SeisComPro
Earthquake monitoring

SeisComPro: Software Extensions and Web Applications for SeisComP

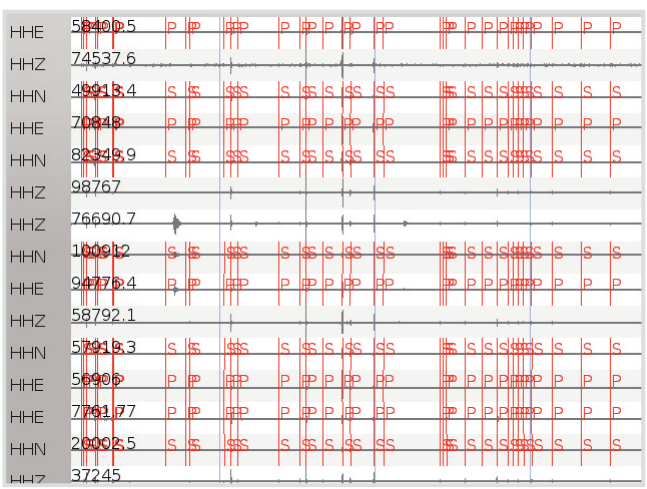
SeisComPro in a nutshell

SeisComPro adds capable software modules to SeisComP establishing an enhanced system for monitoring and analysing natural local earthquakes or induced microseismicity in real or any time.
The SeisComPro modules are especially tailored to monitoring high-rate seismicity at a wide range of magnitudes during earthquake swarms, mining or volcano activity, geothermal energy production or extraction of crude oil or natural gas.

- **ccloc** detects microseismicity and classifies the source type by cross correlation.
- **scanloc** associates phase picks for locating local seismicity at low magnitudes and high rates.
- **sceval** evaluates detections to identify fakes.
- **npeval** monitors variable network performance.
- **GAPS** allows earthquake analysis from anywhere.
- **Recommended extensions: scqceval**, **qclog** and our deeplearning pickers **dlpick** and **deepc**.

ccloc

Cross-correlation detection with templates



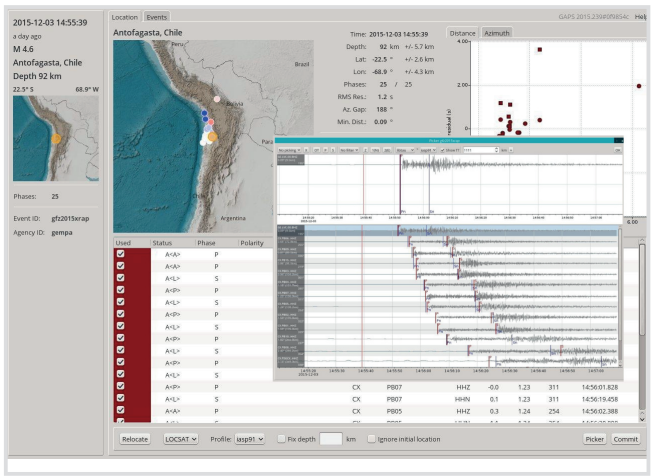
ccloc detects earthquakes and other seismic events at very low to large magnitudes by matching waveform templates from known master events to real-time or archived data. Computing on GPU is applied for highest performance.

Monitoring applications:

- High-rate natural seismicity, earhquake swarms,
- Micro-seismicity,
- Induced seismicity at geothermal power plants, in mines or near oil and gas production wells,
- Nuclear explosions,
- Discrimination of earthquakes from other seismic sources such as explosions.

GAPS / WebApps

Web-based earthquake analysis



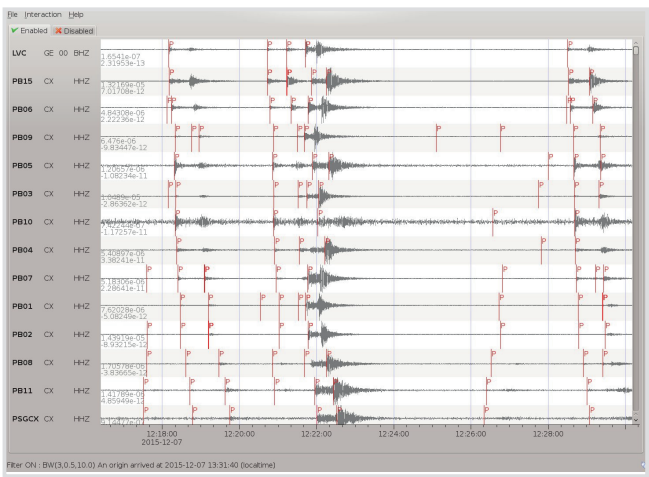
GAPS offers seamless web connectivity to SeisComP from anywhere, for efficient seismicity analysis akin to traditional SeisComP GUIs. GAPs provides four websites with custom information on seismicity, sensors, waveforms and felt reports streamlining mobile work and the fast supply of information to stakeholders and the general public:

- **EQView**: Earthquake activity in customized source regions and magnitudes, did-you-feel-it reports,
- **StationView**: Network state and activity,
- **TraceView**: Real-time seismogram plots,
- **OriginLocatorView**: Interactive seismic analysis.

Visit: **https://demo.gempa.de/gaps/**.

scanloc

Clustering and association of detections

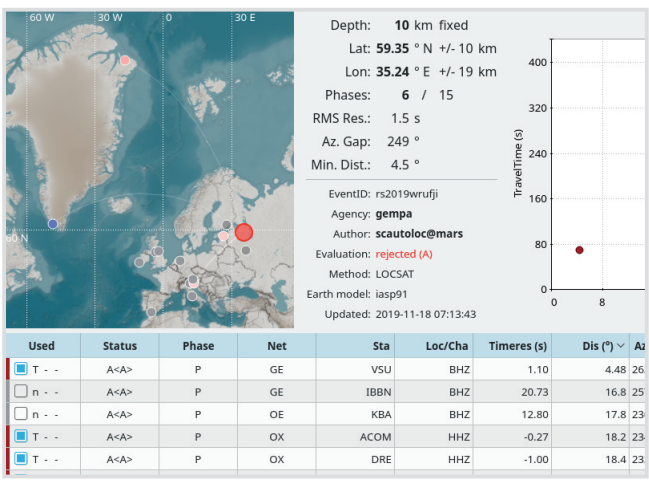


scanloc is a clustering and association tool to detect and to locate local to regional earthquakes using the cluster search algorithm DBSCAN. The cluster search in scanloc identifies phase picks from a cloud of possible picks reliably associating them to earthquakes. It also associates additionally incoming P- and S-phases to already existing internal or external hypocentre solutions.

In high-seismcity areas scanloc ensures reliability of earthquake hypocentres at a wide range of magnitudes and with high sensitivity. It is just perfect for monitoring local earthquakes, geothermal sites, mines or wells.

sceval

Realtime event evaluation



sceval evaluates origins received from the SeisComP messaging system.

Noisy data and accidental coincidences in automatic seismic phase detections can lead to unreasonable or even fake earthquake locations. Such outliers are tagged as rejected by sceval and prevented from being mistaken as a real earthquake. Real seiscmic events are recognised and confirmed. This verification helps in accurately identifying and confirming genuine seismic events. Consequiently, operators and stakeholders receive the correct information on earthquakes avoiding unnecessary work load or excitation.