



OpenSHA: A DEVELOPING, COMMUNITY-MODELING ENVIRONMENT FOR SEISMIC-HAZARD ANALYSIS

Edward H. FIELD¹ and Thomas H. JORDAN²

SUMMARY

Proper seismic-hazard evaluation requires that all viable earthquake-forecast and ground-motion models be accounted for in the analysis to adequately represent epistemic uncertainties. However, our community has lacked a computational infrastructure that can accommodate the wide variety of models currently under development, including forecasts based on stress interaction and time-dependent probabilities, and ground-motion estimates based on full waveform modeling. OpenSHA (<http://www.OpenSHA.org>) is an effort to develop an object-oriented, open-source, and optionally web-based “community-modeling environment” for seismic-hazard analysis (SHA). The goal is to enable any arbitrarily sophisticated (e.g., physics based) model component to “plug in” for analysis without having to change what is being plugged into (without rewriting existing code). This emerging infrastructure will allow the models, as well as the various data repositories upon which they depend, to be geographically distributed and run-time accessible via the Internet. Building such a community-modeling environment raises several issues related to computational speed, ease of use, error prevention, and repeatability of results in an environment where the models and data are continually being updated. The Information-Technology Research collaboration of the Southern California Earthquake Center is helping us resolve some of these issues.

To date we have developed applications for computing hazard curves, hazard spectra, hazard maps, and scenario ShakeMaps, where one can choose from a variety of attenuation relationships and earthquake-rupture-forecast models (including the WGCEP-2002 San Francisco Bay area forecast, the most sophisticated, time-dependent model ever developed). These applications run on all popular types of computers.

¹ United States Geological Survey, Pasadena, CA, USA. Email: field@usgs.gov

² Southern California Earthquake Center, University of Southern California, Los Angeles CA, USA

INTRODUCTION

All information relating to this project can be found at our web site:

<http://www.OpenSHA.org>

In particular, you can find downloadable applications, examples of accomplishments, links to source code, information on how to get involved, and extensive documentation including a paper published in the *Seismological Research Letters* [Field et al., 1] available at:

http://www.opensha.org/documentation/SRL_paper_v13_DblSp.pdf

REFERENCES

1. Field, E.H., T.H. Jordan, and C.A. Cornell. "OpenSHA: A Developing Community-Modeling Environment for Seismic Hazard Analysis." *Seism. Res. Lett.* 2003; 74: 406-419.