2013 SCEC Proposal Report

Community Stress Model Web Interface
(CSMWI-V1.0)

PIs:

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Abstract

This collaborative proposal was to implement the first version of the SCEC Community Stress Model (CSM) web site. The design specifics resulted from community discussions and CSM model candidates are from community model contributions as supported over a series of CSM workshops. The web site is now operational, all stress model contributions as well as plotting scripts are freely available for download, along with workshop material. Initial stress model validation capabilities are also accesible.

Technical report

Crustal stress is a fundamental quantity that is relevant to many aspects of the earthquake problem. SCEC has committed to the development of the Community Stress Model (CSM) to provide better constraints on the stress field, and a means to formally test physical connections between observations and stress models. The intended CSM endproducts are a small suite of models for the 4D stress and stressing-rate tensor in the California lithosphere. There is a range of potential uses for the CSM, including seismic hazard estimates, crustal seismicity studies, dynamic earthquake rupture models and earthquake simulators.

Based on a series of two CSM workshops in 2011 and 2012, the community defined a few key web site design specifics, such as a consistent presentation of stress and stressing-rate models, an intermodel comparison, and a facility to compare ("validate") stress models with independent constraints, such as from borehole data or the World Stress Map. All of these capabilities are now accessible at the CSM website, version 1.0, to be found at `http://sceczero.usc.edu/projects/CSM`.

The CSM web interface is a PHP code base implemented within SCEC's Drupal framework, at `sceczero.usc.edu`. Currently, model comparison plots are generated on a remote server and automatically pushed onto the site. Plotting scripts are also available for download to allow users to conduct their own analysis and plotting offline.

There is also one PHP metadata file describing all the models, including authors, permissions and model download information. The model description and model comparison pages are dynamically generated from this metadata with filters for different metrics and depths.

Besides access to stress models and comparison plots and data, the web site also hosts access to the CSM email list, and serves as a clearinghouse for all CSM working group activities, e.g. providing access to old workshop presentations and the like.

While the initial CSM web site is complete as to having achieved all design goals, we expect to embarked on future developments once more comprehesive validation datasets, or different kinds of stress models will have to be hosted.

Exemplary figure
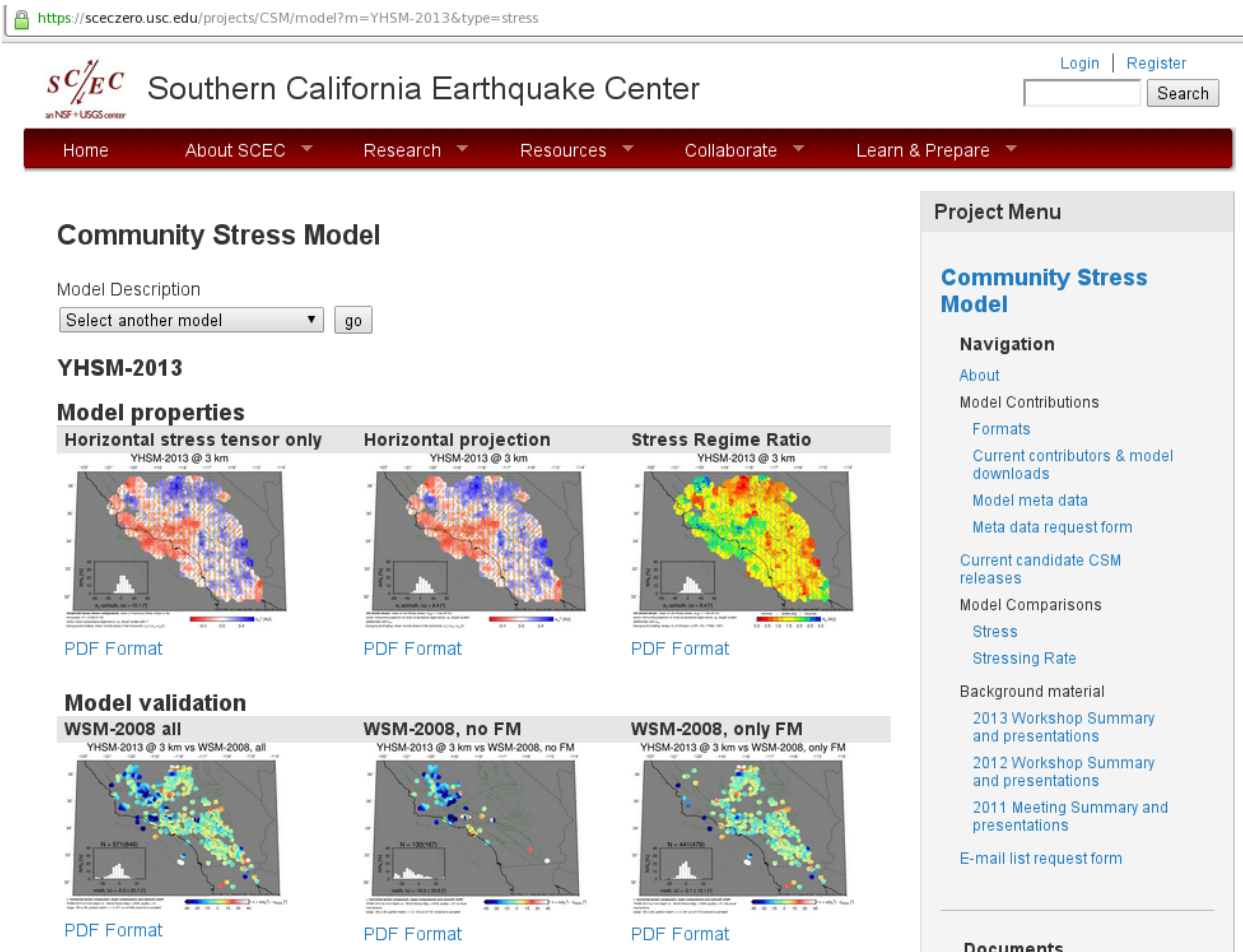
Figure 1: Screenshot of an example component of the CSM website (sceczero.usc.edu/projects/CSM), displaying the first candidate stress model and automated model validation.

Intellectual merit and broader impacts

The CSM web site serves to archive, organize, enable and energize several of the efforts of the CSM community, and will serve as a repository for future additional constraints for validation (e.g. expanded borehole data). The CSM website will also host future iterations of CSM release models, openly accessible to all. This will not only foster scientific discourse on the fault loading problem for southern California, but also build bridges to research in other communities, such as induced seismicity studies.

Publications

One conference presentation arose from this work, as well as several related workshop presentations.

- Yu, J., Becker, T. W., Hardebeck, J. and the SCEC CSM Working Group (2013): The SCEC Community Stress Model web site v.0.1, Abstract, Southern California Earthquake Center Annual Meeting, Palm Springs, Proceedings Volume XXIII, p. 182.