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Sub-daily seismic velocity changes as indicator for large vulnerable groundwater reservoirs

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We use an adapted approach for long-distance high temporal resolution monitoring to investigate the daily and sub-daily behavior of seismic velocity changes. We analyze four years of continuous data from AlpArray and other local networks throughout the Central-Southern Europe. Focusing on the 1 Hz frequency we calculate seismic velocity changes based on coda wave interferometry. Our results show that we can observe a consistent periodic behavior with periods of 24 h and 12 h, with a focus primarily on the latter. We attribute these changes predominantly to variations in atmospheric pressure. These changes manifest through loading effects on the unsaturated zone and alterations in the water bodies below that. By analyzing the spatial variations of this two-cycle-per-day behavior we found a strong correlation with extensively karstified water-bearing formations. This connection may contribute to the hydrological characterization of the near-subsurface in central Europe identifying large water reservoirs.