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Investigations of historical seismograms of the 1956 Amorgos-Santorini earthquake (Greece, Ms=7.4)

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The digitization of historical seismograms allows to gain new information about important earthquakes that occurred in the first part of the 20th century.
On July 9, 1956 a strong earthquake occurred between the islands Amorgos and Santorini within the volcanic arc of the Hellenic Subduction Zone. A second strong earthquake followed just SW of the first event about 13 minutes later. Both earthquakes caused severe damages on the surrounding islands. A tsunami, with a maximum wave height of 30 m at the south coast of Amorgos caused damages within a region of 100 km. Available focal mechanisms of the first event vary from strike-slip to normal faulting. The focal depth of the first event is estimated to 10 (+/-10) km. Depth estimates for the second event vary between 40 and 100 km. This suggests a re-examination of the events.
It was possible to collect more than 80 analogue seismograms of 30 seismic stations from Belgium, Denmark, Germany, Italy, Croatia, Malta, Austria, Poland, Romania, Switzerland, Spain and Turkey. On all seismograms the first main shock is visible in various qualities, while the second main shock can be clearly observed at 3 stations. The stations, for which useful digitized waveforms are available, are at a distance from 247 km up to 2337 km with a azimuthal coverage of 120°. The digitization and correction of the suitable seismograms was done by applying the program TESEO (developed by INGV, Rome).
The seismograms of the first event show large surface wave amplitudes, while the surface waves are missing at the second event. The frequency content of the digitized seismograms is investigated using a multiple filter technique (MFT). MFT calculations show clearly the P and S wave as well as the dispersion of the surface wave of the first event. Synthetic waveforms are calculated for various depths down to 160 km and different moment tensors with the program GEMINI. Instrument corrected synthetic seismograms may be fitted to digitized recordings in order to constrain the moment tensors and focal depths of the two events by waveform inversion.