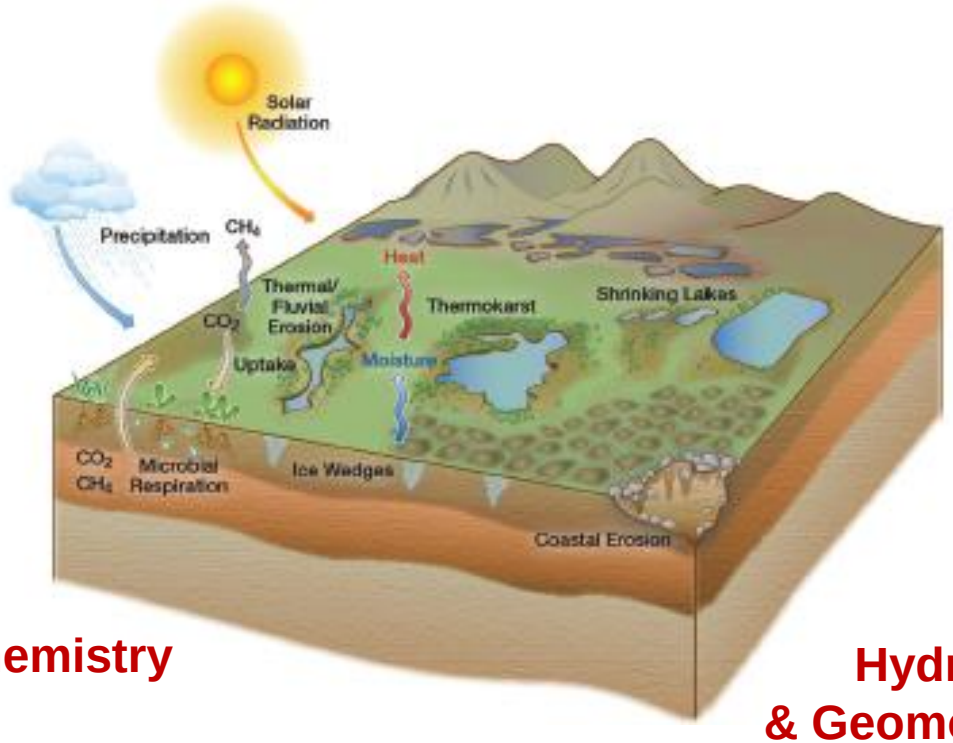
TIME

Next-Generation Ecosystem Experiment: Arctic Landscapes

How does permafrost thawing affect feedbacks to the climate system? (ngee-arctic.ornl.gov/)

Energy transfer

Vegetation dynamics



Biogeochemistry

Hydrology & Geomorphology

Science ⇔ Technology ⇔ Society

- **Ethical, Legal, and Social Implications**
  - Mapping social issues that arise from choices made along the pathway from research toward use, e.g.:
    - Nanotechnology
    - Bioenergy

elsi.ornl.gov/

- **Institutionalizing energy and GHG behavior**
- **Center for Bioenergy Sustainability**
  - Using science and analysis to
    - understand the sustainability (environmental, economic, and social) of current and potential future bioenergy production and distribution
    - identify approaches to enhance bioenergy sustainability
    - serve as an independent source of the highest quality data and analysis for bioenergy stakeholders and decision makers

www.ornl.gov/sci/ees/cbes/