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Local versus regional active stress field in 5900m San Gregorio Magno 1 well (southern Apennines, Italy).

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The aim of this work is to characterize the local stress field in a peculiar sector of the southern Apennines by analyzing borehole breakouts, fractures and logging data along the San Gregorio Magno 1 deep well, and to compare the achieved stress field with the regional one.
The study area is characterized by diffuse low-Magnitude seismicity, although in historical times it has been repeatedly struck by moderate to large earthquakes. We have analyzed in detail the 5900m San Gregorio Magno 1 well drilled in 1996-97 by ENI S.p.A. and located very close (1.3 km away) to the Irpinia Fault. This fault was responsible of the strongest earthquake happened in this area, the 23rd November 1980 M6.9 earthquake that produced the first unequivocal historical surface faulting ever documented in Italy. The mainshock enucleated on a fault 38 km-long with a strike of 308° and 60-70° northeast-dipping, consistent with a NE-SW T-axis and a normal faulting tectonic regime.
Borehole breakouts, active faults and focal mechanism solutions have allowed to define the present-day stress along and around the San Gregorio Magno 1 well and other analysis (logging data) to discriminate the presence of fracture zones and/or faults at depth. We have considered data from 1200m to the bottom of San Gregorio Magno 1 well. Our analysis of stress-induced wellbore breakouts shows an inhomogeneous direction of minimum horizontal stress (N359+-31°) orientation along the well. This direction is moderately consistent with the Shmin-trend determined from breakouts in other wells in this region and also with the regional active stress field inferred from active faults and earthquake focal plane solutions (N44 Shmin oriented). For this reason we have computed for each breakout zone the difference between the local trend and the regional one; comparing these breakout rotations with the spikes or changing trend of logs we have identified possible fractures or faults at different depths. We have correlated the scattering intervals of breakout orientations to fracture and/or active fault zones, to the presence of fluids and to the lithology to identify possible local source of stress.