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The Surface faulting produced by the 30 October 2016 Mw 6.5 Central Italy earthquake: the Open EMERGEO Working Group experience

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The October 30, 2016 (06:40 UTC) Mw 6.5 earthquake occurred about 28 km NW of Amatrice village as the result of upper crust normal faulting on a nearly 30 km-long, NW-SE oriented, SW dipping fault system in the Central Apennines. This earthquake is the strongest Italian seismic event since the 1980 Mw 6.9 Irpinia earthquake. The Mw 6.5 event was the largest shock of a seismic sequence, which began on August 24 with a Mw 6.0 earthquake and also included a Mw 5.9 earthquake on October 26, about 9 and 35 km NW of Amatrice village, respectively.
Field surveys of coseismic geological effects at the surface started within hours of the mainshock and were carried out by several national and international teams of earth scientists (about 120 people) from different research institutions and universities coordinated by the EMERGEO Working Group of the Istituto Nazionale di Geofisica e Vulcanologia. This collaborative effort was focused on the detailed recognition and mapping of: 1) the total extent of the October 30 coseismic surface ruptures, 2) their geometric and kinematic characteristics, 3) the coseismic displacement distribution along the activated fault system, including subsidiary and antithetic ruptures.
The huge amount of collected data (more than 8000 observation points of several types of coseismic effects at the surface) were stored, managed and shared using a specifically designed spreadsheet to populate a georeferenced database. More comprehensive mapping of the details and extent of surface rupture was facilitated by Structure-from-Motion photogrammetry surveys by means of several helicopter flights.
An almost continuous alignment of ruptures about 30 km long, N150/160 striking, mainly SW side down was observed along the already known active Mt. Vettore - Mt. Bove fault system. The mapped ruptures occasionally overlapped those of the August 24 Mw 6.0 and October 26 Mw 5.9 shocks. The coincidence between the observed surface ruptures and the trace of active normal faults mapped in the available geological literature is noteworthy.
The field data collected suggest a complex coseismic surface faulting pattern along closely-spaced, parallel or subparallel, overlapping or step-like synthetic and antithetic fault splays. The cumulative surface faulting length has been estimated in about 40 km. The maximum vertical offset is significant, locally exceeding 2 meters along the Mt. Vettore Fault, measured both along bedrock fault planes and free-faces affecting unconsolidated deposits.
This enormous collaborative experience has a twofold relevance, on the one side allowed to document in high detail the earthquake ruptures before Winter would destroy them, on the other represent the first large European experience for coseismic effects survey that we should use a leading case to establish a coseismic effects European team to get ready to respond to future seismic crises at the European level.