



Data-Intensive science gateway for rock physicists and volcanologists



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Abstract

Observations:

- Many rock physics laboratories and volcanology observatories
→ Running many experiments.
- Many scientists
→ Develop computational models.
- Lack of a mechanism for sharing data and models
→ Gap in the Earth Sciences infrastructure.

Hypothesis:

- Information sharing across those communities improves their science.

Proposal: New science gateway[1], which supports:

- sharing data from laboratories and observatories
- sharing models and methods for analyzing data
- supporting recurrent operational tasks

EFFORT project

Multi-disciplinary.

EFFORT aims:

- Determine predictability of brittle failure of rock samples.
- Determine how predictability scales with geo-system complexity.
- Provide facility for developing and testing codes.

EFFORT prototypes the science gateway:

<http://effort.is.ed.ac.uk>

Science gateway facilities

Storage system:

- Store experimental data and models [2, 3] in a repository
- Store metadata for data and models in a catalogue

Sharing Data:

- Upload rock physics data and metadata in real-time
- or from previous experiments using new transfer tool **FAST** [4]
- Upload volcanic monitoring data from observatories
- Select data from catalogue via web portal [5]
- Visualize accumulated data via web portal

Sharing model and methods:

- Upload models + metadata via web portal
- Select models via web portal
- Run models on cluster via web portal
- Visualize the results of models
- Models use new python library called “varpy”

Recurrent Operations:

- Automated data and metadata upload using **FAST**
- Generate synthetic data via web portal
- Run models periodically on experimental data

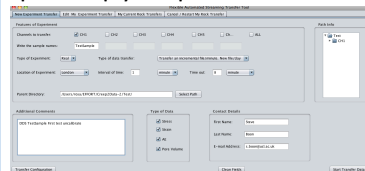
Visualization of data in real time



Upload volcanic monitoring data in real time

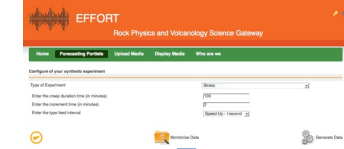


Upload rock physics experimental data in real time

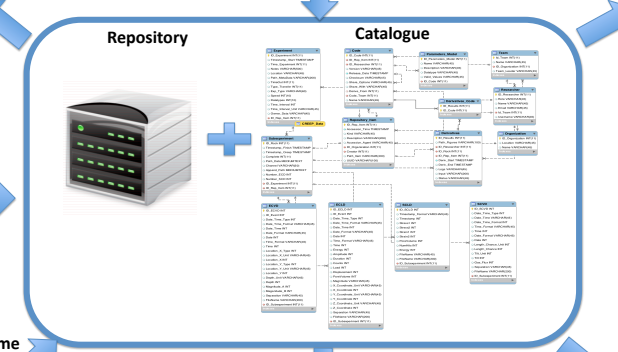


Science gateway lifecycle

Generation of synthetic Data



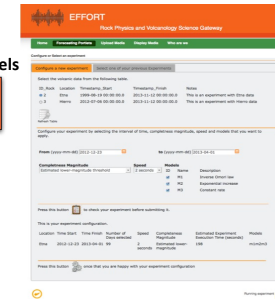
Visualization of synthetic data in real time



Write & upload models



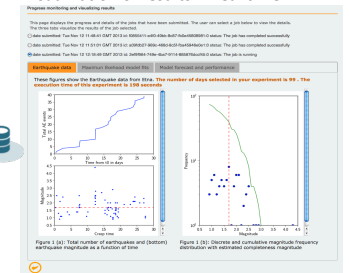
Selection of models and data



Run models



Visualization of results in real time



Conclusion and Future Work

Gateway could be used by EPOS.

Expected benefits:

- Prediction of brittle failure scaled to natural phenomena
- Increases scientific impact
- Fast testing and method propagation
- Resources for education and training

References

- [1] Rosa Filgueira et al., Innovative platform to promote persistent collaboration research in Rock Physics and Volcanology, eScience 2014 (in preparation)
- [2] Bell et al., Challenges for forecasting based on accelerating rates of earthquakes at volcanoes and laboratory analogues, GJI, 2011
- [3] Bell et al., The limits of predictability of volcanic eruptions from accelerating rates of earthquakes, GJI, 2013
- [4] Rosa Filgueira et al., FAST: Flexible Automated Synchronization transfer. DDC 2014
- [5] U. o. E. Data Intensive Research Group, Rapid: Giving computational science a friendly face.