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How to tackle spatial variability and temporal non-linearity in land subsidence in unconsolidated coastal environments?

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Accurate land subsidence quantifications are of growing importance as relative sea-level rise in unconsolidated coastal environments is increasingly dominated by subsidence. Land subsidence, especially in unconsolidated settings, is the result of a complex interplay and sum of a range of different subsurface processes. As these processes can be spatially and temporally very variable, it requires more than (point and/or land surface) measurements to accurately quantify subsidence, especially when projections of subsidence are required for example to assess future relative sea-level rise. This requires first of all a thorough understanding of subsidence drivers and subsurface processes in a 4D perspective (3D including time) and secondly data interpretation methods and tools to handle the complex coupling of these interrelated processes to enable spatial-temporal quantification and projection of coastal subsidence.

We present a set of novel approaches, with which we aim to move our capacity to accurately capture and simulate the highly dynamic behaviour of subsidence processes. The approaches range from novel field experiments to advanced interpretation of sedimentary information in coastal-deltaic setting to gain important input for numerical modelling, and to newly-developed state-of-the-art 3D numerical simulators. Through these combined methodologies we aim to improve our capacity to assess both natural subsidence processes, like natural compaction, and anthropogenic-induced processes, like aquifer-system compaction following overexploitation in unconsolidated settings. This will ultimately contribute, for example through scenario modelling of anthropogenic drivers, to create reliable future projections of land subsidence which will enable sound projections of relative sea-level rise.