# GEON2 and OpenEarth Framework (OEF)

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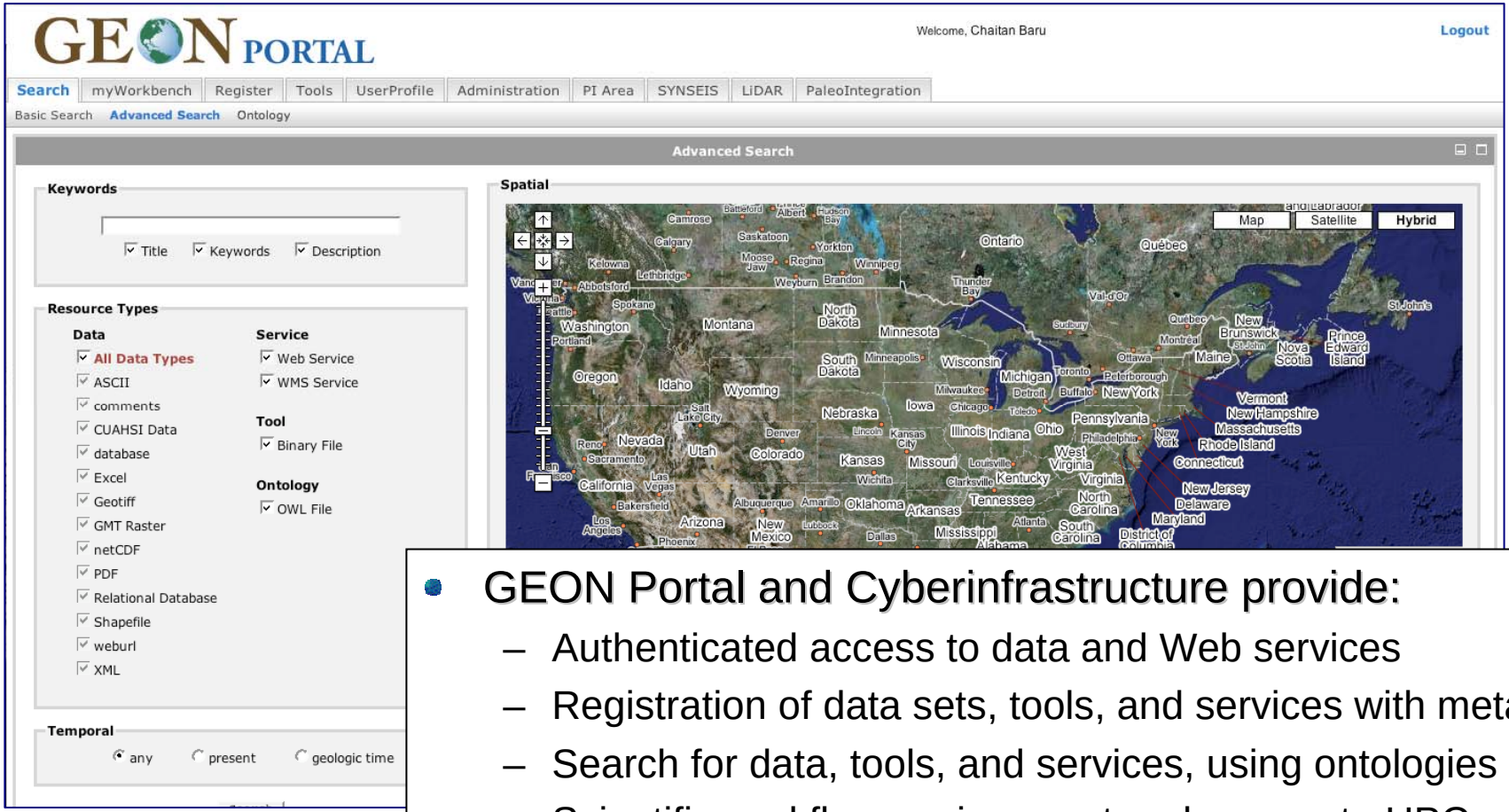
# Outline

- Background
- OEF Goals and Motivations
- OEF Philosophy
- OEF Visualization and Architecture
- Project Plans

# GEON Portal




- GEON Portal and Cyberinfrastructure provide:
  - Authenticated access to data and Web services
  - Registration of data sets, tools, and services with metadata
  - Search for data, tools, and services, using ontologies
  - Scientific workflow environment and access to HPC
  - Data and map integration capability
  - Scientific data visualization and GIS mapping

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# GEON1 vs. GEON2

- GEON initially funded in 2002 to bring together 16 institutions develop an infrastructure for managing distributed collections of large, heterogeneous, multidisciplinary earth science datasets.

- GEON renewed this year – focus in *v.2* of GEON is to expand infrastructure to include open source software for integrating, analyzing, and visualizing these data sets.
  - OpenEarth Framework

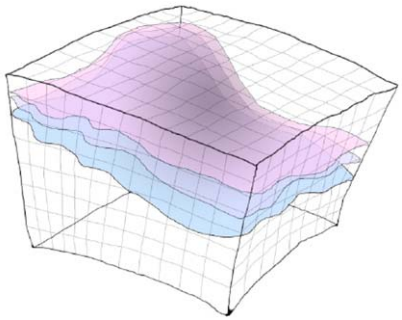
# OpenEarth Framework Goals

Geologic Integration:

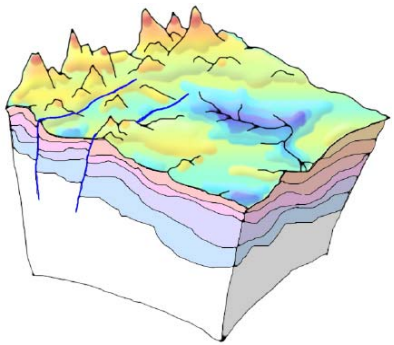
- *Data types* - topography, imagery, bore hole samples, velocity models from seismic tomography, gravity measurements, simulation results…

- *Data coordinate spaces and dimensionality* - 2D and 3D spatial representations and 4D that covers the range of geologic processes (EQ cycle to deep time).

# Integration & Visualization of 3D/4D data

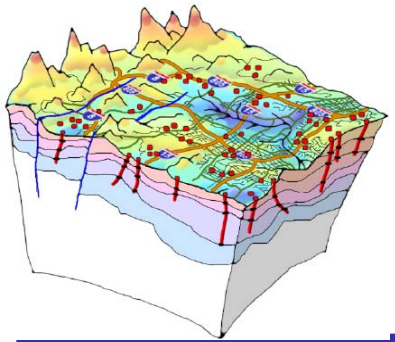


*"For a given region (i.e. lat/long extent, plus depth), return a 3D structural model with accompanying physical parameters of density, seismic velocities, geochemistry, and geologic ages, using a cell size of 10km"*



–Derived 3D volumetric model

- –Multiple isosurfaces with different transparencies
- –Slices through the volume
- –Variable gridding: data typically has lower resolution at greater depths



–2D surface data: Topography ("2.5D") Satellite imagery, street maps, geologic maps, fault lines, and other derived features etc.

–Bore hole or well data and point observations.

# OpenEarth Framework Goals

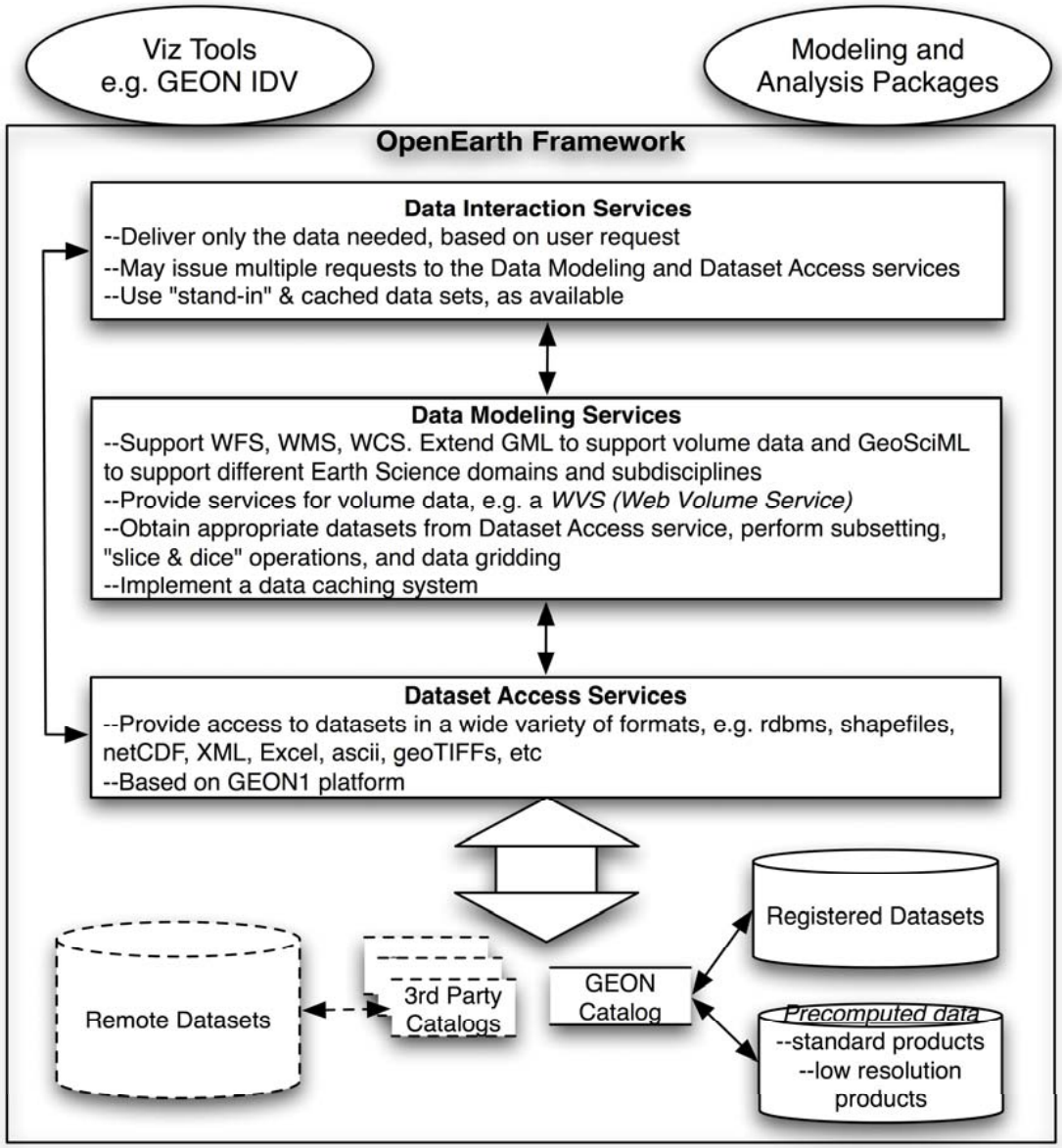
Structural Integration:

- *Data formats* – shapefiles, NetCDF, GeoTIFF, and other formal and defacto standards.
- *Data models* - 2D and 3D geometry to semantically richer models of features and relationships between those features.
- *Data delivery methods & Storage Schemes*- local files to database queries, web services (WMS, WFS) and services for new data types (large tomographic volumes, etc.).

# OEF Philosophy

- OEF focused on integrating data spanning the geosciences.
- Open software architecture and corresponding software that can properly access, manipulate and visualize the integrated data.
- Open source to provide the necessary flexibility for academic research and to provide a flexible test bed for new data models and visualization ideas.

# OEF Architecture

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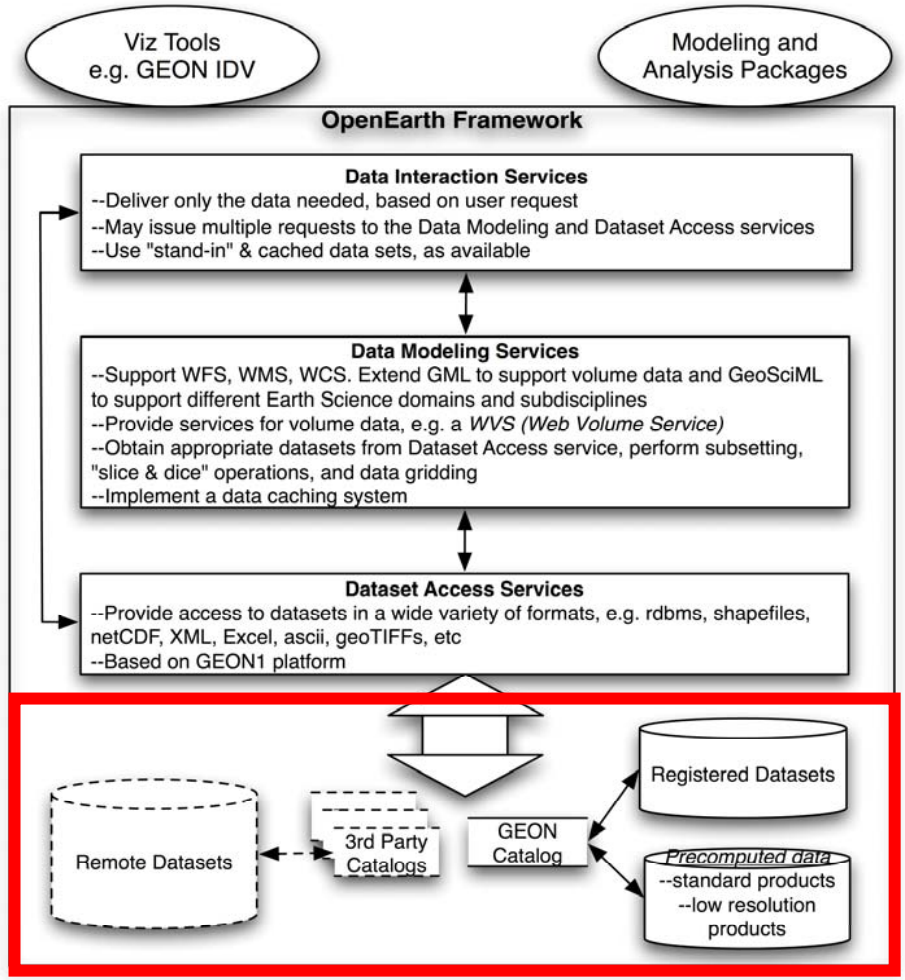
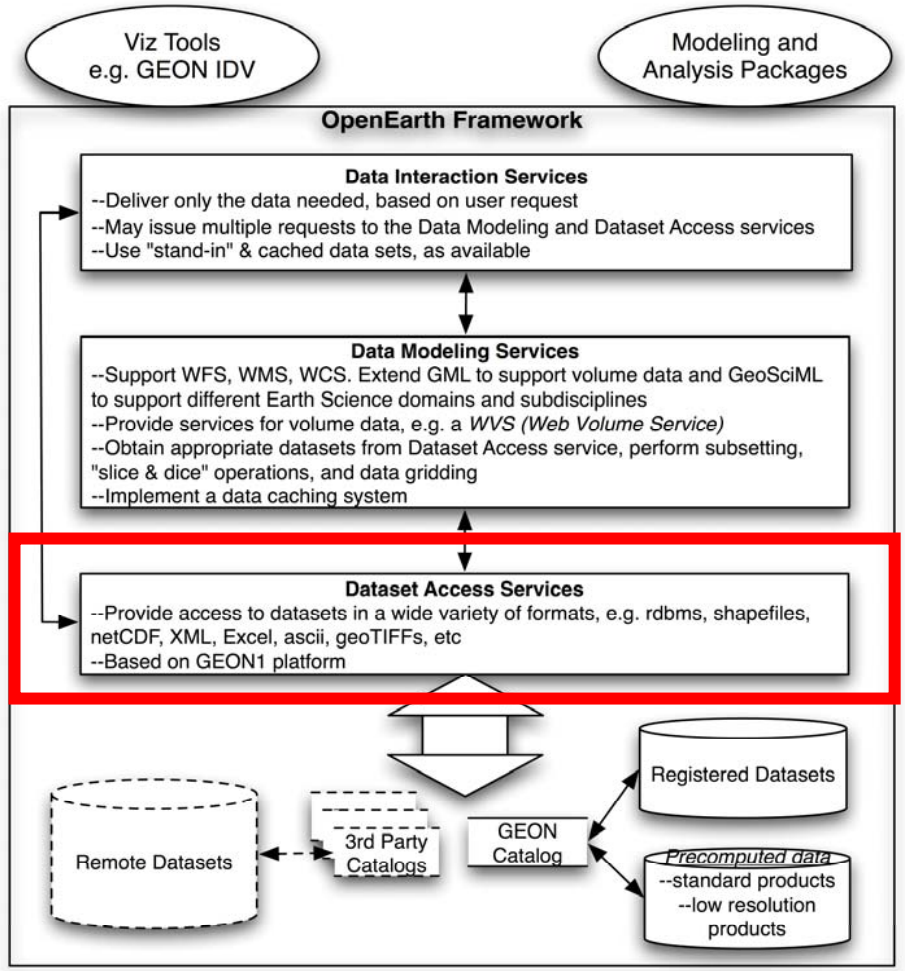
# OEF Architecture

- Data Layer:
  - GEON Catalog (GEON register datasets)
  - 3rd Party Catalogs (Remote datasets



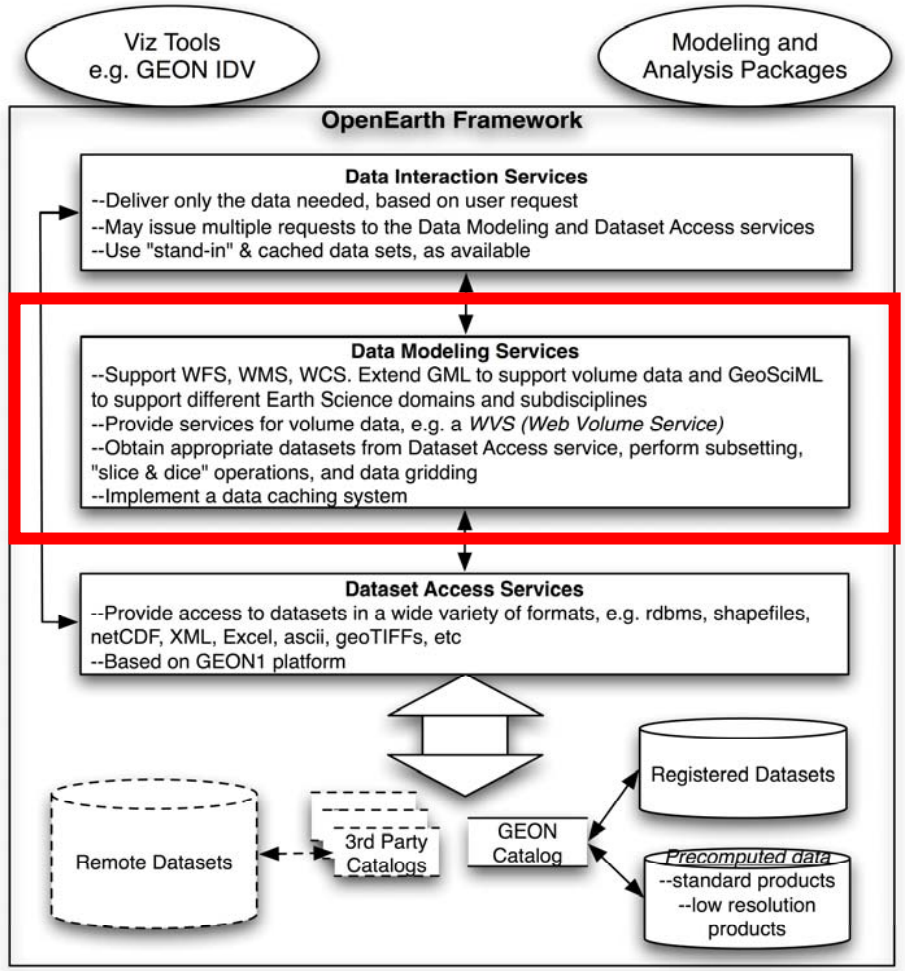
# OEF Architecture

- Data Access Services:
  - Manages and delivers stored data and metadata
  - Provides access to data in a variety of formats via various sources.
  - Hides storage and access details (location, authentication, protocols etc.)



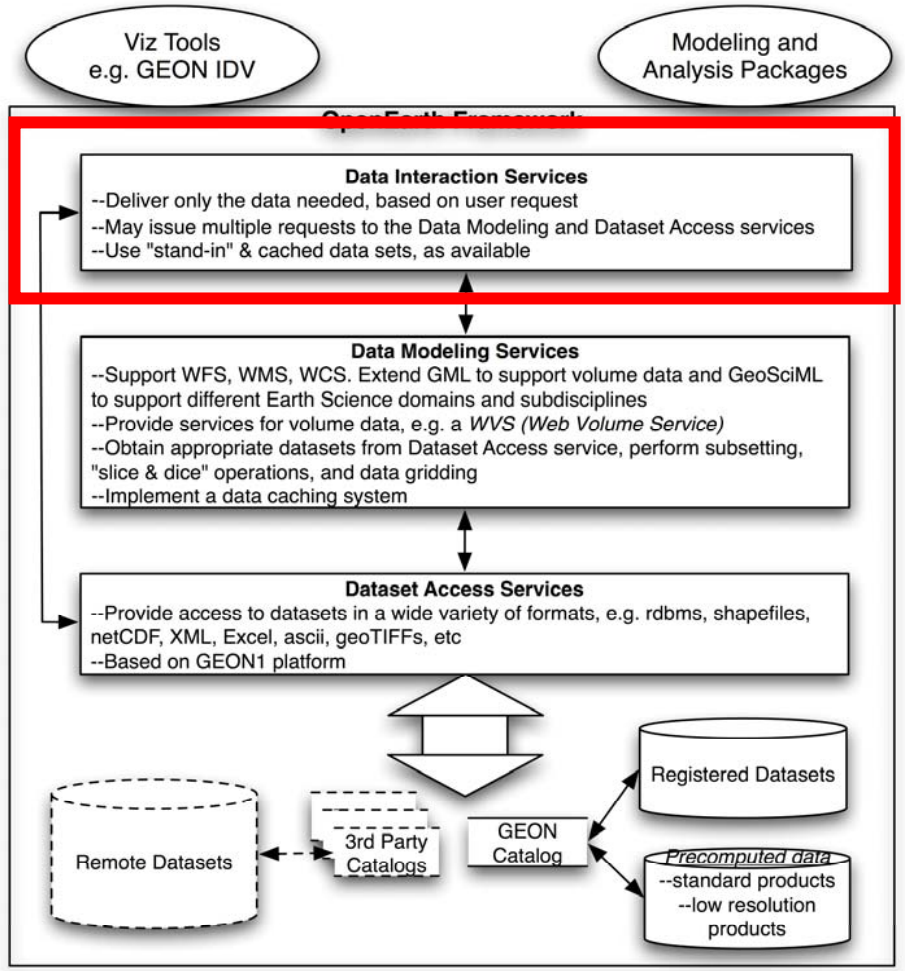
# OEF Architecture

- Data Modeling Services:
  - Provides on-demand and preprocessing operation on requested data.
  - Operations to subset, extract and derive data for area of interest.
  - Use recent access patterns to guide preprocessing to prepare data in anticipation of future need.



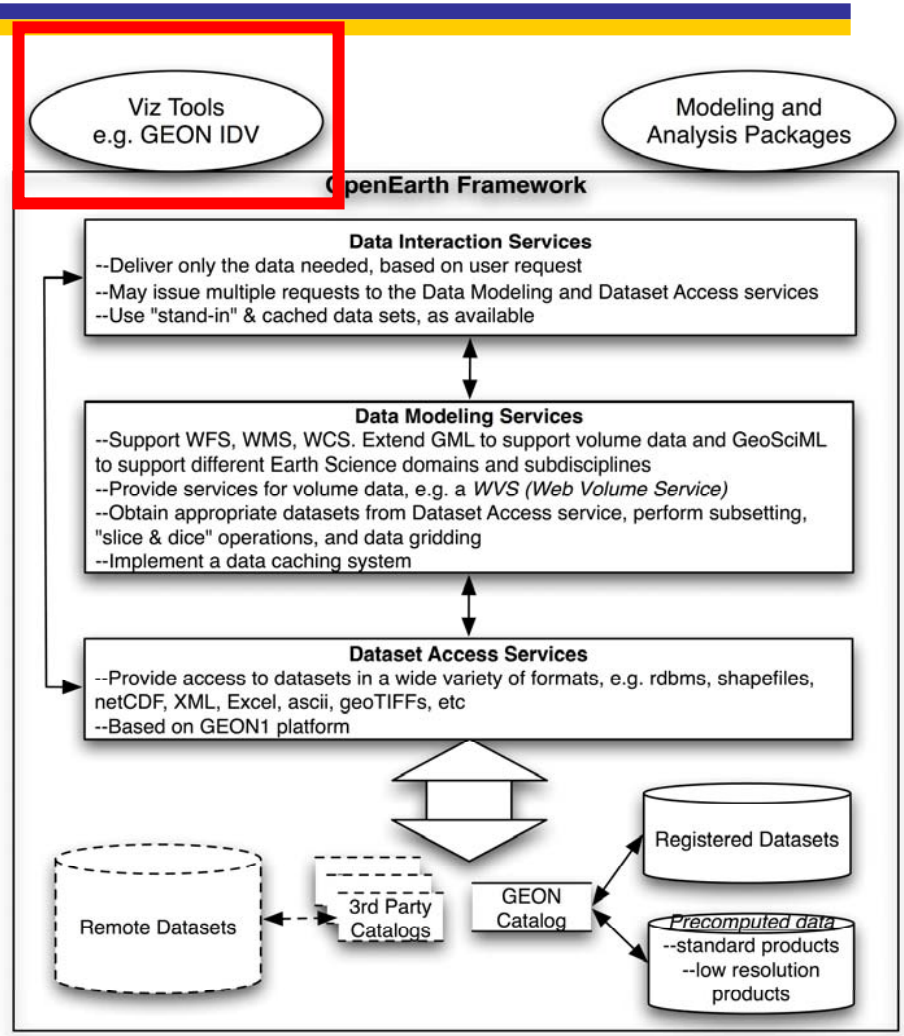
# OEF Architecture

- Data Integration Services:
  - Designed to support rapid visualization of integrated datasets
  - operations to grid data, resample it at multiple resolutions and subdivide data to better support progressive changes to the display as the user pans and zooms

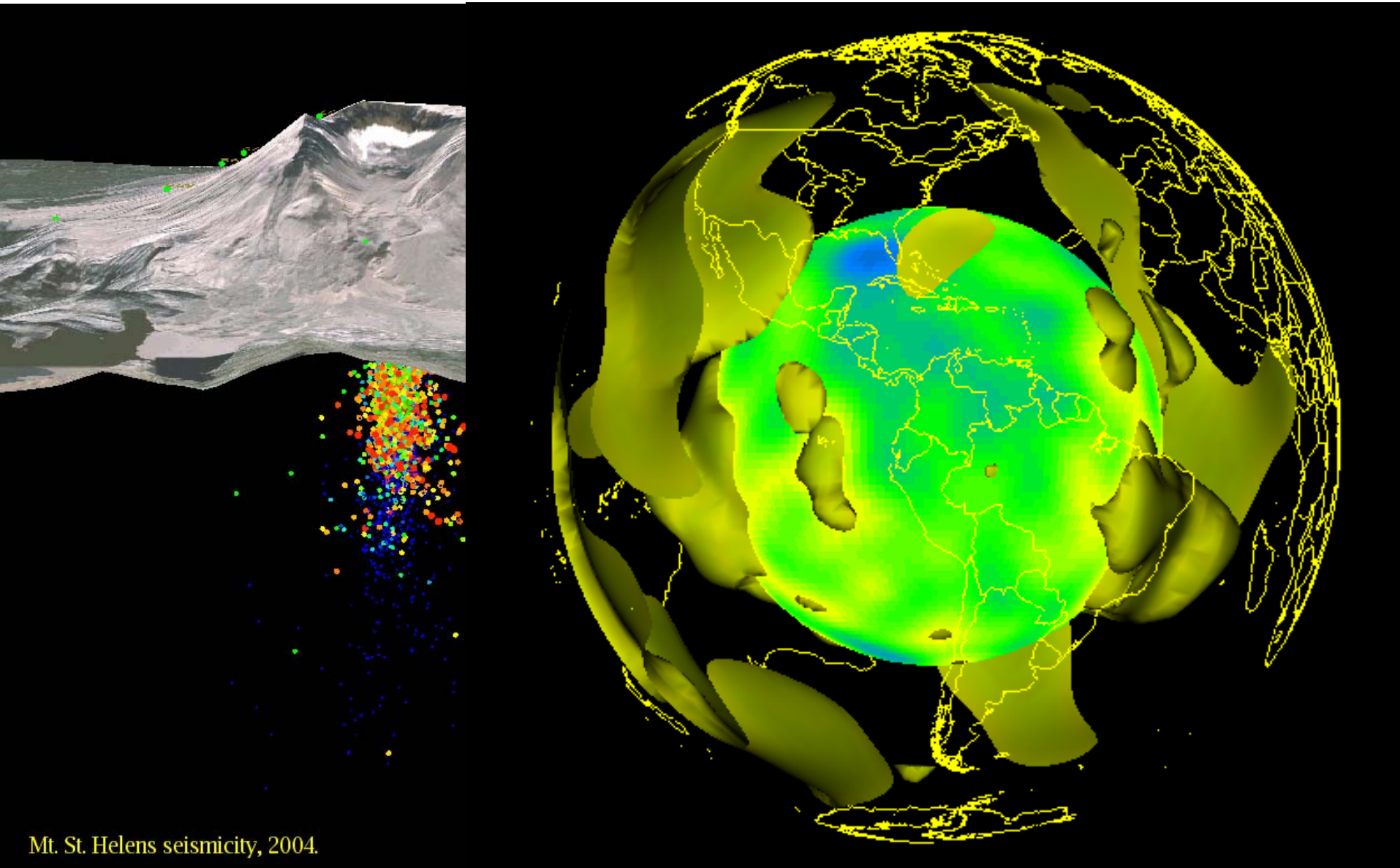


# OEF Architecture

- Visualization Tools:
  - Run on the user's computer, dynamically query spatial and temporal data from the OEF services
  - Uses 3D graphics hardware for fast display
  - Open architecture supports multiple visualization tools authored throughout the community (e.g GEON IDV)
  - New viz capabilities developed as necessary



# Example Application - Waiting for example from Randy (?)…



Mt. St. Helens seismicity, 2004.

# Project Plans

- Currently testing visualization toolkits and various libraries.
- Beginning development with a sample of heterogeneous data for a region of interest (Parkfield).
- Using these data as a test case, we will develop software to enable visualization the integrated information as well as to interactively access and manipulate the underlying data.

# Thank You

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