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Physical properties of seismogenic Triassic Evaporites in the northern Appennines (Central Italy)

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Two earthquakes of magnitudes Mw=5.7 and 6 marked the beginning of a seismic sequence in the northern Apennines of Italy in September 1997, characterised by thousands of aftershocks and four additional events with magnitudes 5 $<$Mw$<$ 6. Geologic cross-section integrating surface geology with seismic reflection profiles show that the first two mainshocks and the largest aftershocks nucleated in the Triassic Evaporites (TE) at depth of about 5-6 km.

The aim of this work is to assess the evolutions of physical properties of TE at depth by studying the evolution under varying effective pressure in order to correctly interpret the geophysical investigations.

The TE are a sedimentary sequence, 1.5-2.0 km thick, composed of decimetric-to-decameter scale interbeds of anhydrite and dolostone which have been affected by post depositional diagenetic and intense tectonic processes. We present a data set of laboratory measurements of density, porosity, P- and S-wave velocities and fluid permeability measured at effective pressure from 0 to 100 MPa in a permeameter designeed for simultaneous measurements of physical properties on samples of TE collected from quarries in Tuscany (Italy). Measurements were carried out both for dry and water saturated samples. Microstructural observations carried out with a field emission SEM show foliation and presence of damaged dolostone clasts in the anhydrite samples while the dolostone samples are characterized by centimetric micritic clasts cut by

millimetric gypsum and calcite filled veins. Samples show very low porosity ($<$2%) except for some fractured dolostone collected in the field ($\approx$6%). P-wave and S-wave velocities measured at ambient pressure fit the correspondent density. By increasing effective pressure to 100 MPa P- and S-wave velocities increase of about 20% and 5% in dry and water saturated samples respectively. S-wave velocities appear to be more significantly influenced by the direction of the foliations. Low velocities hysteresis observed after the pressurization-depressurization cycle suggest that the bulk of deformation in hydrostatic stress conditions is elastic. Preliminary fluid permeability measured through the steady-state technique show values for dolostone in the range of 10^{-17}-10^{-18} m^2 and even lower values for anhydrites (10^{-19}-10^{-20} m^2). Finally samples from boreholes and correspondent physical properties are also presented. The integration of the two data sets is expected to highlight the changes in physical properties due to the exhumation.