European Geosciences Union General Assembly 2016 Vienna, Austria, April 18–22, 2016

Session: EOS5 ECS | D9

The 1980 Irpinia-Basilicata earthquake: the environmental phenomena and the choices of reconstruction.

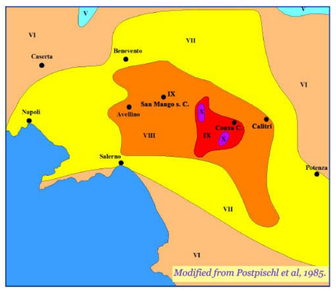
Sabina Porfido[1], Giuliana Alessio[2], Paola Avallone[3], Germana Gaudiosi[2], Giovanni Lombardi[3], Rosa Nappi[2], Raffaella Salvemini[3], Efisio Spiga[4]

1) CNR-IAMC Napoli, Italy 2) Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Napoli Osservatorio Vesuviano; 3) CNR-ISSM Napoli, Italy; 4) Independent Researcher, Avellino Italy

(corresponding author:sabina.porfido@iamc.cnr.it

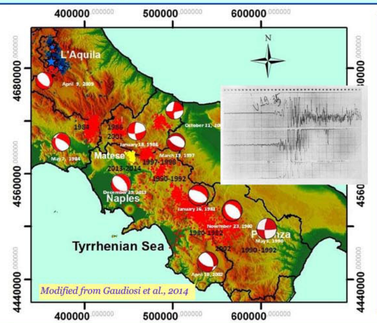
Aim of the study: to describe specific changes that have taken place in the 35 years following the 1980 earthquake; how the urban and territorial setting have been modified, especially in the villages located in the epicentral area; the consequences of the ground effects on the choices of reconstruction, both in situ, and far from the original historical centres.

The 23 November 1980 earthquake, known as the "Irpinia-Basilicata earthquake" was the strongest seismic event of the last 80 years in the Southern Apennines of Italy (Mw=6.9, Io=X MCS, Postpischl, 1985). It was felt nearly everywhere in Italy, from Sicily in the South, to Emilia Romagna and Liguria in the North.



Modified from Postpischl et al, 1985.

This earthquake was characterized by a complex main rupture, composed of three major sub-events, corresponding to three normal faulting events. Many localities in the Avellino, Salerno and Potenza provinces were nearly completely destroyed (I=IX-X MSK, Postpischl et al., 1985); among them Castelnuovo di Conza, Conza della Campania, Lioni, Santomenna, San Mango sul Calore, San Michele di Serino and Sant'Angelo dei Lombardi. About 800 localities suffered serious damages (Balvano, Bisaccia, Calitri, etc); 75,000 houses collapsed totally and 275,000 were badly damaged. Casualties were about 3000, and 10,000 people were wounded.



Modified from Gaudiosi et al., 2014

A large amount of information on primary and secondary environmental effects, over all slope movements, was available on the basis of several geological surveys of the area affected by this earthquake. The total amount of surface faulting was about 40 km in length and the maximum displacement about 100 cm, while the total area interested by slope movements was estimated in 7400 km² (Porfido et al., 2002, 2007; Serva et al.2009).

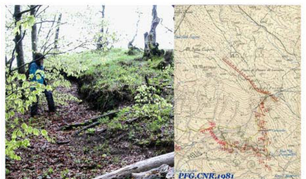
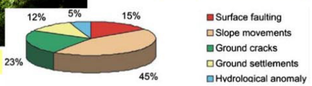


Photo by Rosa Nappi, 2004

The 1980 M. Marzano fault scarp, May 2004.

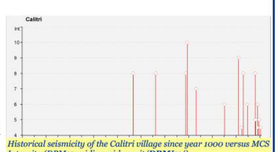

The 1980 San Gregorio Magno fault scarp.



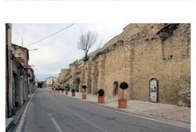
Case histories: some case histories as Calitri and San Mango sul Calore villages, were affected by severe landslide phenomena, and in situ rebuilt, whereas Conza della Campania, on the basis of the suffered damages, has been reconstructed far from its original location.

Calitri

Distance from the epicentre (Laviano): about 16 km
Intensity: VIII MSK – ESI
Casualties number: 6
Environmental effects: large landslide in the urban centre (approximately 850 m long and about 100 m deep), also triggered by past earthquakes (1694, 1805, 1910 and 1930 seismic events); liquefaction phenomena; ground cracks.
Type of reconstruction: 'in situ' with partial retrieval of the urban heritage in the area affected by landslide.

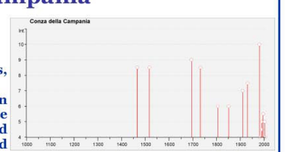


Historical seismicity of the Calitri village since year 1000 versus MCS Intensity (DBM11emidius.mi.ingv.it/DBMI11/).

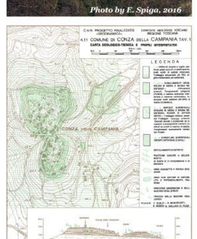



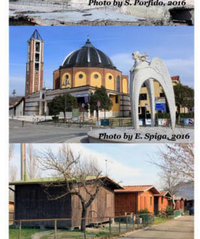
Conza della Campania

Distance from the epicentre (Laviano): about 9 km
Intensity: IX MSK – VIII ESI
Casualties number: 189
Environmental effects: slope movements; ground cracks, ground settlements.
Type of reconstruction: new village completely relocated in Piano delle Briglie (4 km far from the original nucleus) by the architect Beguinot . From the old town core it was recovered the archaeological park (the old Compsa of Roman origin) and some houses in the lower part , through European funding.



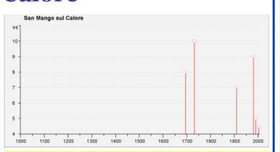
Historical seismicity of the Conza della Campania village since year 1000 versus MCS Intensity (DBM11emidius.mi.ingv.it/DBMI11/).

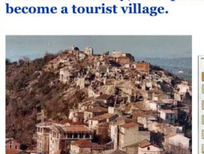


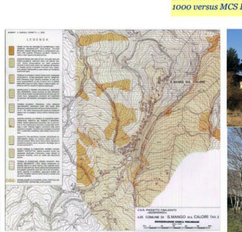
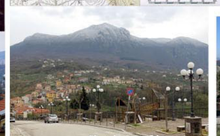
San Mango sul Calore

Distance from the epicentre (Laviano): about 20 km
Intensity: IX MSK – VIII ESI
Casualties number: 84
Environmental effects: slope movements; ground cracks.
Type of reconstruction: 'in situ' total rebuilding after reclamation of foundation soil. In the S.Stefano locality, the prefabricated houses have become a tourist village.



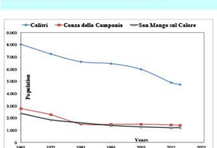
Historical seismicity of the S. Mango sul Calore village since year 1000 versus MCS Intensity (DBM11emidius.mi.ingv.it/DBMI11/).




FINAL REMARKS

In the so-called Anthropocene age it is extremely important, for reconstruction of the villages destroyed by earthquakes, the role of the geologist both in technical and social context, as well as in the ethical one. After the 1980 earthquake, only two villages have been completely relocated, not only respecting the technical parameters, but above all respecting the people will; one of them is Conza della Campania, the other one is Romagnano al Monte. In the examples above described, geologists have deeply contributed both to the retrieval of the villages and to their relocation 'in situ'.



ISTAT data report a gradual decrease in population for all three surveyed municipalities . In San Mango it has gone from 1,581 people in 1981 to 1,192 in 2011, a decline of 401 units. In Calitri for the same period there was a decrease of 1697 units.

References
Catecchia V., 1986a: Ground deformations and slope instability produced by the earthquake of 23 November 1980 in Campania and Basilicata, Geol. Appl. e Idrogeol. 21(S3), 31–100.
ISTAT (2010) http://demo.istat.it/bil2010/index.html
S. Porfido, et Al., 2002. Areal distribution of ground effects induced by strong earthquakes in the Southern Apennines (Italy), Surveys in Geophysics, vol. 23, p. 529-562.
S. Porfido et Al., 2007. Seismically induced ground effects of the 1805, 1930 and 1980 earthquakes in the southern Apennines, Boll. Soc. Geol. It., vol. 126, p. 333-346.
D. Postpischl, A et Al., 1985. The Irpinia earthquake of November 23, 1980. Atlas of isoseismal maps of italian earthquakes, CNR-PFG N. 114 V.2A.
L. Serva, et Al., 2007. Environmental effects from five historical earthquakes in Southern Apennines (Italy) and macroseismic intensity assessment contribution to INQUA EEE Scale Project. Quat. Int., vol. 173, p. 30-44.
Samuelli-Ferretti & Sim, 1983. Comune di Calitri (AV). In: Indagini di microzonazione sismica CNR- PFG, Pubbl. n . 492
Guelfi, Monteforti, Bozzo, Galliani, Plesi, 1983. Comune di Conza della Campania (AV). In: Indagini di microzonazione sismica CNR- PFG, Pubbl. n. 492
Pro Loco Conza: http://www.geolococompsa.it/Pagine_Principali/Storia.html