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Spatiotemporal variability of soil water stable isotopes at Langeoog Island in Germany

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Stable isotope studies of soil water (hydrogen and oxygen isotopes) comprise important information for fields like hydrogeology, water sciences and ecology. Novel laser techniques with substantial higher sample throughput allow campaigns with better spatial and temporal sampling resolution. We collected soil samples from unsaturated zone profiles during May, June and October 2012 at the Island Langeoog in Germany, to depths of more than 500 cm and vertical steps of 10 cm resolution. Continuing sampling campaigns are planned for January and March 2013. For an estimation of isotope composition we used a novel vaporization method with an induction module (IM) coupled to a Picarro L2120-i water vapor analyzer that was recently introduced. Accuracies derived during tests with spike waters and sandy soils are between 0.8‰ and 4‰ over a range of 21‰ and 165‰ for δ^{18}O and δ^{2}H, respectively. For field samples we analyzed three replicates for each soil sample. The unsaturated zone profiles show patterns that can be interpreted as summer and winter fluctuations, which allow a direct observation of soil water movement and an estimation of groundwater recharge. A discussion of accuracies and advantages of the method will be given and future perspectives on soil water isotope studies will be discussed.