Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01703, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01703
EGU General Assembly 2008

Fault strength in California and western Nevada

S. Carena, C. Moder

Department of Earth and Environmental Sciences, Ludwig-Maximilians University, Munich, Germany (scarena@geophysik.uni-muenchen.de)

The behavior of many major faults on Earth can only be explained if they are assumed to be much weaker than predicted by Byerlee's Law. Fault friction can be studied with numerical forward modeling, but this requires knowledge of the detailed 3-D geometry of the faults. The latter is now available for most of California, thanks to the SCEC Community Fault Model (southern California) and to the USGS project "3-D Geologic Maps and Visualization" (San Francisco Bay and surrounding region).

We modeled a network of approximately 200 faults in California and Nevada with the finite-element code SHELLS. To avoid having to impose boundary conditions at the edge of the region, we used a variable-resolution grid, globally coarse but with local (California and western Nevada) high-resolution representation of actual faults based on the existing 3-D fault maps. Plates are driven with NUVEL-1 velocities. Fault slip-rates are an output of the model, and we compared them with geologic slip-rates to determine the best fitting value of effective fault friction coefficient (μ).

Our initial results show that realistic slip-rates on the main plate boundary faults can only be achieved with very low μgalues. The already low value of 0.17, which was recommended for California faults by Bird & Kong 1994, seems to be an upper bound. In fact, the San Andreas fault slip-rate is best fit with μ <0.05. It is also apparent that a single value of μ does not give the best fit for all faults simultaneously. Minor faults are best fit with higher μ values (in the 0.1-0.2 range), suggesting that slip-dependent weakening should be considered when determining the best μ value for specific faults. In general, the type of faulting obtained from the model fits the data well at low μ, including the widespread thrusting in the Western Transverse Ranges and the normal faulting in the Basin and Range. The next step will be to test whether driving plates

using current mantle convection models confirms very low μ.