VIRTUAL 37th General Assembly of the European Seismological Commission
ESC2021 19-24 September 2021

Session 20

New seismological workflows: from event detection to earthquake forecasting

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Deep learning applications in seismological practice provide now a dramatically increase in the number of detections revolutionizing the way we describe and understand fault systems. The improvements touch upon pre-processing, event detection, phase picking, and association techniques allowing us to develop comprehensive earthquake catalogs that include seismic parameters and rupture characteristics. These catalogs are critical for advancing our knowledge about earthquake behaviour and triggering mechanisms. Ultimately these workflows support rapid analysis capabilities and will transform standard seismological practice. The existence of high-resolution data products translates into improved predictability of short-term earthquake forecasts that track the evolution of earthquake sequences using physics-based or statistical simulations. In this session we focus on induced and natural seismicity cases with high-resolution catalogs, machine learning applications, ranging from event detection to model development, existing labelled long-term datasets for algorithm training, how data quality may influence forecast predictability, what is the information gain for advanced operational forecasts based on machine learning catalogs and how these workflows can be adapted for different spatial scales from monitoring microseismicity in observatory sites, evolving aftershock seismicity to national level earthquake detection. We will close the session with an open discussion with a panel of experts focusing on recent European and US examples of high-resolution earthquake development with machine learning applications.