Connecting velocity changes with complementary observations (fast and slow strain perturbations, temperature etc.): Insights from long-term (decades) monitoring in several Italian regions

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We present a set of studies on velocity variations (dv/v) measured from seismic noise correlation in the Italian region. By exploring the evolution of the dv/v as function of coda lapse time, and comparing with independent observations (e.g. dynamic and quasi-static strain, temperature induced strain, rain etc.) we are able to get new insights into the causes of velocity variations as function of space (depth). Out of our results we recognized depth dependence of coseismic velocity drop and recovery in the region of l’Aquila, and depth and spatial dependence of sensitivity to long period (years) small strain variation (~10e-6) induced by hydrological processes. In a similar way to dynamic acoustic-elastic testing in laboratory, we extract non-linear parameters of the crustal rocks. These measures are compared with laboratory results to get insights about the physical state of the rocks in the crust, in regions hosting seismogenic faults. A summary of frequency and strain dependent dv/v and sensitivity further permits to compare our results to laboratory experiments.