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Seasonal land subsidence and rebound monitoring in the Lucca plain (central Italy) with ERS 1&2 and in situ observations

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We investigates the application of radar interferomety (InSAR) to the measurement and interpretation of surface displacements over e developed aquifer systems in the Lucca plain (central Italy). We focus on the first results of a ESA Category 1 Project to study land subsidence by integrating InSAR with ground-truth levelling surveys, geological-geothecnical and hydrogeological data from 1993 to 2005. The subsidence appears to be related to the withdrawal of groundwater over the last two decades, which caused drop of water table and in turn led to elasto-plastic compaction of fine-grained sediments. Moreover, considering the geological framework, we cannot exclude regional vertical motions. Levelling measurements provide vertical motion rates of about 5-10 mm/year averaged over 10 years and show a clear positive correlation with the hydraulic head fluctuation. To monitor such slow changes using interferometry requires accounting for land cover changes, temporal decorrelation, atmospheric effects and differential ground. We consider over a hundred ERS images in track/frame pairs 215/873 and 165/2727. using least-squares method for extract time series from multiple interferograms. Levelling data help constrain the inversion. The results of such small-magnitude vertical displacements observed using ERS1&2 data will be discussed and interpreted in relation to water table changes, stratigraphic and geotechnical data.