Application of template matching for earthquake detection of seismic activity in Castanhão Reservoir, NE Brazil

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The man-made changes to the environment can trigger seismic events. The Castanhão region (Ceará, NE Brazil) can be considered an example of such activity. The dam built over the Jaguaribe River was followed by the creation of Castanhão Reservoir, which soon - before the opening of the dam - started to impact the area. Said process resulted in the occurrence of earthquake swarms on the site.

In this study, we analyze the continuous data recorded on the network of 6 seismological stations. The data set contains waveforms recorded throughout the 12 months of 2010. Two detection algorithms were used to detect the seismic events related to activity within the reservoir area. For initial detection, we applied the STA/LTA algorithm that enabled us to find approximately 150 seismic events, 53 of which are selected as templates in the next step. A template matching was performed over the same data set, doubling the detections of the quakes recorded on, at least, three stations. We performed the template matching using the PyMPA software in the frequency range from 5 to 100 Hz.

PyMPA allowed the detection of over 300 events that will be located using Hypo71 and then relocated using the double difference method with HypoDD. In the next step, we will calculate the source parameters for each quake. We also plan to include the results from our analysis in a catalog to be available on European Plate Induced Seismicity Observations & Datasets within EPOS Services (EPISODES) Platform of EPOS Thematic Core Service Anthropogenic Hazards.