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Present-day stress magnitude at depth from leak-off tests in Italy

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We present new results from the analysis of leak-off tests, performed in deep oil wells in Italy, to characterize the present-day stress magnitude and regime in the crust. In the last years we have collected a large number of data (more than 500) from different stress indicators, mainly borehole breakouts, earthquake focal mechanisms and fault data, which provided information on the present-day stress orientations. In some areas the tectonic regime has been inferred either from fault plane solutions of M$\geq$4 earthquakes or from stress inversions of smaller earthquakes. Where seismicity lacks, the regime is not well constrained and little or no information on the magnitude of the crustal stresses is available. In order to improve our knowledge in stress regime and its magnitude in Italy, in this work we use the leak-off test technique. Each test is performed at the bottom of an open hole by sealing off a section and then slowly pressurizing with a fluid until hydraulic tensile fractures develop. The minimum horizontal stress is inferred by leak-off pressure record, the vertical stress is computed by rock density data and the maximum horizontal stress is estimated applying a specific formula from the literature. Thanks to ENI S.p.A. (Italian oil company), that kindly provided new well data, we have been able to perform a critical review of our preliminary calculations and to enhance our previous results concerning stress magnitudes. Totally, we have analyzed 192 leak-off tests at depth between 200 and 5400m (average 1800m). In particular, wells are located along the Italian peninsula and in Sicily: most of them are in the Po Plain and along the Apenninic foredeep; few are in southern Apenninic belt and a few tens are in Sicily. After an accurate selection of the most robust results, we better characterize the Italian stress regime at depth.