# Seismic velocity variations generated by controlled hydrological changes : field and laboratory studies based on seismic noise cross-correlation

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Continuous seismic noise recordings allows the possibility to monitor changes of the investigated media at various scales. In this study, we focus on the link between seismic velocity variations (dv/v) derived from seismic noise cross-correlations between pair of stations and the controlled hydrological variations generated at two scales in different contexts. The first field-scale experiment has been performed within the water-field of Crépieux-Charmy (Lyon, France), where 99 3-C velocimeters were deployed during 20 days around a retention basin built to modify the flow of water in case of pollution from a river. This allowed to dynamically image the seismic velocity variations deduced from the seismic background generated by two filling/drainage cycles of the basin. The dense seismic network has allowed us to obtain high resolution tomographies of the velocity variations and to relate them to local measurements of the water table using piezometers. Although a remarkable agreement was found between the 2 observables, showing in particular the establishment of a 3D dome of the water table, this experiment also allowed to show response delays at the level of the drainages, due to the variations of the unsaturated zone content. To better understand these effects occurring in the critical zone, we tried to reproduce a similar monitoring experiment at the laboratory scale, by equipping a tank filled with sand where we could vary and measure the hydrological changes (water table, saturation). We used continuous seismic sources deployed on the edges of the tank and recorded the seismic noise thanks to 3 components accelerometers. The combination of these two approaches at different scales permit to better understand the links between seismic velocity variations, water table and relaxation due to changes of the water content within the unsaturated zone.