Interface and Workflow Design and Implementation for Geological Carbon Storage Modeling, Simulation, and Risk Management

DOE Phase I SBIR DE-SC0020734

GCS Risk Manager (GCSRiskman) Prototype

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Illinois Rocstar – Multiphysics, Multiscale, Multifidelity Simulation

Fluids, solids, chemistry, microscale, macroscale, reduced order, and more!

Hot gas flow field and propellant stress in propellant of Titan IV rocket motor using Illinois Rocstar – Rocstar Multiphysics tool

Pack of polydisperse crystals

Automated meshing of experimental nuclear reactor core (3D)

Gas temp and propellant stresses in Titan IV solid rocket motor

Full order model (FOM) versus reduced order model (ROM) of nuclear reactor plenum using Illinois Rocstar AccelerateCFD

Scientific Cloud Computing Simverse.com

Scientific Desktop Computing GCSRiskman
Advanced Graphical User Interface (GUI)
- Support use of NRAP-OpenIAM
- Support scientists to technical regulators
- Interviewing current/past users of OpenIAM
  - Carl Carmen – Illinois State Geologic Survey (ISGS), University of Illinois
  - Nick Azzolina, Nessa Mahmood – Energy & Environmental Research Center (EERC), University of North Dakota
  - John Jiao – Center for Economic Geology Research, University of Wyoming
- Interfaces with reservoir modeling codes
- Packaging and distribution mechanisms
  - OpenIAM package with GUI
  - Simple, one-click install for non-programmers
User Interface Starts Here

OS-native look and feel (Windows, Mac, Linux)

Credits, information, usage

Post-process existing OpenIAM output

Open existing OpenIAM model

Import from external reservoir model

Start new OpenIAM model from scratch
Typical Data Entry (demo)

- **Tooltips**
- **Prompts**
- **Contextual input**
Stratigraphy Definition (demo)

- Action buttons
- Add layer pop-up
- Component list (wells, etc)
- Graphical display of layer data
- Delete or edit layers
- Graphical display settings

Graphical display of layer data by relative thickness

- Define Stratigraphy
- Graphical display settings
- Component list (wells, etc)
- Graphical display of layer data
Post-processing

Select chart type

Open new dataset

Choose charts to show

Save charts in different formats

Edit chart display

Display up to 4 charts

Export chart data to file (not shown)
Phase II Plan

- Continue very successful Stakeholder Interaction
- Add closer ties to NRAP team
- Develop further workflows for use and installation
- **GCSRiskman** user interface development continues…
  - Complete already designed screens, add new screens
  - Support for advanced features such as
    - User added models
    - Import reservoir modeling data
    - Advanced post-processing (in conjunction with SMART Visualization project)
    - Simulation Lifecycle Management (SLM) features
    - Support for OpenIAM/DREAM interaction
    - Machine learning and centralized data collection
    - Cloud implementation of **GCSRiskman** in Illinois Rocstar Simverse* environment
- Extensive automated internal testing and deployment
- Extensive user testing; quarterly releases from 6 months onward
- User and developer documentation

*http://simverse.com
Integration with SMART Visualization Project

- Advanced visualization features for subsurface science
  - 3D immersive
  - 2D interactive
  - Connected to data
- Features that make sense will be made available in GCSRiskman
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