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# Complex deformation at shallow depth during the 30 October 2016 Mw6.5 Norcia earthquake: interference between tectonic and gravity processes?

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The question of the relationship between slip near the surface and at depth during earthquakes is still not fully resolved at the moment. This leads to large uncertainties in the evaluation of past earthquakes magnitude based on surface observations, which are the only accessible evidences for such events. A better knowledge of the way slip is distributed over the different ruptures within the first kilometers from the surface would greatly help to reduce these uncertainties. The 30 October 2016 Mw6.5 Norcia earthquake has been captured by different geodetic techniques, which allow to access to the slip distribution at depth and also at the surface, with an unprecedented level of detail for a normal-faulting earthquake. We first present coseismic surface offset measurements from very high resolution optical satellite images over the whole affected area, that complement observations made in the field, following the earthquake. Then we propose a rupture model based on joint inversion of the geodetic data, that explains the observations at both far-field and near-field scales. Finally we explore different slip distribution configurations at shallow depth, in an attempt to better explain the near-field deformation observed at the surface. Despite the fact that the solution is not unique, several evidences suggest that gravity processes could be involved locally, that would interfere with the expected, larger scale tectonic processes. If such a phenomenon was proven, extra caution would be required when dealing with field observations to study past earthquakes.