Increasing Earthquake Forecast Testability - CSEP Future Developments

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The Collaboratory for the Study of Earthquake Predictability (CSEP) has expanded over the years to many different testing areas hosted at multiple testing centers. Hundreds of earthquake forecast models have been submitted to CSEP and are being tested. New testing metrics were developed and implemented and a lot of progress was made to establish CSEP as an institution that cannot be ignored when issuing earthquake forecasts. Its rigor and independence became the standard in evaluating earthquake forecasts and in reporting on the results.

In the framework of the testing activities of the Global Earthquake Model, one line of expanding the capabilities of CSEP was developed at GFZ Potsdam. The group there applied the mechanisms that CSEP introduced to earthquake forecast models to the area of intensity prediction equations (IPEs) and ground-motion prediction equations (GMPEs). The first truly prospective tests were carried out on IPEs for Italy and also on GMPEs for Japan and New Zealand. This new set of tests helped CSEP move into the hazard domain and increase the relevance of its results to the hazard community. Finally, the group at GFZ Potsdam has also conducted the first prospective test of the US national seismic hazard maps.

Although these tests have been successful and well-received, they have also shown the limitations of the CSEP approach. Many aspects of seismic hazard or earthquake forecasting remain inherently untestable if only the model forecasts are tested and not the model ingredients. We propose to continue along the lines of the GFZ Potsdam developments and create new areas of activity for CSEP, namely targeted experiments that cannot be conducted with the current CSEP software system. As part of the eGSIM (European Ground Shaking Intensity Models) service, we will introduce permanent testing of IPEs and GMPEs to the testing center to establish strong performance records to be used in hazard models. Further targeted experiments include the predictive power of b-values, discrimination of foreshocks for short-term forecasting, as well as a deeper look into precursory
phenomena applying CSEP-style rigorous testing. We support including testability in future hazard models or their components to move to better testable seismic hazard models. Finally, to expand into the risk domain, we will test exposure models against new and independent data.

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