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Doublets and wavelets: anisotropic changes measured at Mt. Vesuvius.

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Shear-wave splitting is the elastic-equivalent of the well known phenomenon of optical birefringence. A shear wave propagating through an anisotropic solid splits into two S-waves that travel with different velocities and with different directions of polarization, generating two observables: TD that is the time delay between the two split S waves, and LSPD that is the polarization direction of the faster S wave. In the upper crust this phenomenon has been interpreted to occur in zones of fluid-filled cracks, microcracks or preferentially oriented pore spaces. The time evolution of anisotropic distribution of microcracks due to a differential stress, according to the nonlinear anisotropic poroelasticity (APE) model, is explained by the fluid migration along pressure gradients between neighbouring microcracks and pores. In this framework the shear wave splitting parameters are indicators of the state of stress in the upper crust. We obtained shear wave splitting measurements for local earthquakes occurred before the largest earthquake (M= 3.6 occurred October 9th, 1999) recorded at MT. Vesuvius after the last eruption (March 1944). The arrival times of split shear waves and the polarization directions were detected by using the wavelet transform of a three-component signal. In order to avoid any spatial effects on the time behaviour of the parameters, we perfomed the analysis for a selected a dataset of doublets. Short term (of the order of the days) variation of both TD and LSPD parameters are retrieved before the occurence of the M=3. 6 event.