SCI-WMS: Python Based Web Mapping Service For Visualizing Geospatial Data

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Introduction

- SCI-WMS is an open-source Python implementation of the OGC WMS (Web Mapping Service) API for CF-Compliant coastal, atmospheric, climate and weather data with support for structured and unstructured topologies
- Deployed within the IOOS-COMT project scope for qualitatively assessing society-critical atmostpheric and oceanagraphic model and forcasting data including: forecasting, risk assessment, model comparison, algorithmic/parameter selection
- Achieves real-time visualization of externally hosted CF-Compliant data
- Can visualize data registered to structured or unstructured grids by adhering to CF-UGRID Conventions
- Abstracts a dataset into two objects: a topology and corresponding model data.
- Topologies are stored locally for efficient spatial queries
- Model data is hosted externally, subsets of which are downloaded and rendered per request
- Supports arbitrary cartographic projections
- Source code is available at `https://github.com/brandonmayer/sci-wms/tree/testbed`
- Deployed for COMT-IOOS at `http://testbedwww.sura.org/explorer/`

Architecture Overview

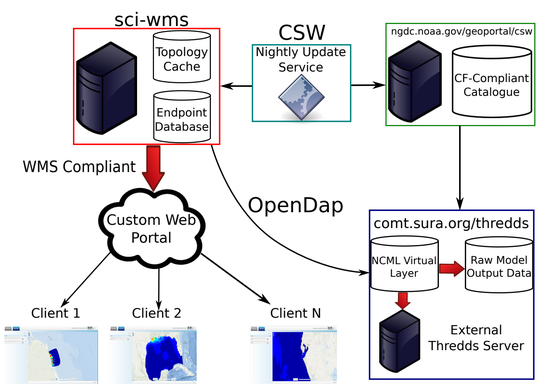

Figure 1: *Overview of the SCI-WMS architecture within the scope of the U.S. IOOS COMT project.*

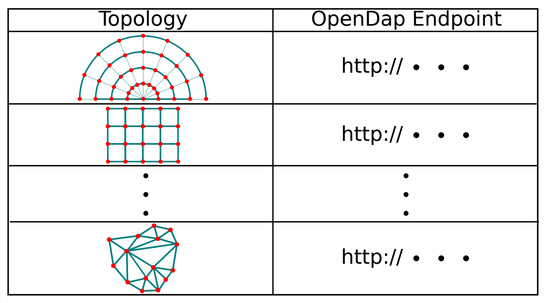

Figure 2: *Topology and endpoint data store. Topologies are classified as either c-grid or u-grid for efficient geospatial queries and remote model data access.*

- Unstructured grid locations are cached using R-Trees
  - Fast queries for lat/lon coordinates lying within current view for a WMS getMap request
  - Fast K-nearest point lookups for getFeatureInfo requests.

WMS Extensions

While SCI-WMS is fully complient with the OGC WMS specification, SCI-WMS supports extensions to augment and simplify the basic WMS API for rapid front end UI development

- Query and return list of all available datasets and layers via json(p)
- Return requests for subsets (spatial/temporal) of raw model data as json(p)
- Responsds to requests for all available styles and colormaps in json(p) format
- Can generate and serve color-ramp previews

Examples

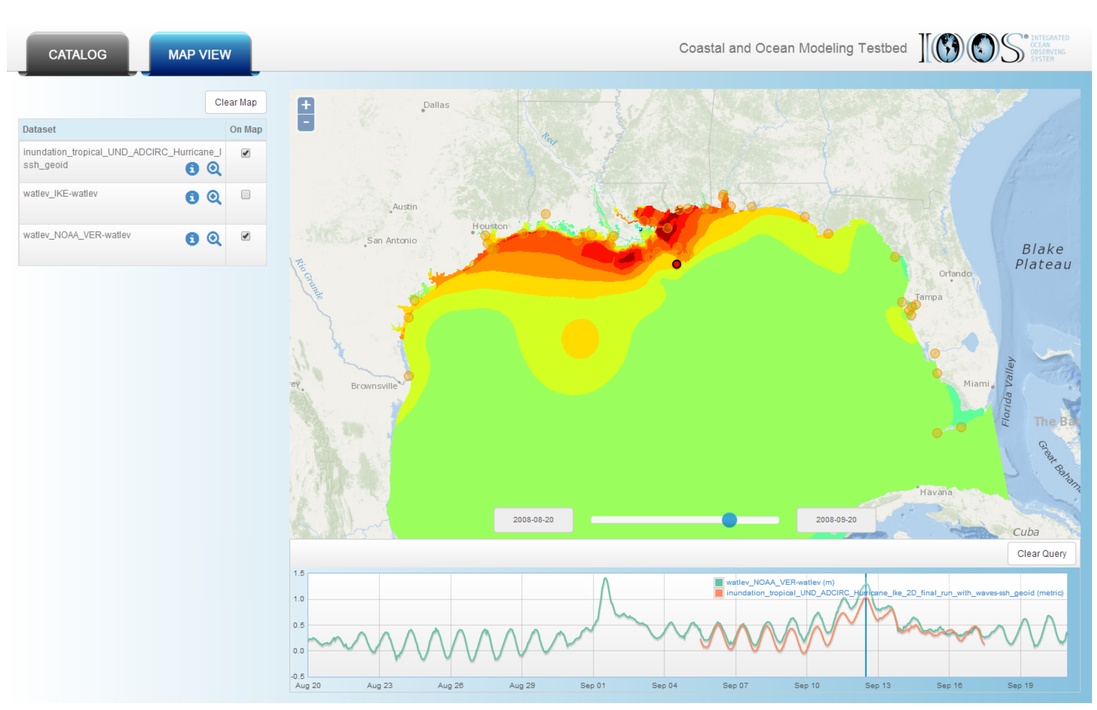

Figure 3: *Comparison of ADCIRC (unstructured topology) model results with observed water levels in the Northern Gulf of Mexico for Hurricane Ike. Verified observed water levels are from NOAA's Station 8760922 (red dot on map). The map shows modeled water levels (in meters above the geoid) at the peak of the storm in southern Louisiana. The time series plot shows both the modeled (green) and observed (orange) water levels. The vertical blue line in the time series plot corresponds to the current time of the map.*

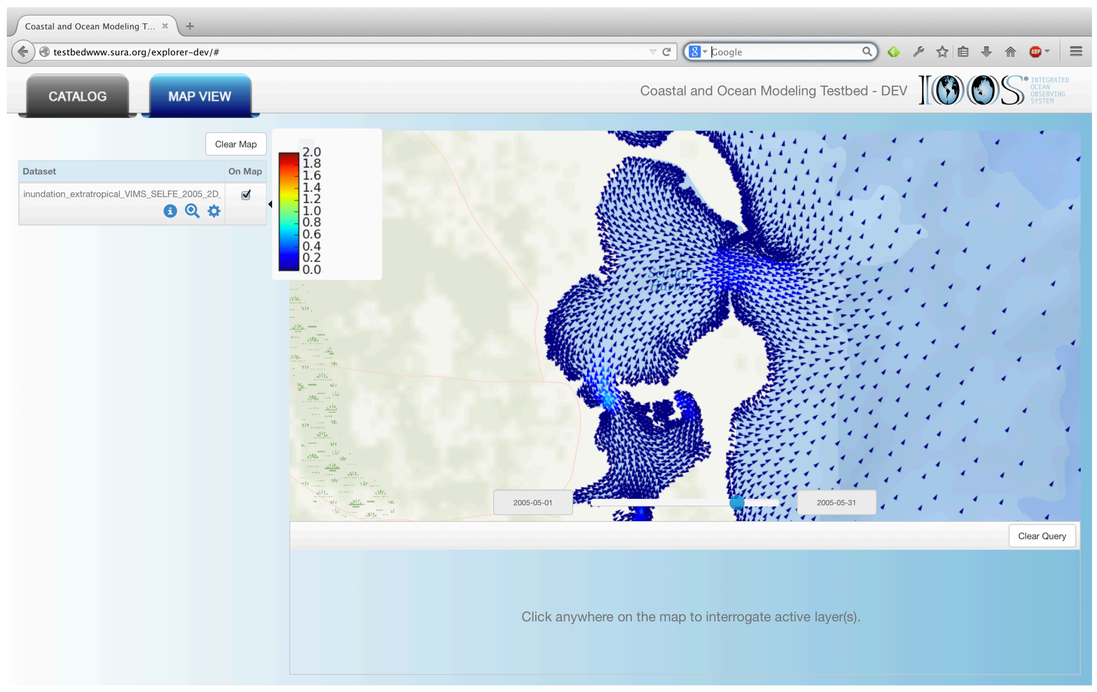

Figure 4: *SELFE model of current direction and speedin the Chesapeake Bay.*

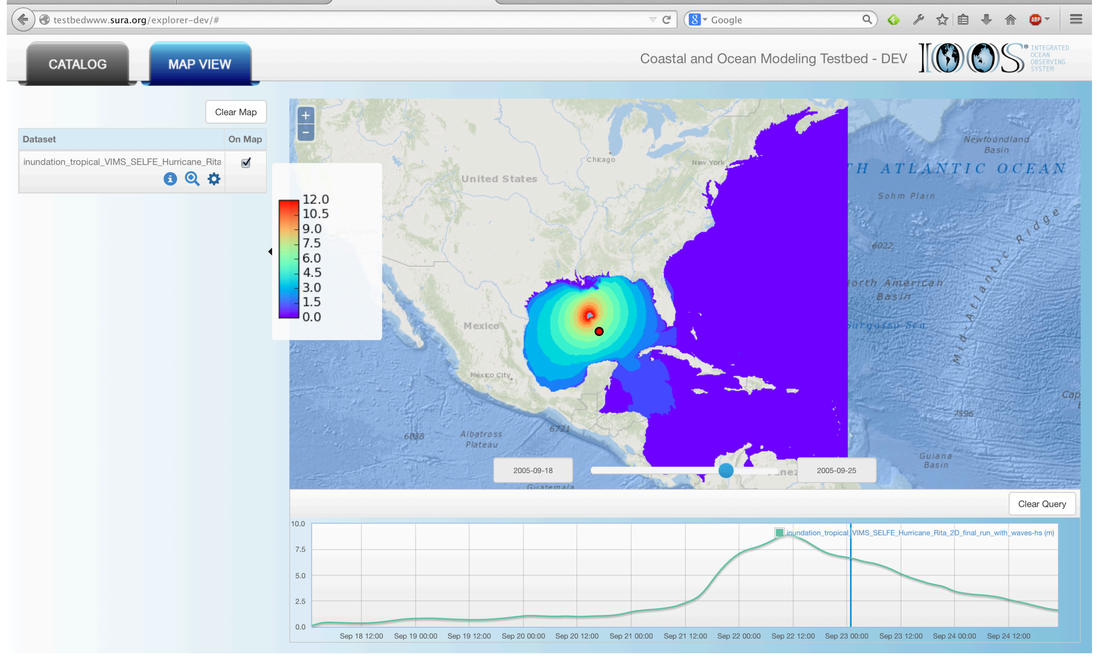

Figure 5: *Visualizing SELFE model of significant sea surface wave height along the eastern coast of the United States. The underlying topology is an unstructured grid with over 5 million nodes which SCI-WMS can handle in real time.*