Geophysical Research Abstracts
Vol. 18, EGU2016-8190-2, 2016
EGU General Assembly 2016


# Syngine: On-Demand Synthetic Seismograms from the IRIS DMC based on AxiSEM & Instaseis

Martin van Driel (1), Alex Hutko (3), Lion Krischer (2), Chad Trabant (3), Simon Stähler (2), and Tarje Nissen-Meyer (4)

(2) Institute of Geophysics, LMU Munich, Munich, Germany, (3) IRIS Data Management Center, Seattle, USA, (1) Institute of Geophysics, ETH Zürich, Zürich, Switzerland, (4) Department of Earth Sciences, Oxford University, Oxford, UK

This presentation highlights the IRIS DMC's Synthetics Engine (Syngine), a new on-demand synthetic seismogram service (ds.iris.edu/ds/products/syngine/) that complements the time series data IRIS has traditionally distributed. The synthetics are accessible using a web service for user specified source-receiver combinations and a variety of Earth models. Syngine is designed to be extremely fast, making it feasible to request large numbers of source-receiver combinations. This capability supports studying variations in source properties, Earth models or temporal changes in instrument responses.

We have computed a set of global-scale databases of Green's functions using the spectral-element method AxiSEM (www.axisem.info , see also abstract EGU2016-9008) for selected well known spherically symmetric Earth models (PREM, IASP91, AK135f...) with anisotropy and attenuation. Fine-scale models have resolution from 1 to about 100 sec periods with durations of 60 minutes; lower resolution models extend to a few hours duration. Behind the scenes, the web service runs Instaseis (www.instaseis.net), a system that rapidly calculates broadband synthetic seismograms from the pre-calculated Green's functions. Receivers may be specified at arbitrary coordinates or using real network and station codes, which are resolved using metadata at the DMC. The service also provides optional, on-demand processing methods, including convolution with a specified moment tensor (specified explicitly or by GCMT ID) and one of a few source-time functions with variable duration. The interface is designed to be callable by scripts and to support automated processing workflows. The DMC also provides a user-friendly command line Fetch script to download selections of synthetics. This new resource provides a powerful tool in multiple research areas where synthetic seismograms are useful.

Regarding the Instaseis/AxiSEM functionality, one only needs to perform two forward calculations with AxiSEM for a complete, new database, and this overall idea can thus be extended and applied quite easily to any choice of 1D model. AxiSEM is currently being extended to include local, regional and continental scale wave propagation such that regional databases (e.g. Europe or North America) are easily feasible at even higher frequencies. The enhancements resulting from the evolution of AxiSEM will be evaluated for use in Syngine and offered by IRIS as resources allow.