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Seasonal variation of the measure of soil fundamental resonant frequency

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The ambient seismic noise analysis is a very important tool for evaluating the fundamental resonant frequency of soil deposits (Fo) by applying the horizontal to vertical spectral ratio method (H/V).
We performed noise measurements in a large area of the Po Plain and found Fo in a range between 0.5 and 0.8 Hz. This range is connected to a significant discontinuity in the sedimentary layers at a depth of around 110 meters.
Several months of seismic noise continuous recording in two selected sites of the Po Plain, Boretto and Mantua which are 33 Km apart, showed a daily, weekly and seasonal variation of the fundamental frequency Fo evaluated by means of H/V ratio.
Whereas daily and weekly variations of Fo are related to the spatial distribution of local sources of anthropic activity, the seasonal variation shows a significant correlation between the two investigated sites.
In order to asses the possible influences of soil condition upon the observed seasonal variation of Fo, we evaluated the absolute spectral content of the seismic noise on the same time window recorded at a site, Bormio (Valtellina), located 160 Km away from the Po Plain stations. To note that the wave field at Bormio station is not affected by the characteristic deep sedimentary alluvial layers of the Po Plain.
We found a significant correlation among the general weather conditions, the global pattern of the wave field recorded by the station in the Alpine region, in terms of spectral content in the range 0.1 to 1 Hz, and the seasonal variation of the measure of Fo by means of H/V ratio of the stations in the Po Plain.