Digital Crust – A 4-D Exploratory Environment for Earth Science Research and Learning

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A comprehensive four-dimensional (4D) framework that lets geoscientists register, organize and integrate different types of Earth-system data.

Organize descriptions of the crust in a geospatial and time-evolving xyz-t (4-D) reference system

• Represent and analyze data using structured, document-based database objects.
• Support sharing of data, interpretations, and models.
• Present alternative working hypotheses
• Expose data and knowledge inconsistencies and gaps.
• Integrate multiple data types or sources to produce best-constrained data products.
• Lead students on a virtual journey through the Earth’s crust to examine the traces of processes that have shaped the Earth.

Planned Features

• Dynamic definition of new data types
  -- Content models in Information Exchange Registry; Document database (MongoDb) allows open-world information models
• Deploy web services from data
  -- Upload new data and generate live web services
  -- Interoperability through registered information models
• Query across information stores
  -- SOLR/ElasticSearch indexes
• Integrate query results from local and networked data stores
  -- Index networked servers and catalogs (e.g., CINERGI)

Proof of Concept

• Generate a 3-D gridded model of crustal permeability and lithology for fluid and geochemical flux simulations in earth system models
• Integrate USGS Regional Aquifers, MacroStrat and other “scaffolding” data
• Online editing/annotation to data (starting with Macrostrat) to update model

Component architecture

Basic data model

We are seeking collaborators with regional data integration challenges