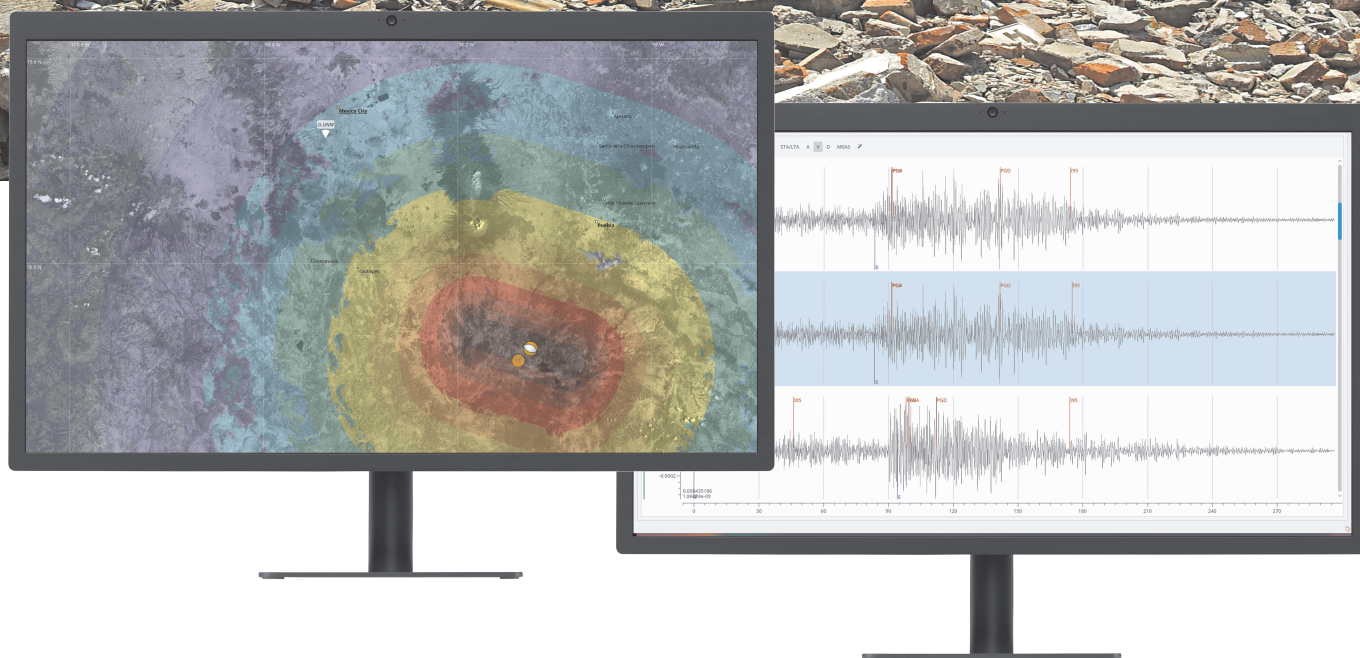


SIGMA
Seismic Intensity and
Ground Motion Analysis



Seismic intensity and ground motion processing and analysis

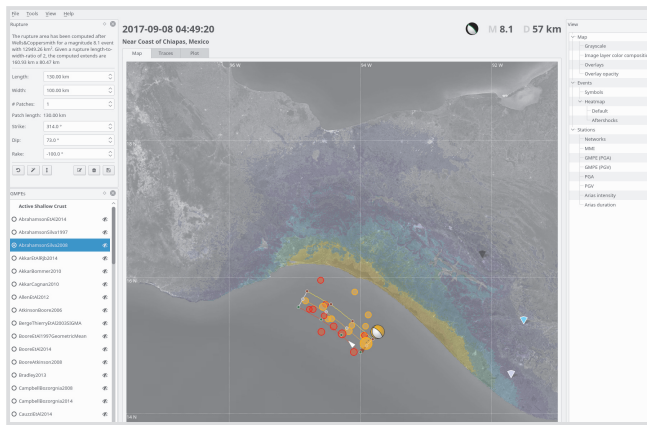


SIGMA in a nutshell

The new SIGMA module provides Seismic Intensity and Ground Motion Analysis. Supporting FDSNWS it can run independent of SeisComP. PS(A) and MMI maps are generated based on ground motion prediction equations (GMPE). Finite ruptures are modeled by an interactive generator and an aftershock heat map. GMPE's can be added as C++ or Python plugins supporting OpenQuake. SIGMA considers site effects through Vs30 information. The strong motion analysis calculates engineering seismology parameters and compares them with the GMPE-based values. All information is stored in a SQL database. Strong motion parameters, event information, rupture parameters, waveform data and map plots can be exported for further processing and report generation.

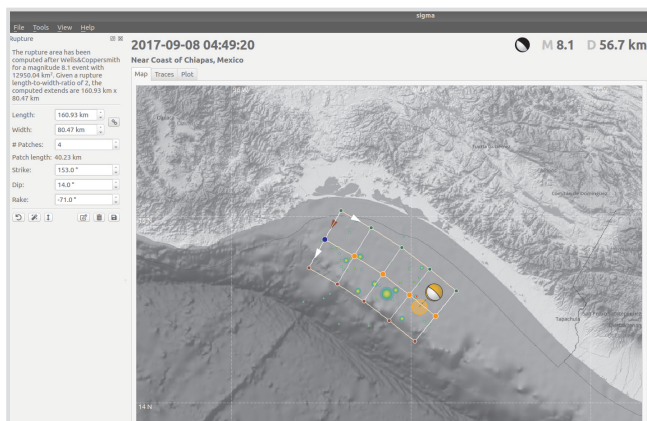
FEATURES

- Interface to SeisComP and FDSNWS
- Automatic and interactive SM data processing
- MMI and (P)SA maps
- Open source C++ and Python plugins
- Interface to the OpenQuake hazard library
- Earthquake engineering parameters:
 - PGA/PGV/PGD
 - Arias and characteristic intensities: I_a and I_c
 - Cumulative absolute velocity: CAV
 - Energy density: SED
 - Mean and dominant period: T_m , T_p



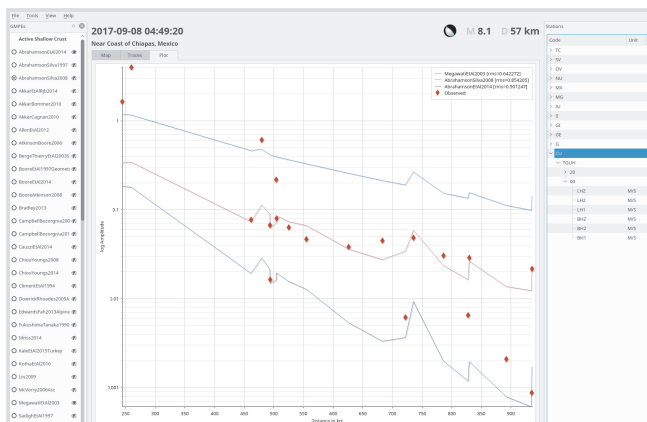
Ground Shaking Maps

SIGMA calculates peak ground acceleration (PSA) and velocity (PSV) and MMI maps applying ground motion prediction equations (GMPE). Customized GMPE's can be implemented either as C++ or Python plugins. The OpenQuake seismic hazard analysis framework is supported by a Python plugin providing GMPEs for regions world-wide. Using the global Vs30 of USGS grid and station specific information, site effects are considered.



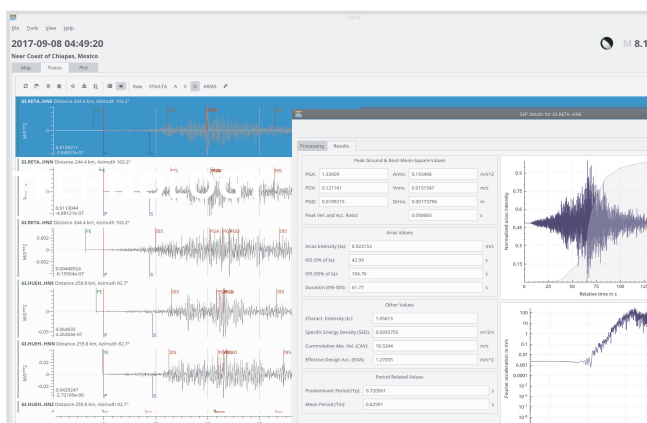
Rupture Modeling

Aftershocks occurring within the first hours after the main shock indicate the rupture area of the main shock. To visualize the aftershock distribution an aftershock heatmap can be activated. Rupture parameters as patch length, width, number and strike, dip, rake allows an automatic rupture generation, patches can be optimized manually. The depth can be adjusted and all rupture information can be finally saved in a DB.



GMPE Comparison Plots

The plot perspective allows a comparison of PGA, PGV, PGD values of GMPE-based calculations and measurements. Multiple GMPE's can be activated as shown in colored lines and the RMS for each GMPE is calculated simplifying the selection of the best matching GMPE. The jumps in the GMPE curves are caused by simulated site effects using station specific Vs30, Z1PT0 and Z2PT5. For station sites the velocity parameters are configurable.



Strong Motion Analysis

The trace perspective provides a semi-automatic waveform processing. Waveforms are retrieved through typical SeisComp sources including FDSN web services. PGA, PGV, PGD, 5% and 95% Arias intensity values and additional common strong motion parameters are determined. Zooming, sorting and processing of individual time window can be applied. The single trace window supports processing with customized parameters.