Non-linear seismic velocity variations observed during a seismic swarm in the Alto Tiberina low angle normal fault from ambient noise correlation measurements

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Earthquake swarms are bursts of relatively small to moderate earthquakes lasting from hours to months without a clear triggering mainshock. To shed new light on the physical processes driving the seismic swarm that occurred in 2013 along the Alto Tiberina low angle normal fault, we investigate the strain sensitivity to seismic velocity variations (dv/v). For that, we use continuous recordings of ambient noise recorded at 18 stations located in the vicinity of the Alto Tiberina fault for a period of four years. We then retrieve daily dv/v with a time lapse approach by applying the stretching technique. After decomposing our dv/v into tectonic and non-tectonic (thermoelastic and rain induced changes) components, we find a velocity drop (0.035%) coinciding with the seismic swarm. Our observations and the deduced strain sensitivity of roughly 1000 suggest that the triggering of the swarm is mainly caused by an aseismic slip enhanced by the presence of fluids at seismogenic depth (3 - 5 km).