



The 2016 Kumamoto (Japan) earthquake sequence: coseismic displacement and fault modeling by SAR interferometry

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On April 14, 2016, at 12:26 (UTC), an earthquake of Mw 6.2 (MJMA 6.5) hit the Kumamoto Prefecture, in the Kyushu Island (SW Japan), followed after 28 hours, on April 15 at 16:25 (UTC), by another event of Mw 7.0 (MJMA 7.3). The hypocenters of the two events are located close to the Hinagu-Futagawa fault system, which represents the western part of the Medial Tectonic Line (MTL). The MTL crosses Kyushu from Yatsushiro to Beppu Bay and it is one of the longest and most active right-lateral strike-slip fault system of Japan. The moment tensors of the main events are characterized by a right-lateral strike-slip faulting mechanism with a normal component. In this study, we firstly processed and analyzed the SAR data provided by SENTINEL-1 and ALOS-2 satellite with DInSAR and MAI techniques. After the detection of the four main fault traces, we used the information provided by the SAR interferometry together with the GPS and the seismological data to determine a model of the active faults involved in the Kumamoto sequence. Indeed, applying a non-linear and a linear inversion, we obtained the faults parameters and the distribution of the coseismic displacement along the fault planes. The final results show a correspondence with known active faults, the Hinagu, the Futagawa and the Beppu ones, which are characterized by right-lateral strike-slip faulting mechanism with a normal component. The rupture of the mainshock started from the deeper portion of Hinagu fault at a depth of nearly 12 km and then it propagated northeastwards and upwards along the Futagawa fault, indicating a complex interaction between the two main faults involved in the Kumamoto sequence. According the surface deformation and to the seismicity, it has been possible to detect another fault, located between the Aso and the Kuju volcanoes: the Oita fault that we interpret as a southern segment of the MTL that stops close to the Aso caldera today covered by the Quaternary volcanic deposits. The presence of the volcanoes in this region has an important effect on the seismotectonic setting of active faults because they cause an interruption of the coseismic ruptures.