

## Insights on the deep activity of Piton de la Fournaise Volcano from long-term seismic velocity changes

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We study Piton de la Fournaise (PdF) Volcano dynamics through the observation of continuous seismic velocity changes during the period 2009 to 2013. We compute cross-correlations of ambient seismic noise recorded at 21 broad-band stations of the Undervolc and PdF Volcano Observatory networks. The velocity changes are estimated from the travel time delay measured on the coda of noise cross-correlations. The portion of the coda we use to measure velocity changes consists predominantly of surface waves. The sensitivity at depth of the coda waves thus varies with the frequency, similarly as the one of the Rayleigh waves. The short period waves are sensitive to the shallow structure of the volcano, while the long period waves are sensitive to its deeper structure. Using this property of the surface waves, we seek to estimate the velocity perturbation at different depth. We observe a dependence of seismic velocity change with the period band considered. At short period (0.5-4s), in addition to the short-term velocity changes produced by the volcanic eruptions (October 2010 and December 2010), a long-term increase of velocity is measured between 2009 and 2013. This is consistent with geodetic measurements, which indicate a deflation of the volcanic edifice since April 2007. At longer periods we observe velocity changes that do not correlate in time with PdF eruptive activity. Yet, distinctive episode of velocity changes are observed at different period bands suggesting changes in the elastic properties at different depth.