

[Interoperability among Earth Observations and Earth Science Models](#)

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Submitted by yugenong on Fri, 2015-11-06 14:43 Thursday, January 7, 2016 - 14:00 to 15:30

Event: [Winter Meeting 2016](#) [2]

Session Type: [Breakout](#) [3]

Room Location: [McKinley](#) [4]

Expertise Level: [Intermediate](#) [5]

Collaboration Area: [Discovery](#) [6]

[Geospatial](#) [7]

[Information Technology and Interoperability](#) [8]

[Products and Services](#) [9]

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Abstract/Agenda:

Systems of systems and services have been emerging and growing recent years for facilitating the automatic preparation and feeding of both historic and near-real time Earth Observation customized data and on-demand derived products into Earth science models. To bridge the Earth Observations and Earth Science Models, standards and specifications have also been developed and become mature to be adopted by difference communities. Open geospatial standards/specifications, including the ISO geospatial data and metadata standards and standard-based geospatial web service, workflows, and sensor web technologies are the foundation glues to find, access, analyze, and disseminate data and products. The standard interfaces allow the automatic handshaking between components with workflow designers and underlying workflow execution language.

This session invites experts and scientists to discuss the emerging technologies and solutions to enable the interoperations among Earth Observations and Earth Science Models.

Talks:

- Interoperability among EO data and ES models: applications and development (Liping Di)
- OGC activities and standards for model-sensor interoperability and the Model Web (George Percivall)
- Needs for Earth observational data from coastal oceanographic modeling perspective (Haosheng Huang)
- Realize effortlessly feeding FVCOM and CRM with multisource earth observation data: two applications of CyberConnector (Ziheng Sun)
- Geospatial workflows for reusing standard Web services (Eugene Yu)

Refs:

Di, L., B. Domenico, X. Wu, H. Huang, Q. Tong, E.G. Yu, and J. Song, 2015. CyberConnector: Bridging the Earth Observations and Earth Science Models. Presented at EarthCube All Hands Meeting, Washington, DC, 27-29 May 2015. URL:

<http://earthcube.org/sites/default/files/doc-repository/CyberConnectorEa...> [11]

Notes:

1. Introduction

- EO data are very diverse, and ESMs in different Earth science domains are various
- Issues related to use EO data in ESMs

- data collections
- incompatible in format, projection, and resolutions
- needed data don't exist
- Technologies
 - Interoperability standards and specifications
 - Standard-based data access technologies
 - Web processing services
 - Geospatial processing models, workflow, production visualization
 - Workflow engine -> automatic processing, run models

2. OGC Activities and Standards for Model-Sensor interoperability and the Model Web

- Model web <-> Sensor web
 - Sensor web interoperability is based on open standards.
 - Model Interoperability- an evolution: OpenMI: dedicated tools, technological framework, Model-as-a-Service
- Interfaces simplify Model interactions
 - schedule model runs
 - source data and parameters are flexible and interactive
 - model output
- OpenMI -> data exchange, improve ability to model complex scenarios

- WPS for Model Access: Geoprocessing workflow
- Examples: Simulated flood event(WPS, OpenMI)
- Information Schemas for Models: for data format issues
- Questions:
 - OGC standards in Cloud-> there are already some works

3. Needs for Earth Observational Data from Coastal Oceanographic Modeling Perspective

- The coastal ocean is inter-disciplinary marine system: land, sea, atmosphere, underlying sediments.....
- Issues:
 - Irregular geometry
 - Intertidal wetlands
 - steep topography
 - conservation properties
- Three examples show the necessity to get the data driving the models
 - data integration
 - resolution
 - missing data -> data estimation
 - validation
- Current barriers in accessing Earth observation
 - data are not enough for modelers

- Questions:
 - Is there any collaborations between OGC and domain scientists?
 - Yes, some examples are given.

3. Realize effortlessly feeding FVCOM and CRM with multisource

- EO data are important for models, but there are huge observation data
- Levels of data processing (data transformation and provenance): level_1, 2,3, ..., model input, model output (products)
- 60% of time to prepare data for models
- Modelers need: model-specific form as input; their own data format, but there are big gap between modelers and data
 - exactly matching; different dataform; scale issues
- Solutions : fine-grained existing interoperable web services (CSW, WMS,WCS,.....); workflow technology; gear up the related services in workflow; execute workflows automatically
- Framework: workflow combine models, data preprocessing and data inputs together.
- Examples: web-portal for order submission, workflow services in CyberConnector for data processing, Interactive standards
- Questions:
 - Diversity of models, how to provide the needed models if the models are new?
 - The services are abstracted, and they can be organized to generate a new complex workflow as a new model.

4. Geospatial workflows for reusing standard Web services

- BPEL as the base workflow language

- Event-triggering mechanism
 - Petri net: wait until all are ready
- Workflow types: sequence, loop, Parallel, multi-choice
- BPELPOwer: web-based, support multiple protocols; chain and manage workflow services
- Geospatial Workflows: data-intensive, location-sensitive, data customization
- Special examples: virtual workflow to help find the interesting data from the existing models
- Enterprise Service bus (Apache Synapse); quality and provenance; move programs -> security issues.
- Question: How to control and evaluate the errors in the workflow?
 - Do not have answers, but it is really a good questions.

Attachments/Presentations:  [Realize effortlessly feeding FVCOM and CRM with multisource earth observation data.pptx](#) [12]

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Notes takers:

Name: [Fei Hu](#) [17]

Organization(s): [George Mason University](#) [18]

Email: fhu@gmu.edu [19]

Participants:

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Accepted:

Keywords: [interoperability](#) [21]

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