

Preface to the volume “Geophysical approaches for subsurface investigation: Italian case studies”

This is the twentieth volume collecting a group of selected papers presented during the annual national conference of the “Gruppo Nazionale di Geofisica della Terra Solida” (GNGTS). It may be considered a sort of summary of the novelties arising during the congress.

GNGTS was established in 1978 as an offshoot of the Italian “Consiglio Nazionale delle Ricerche” to promote, develop, and coordinate research in the field of solid Earth geophysics. GNGTS comprises various sections: seismology, geodesy and gravimetry, geothermal research, crustal geophysics, mining and environmental geophysics, near-surface applications, as well as seismic exploration. In the past years, in spite of its limited budget, GNGTS has funded several research activities and has sponsored multi-disciplinary projects, mainly devoted to the study of the Earth’s crust. About 500 researchers refer to the GNGTS and meet every autumn for a national assembly: a point of reference in the life of the Italian geophysics. Although the institution GNGTS was closed in December 2000, the annual conference GNGTS continued to be held and reached its silver anniversary in 2006.

Peer-reviewed proceedings of the national conferences have been published since 1997 in special volumes and on CD-Roms, mainly in Italian. These documents are also available at the GNGTS website gngts.inogs.it. Since the year 2000, with the exceptions of 2012 to 2015, when the volumes of the proceedings of the conference were printed, it was decided to publish selected papers from the GNGTS conferences in an international geophysical journal, also in order to achieve a better dissemination of the GNGTS activities for an international audience.

Over the years, multidisciplinary and single-theme volumes have been issued. The multidisciplinary volumes, which make up the vast majority of the published volumes, generally presented one paper from each of the sessions of the GNGTS conference. In this case, all three broad themes, i.e. geodynamics, seismic characterisation of the territory, and applied geophysics, have been documented by a suite of papers. Conversely, the three thematic issues published up to now, have presented papers from a single GNGTS session that was of particular interest in the year of presentation. In this way, one BGTA volume was devoted to the 2009 L’Aquila earthquake (Amato *et al.*, 2011), another to the GNGTS session concerning earthquake forecasting and hazard assessment (Albarello and Meletti, 2012), a third to the international session on the seismic hazard of the critical facilities (Grimaz and Slejko, 2014), and a fourth referred to the session about science, technology, and communication to support seismic prevention (Dolce and Martelli, 2019). A summary of the structure and activities of the GNGTS is described in a recent paper by Slejko (2020).

The present volume consists of 6 out of the 241 papers presented orally or as posters during the 37th GNGTS national conference, held in Bologna in November 2018. The topics treated in this volume cover several themes of solid Earth geophysics, such as exploration geophysics, volcanology, and engineering seismology. They present specific studies conducted in the Italian territory that give important highlights on the subsurface geological/geophysical structure which provide fundamental elements for the scientific community and all the potential stakeholders interested in the sustainable use of the subsurface.

The paper by Pajola *et al.* (2020) was given as a key lecture at the conference and presents a case history describing the revision of the 3D seismic volume for an onshore hydrocarbon field in Italy. One of the key elements for the success of the project was the contribution of the geological information to seismic data processing and imaging, which was deemed since the beginning as an indispensable guide to drive and constraint the seismic reprocessing.

Ferri *et al.* (2020) present the results of a gravity investigation conducted in the Norcia intermountain basin (central Italy) in order to obtain a subsurface picture of its structural setting and to estimate the thickness of the Quaternary infill sediments. The survey consisted of 210

measurements, placed evenly in the whole Norcia Plain and gravity anomaly maps were produced showing the Quaternary thickness spatial distribution within the basin and buried faults affecting the bedrock.

The interpretation by Patricelli and Poli (2020) of ENI industrial seismic lines, integrated with geophysical and morphotectonic data, led to the reconstruction of the deep geometry, kinematics, and Quaternary rates of the main blind thrusts in the north-eastern corner of the Friuli Plain depicted in four geological cross-sections.

Natale *et al.* (2020) present a detailed reconstruction of faults associated with volcano-tectonic activity within the Neapolitan Yellow Tuff caldera (Campi Flegrei, Campania), based on the analysis of very high-resolution seismic reflection profiles in the Pozzuoli Bay. This reconstruction allowed a tentative chronostratigraphic correlation of intra-caldera seismic reflectors, which involves alternating marine sediments and volcanoclastic deposits from the main intra-caldera eruptions, with the last 15 kyr stratigraphy established on land.

Lanzano *et al.* (2020) describe a parametric table (flatfile) that contains intensity measures of engineering interest and associated metadata of three-components manually processed waveforms, highlighting the main differences in terms of structure, data statistics, and qualification of metadata.

Rosti *et al.* (2020) focus on the seismic vulnerability assessment of the Italian residential building stock, by taking advantage of post-earthquake damage data collected after past Italian seismic events of the period 1980-2009. Seismic vulnerability is described by correlating empirically-derived damage index values and the peak ground acceleration, representing the selected ground motion intensity measure.

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Valentina Volpi and Dario Slejko

Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, Trieste, Italy