

EGU2020-1226

<https://doi.org/10.5194/egusphere-egu2020-1226>

EGU General Assembly 2020

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Integrated interpretation of reflection seismic and aeromagnetic data in a marine geological complex area: a case study.

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This paper presents an integrated seismic and aeromagnetic approach applied in the geological complex area of the Cagliari Gulf in the southern Sardinian margin (Western Mediterranean). The investigated area represents the southern extreme part of the main branch of the Sardinian Rift (SR) (Western Mediterranean) that is made up here of a sub-basin bounded by approximately NW faults. The study was also integrated by complementary information deduced from the GNSS network in southern Sardinia.

The aim of this study was to give a contribution on the knowledge of the tectonic evolution and volcanism of the investigated area. For this purpose we used an integrated interpretation of two-dimensional reflection seismic sections and aeromagnetic data. In the same area a well drilled for oil prospection was used for calibrating the seismic interpretation up to approximately 1.8 sec.. It is worth noting that the interpretation of the seismic data can be problematic in structurally complex areas where volcanic formations occur, but it can be assisted effectively by magnetic interpretation. An interesting magnetic pattern represented by a strong, well-localized positive magnetic anomaly extending N-S for approximately 35 km is present in the western part of the Gulf. Its width in the W-E direction is of almost 20 km. The anomaly seems to be linked with the magnetic anomalies that characterize the southern Sardinian Rift in correspondence to the Campidano Graben. In fact, a set of localized high-gradient anomalies generally corresponding to the Oligo-Miocene andesitic calc-alkaline complexes is present in this Graben. The aeromagnetic interpretation was carried out to explain the origin of the above strong elongated magnetic anomaly that has never been quantitatively interpreted. In this work, this anomaly has been interpreted by means of Euler deconvolution, the analytical signal and by a delineation technique based on the maxima of the radial horizontal derivative of the total magnetic field. The geological knowledge of the area by means of earlier studies also on land contributed to give a petrographic meaning to the magnetic sources, while by the magnetic and seismic integrated interpretation it was possible to carry out a spatial reconstruction of the volcanic source body and to give an useful contribution to the knowledge on the volcano-tectonic evolution of the area. Recently the area of

the Gulf of Cagliari was affected in its western sector by a weak earthquake with hypocenter at around 10 km of depth, localized by Istituto Nazionale di Geofisica e Vulcanologia (INGV). The results of this study also provided new elements of knowledge which have contributed to understand this seismic event.

Acknowledgements: This work was partially supported by FIR (Fondi integrativi per la Ricerca) funded by the University of Cagliari (Italy) and by RAS/FBS (grant number: F71/17000190002) grants for funding.