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Sørensen, Carlo Sass; Knudsen, Per; Andersen, Ole Baltazar

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Coastal Flooding Hazards

due to storm surges and subsidence

Carlo Sørensen (carlos@space.dtu.dk) Per Knudsen (pk@space.dtu.dk) Ole B. Andersen (oa@space.dtu.dk)

DTU Space National Space Institute



Danish Ministry of the Environment Coastal Authority

Introduction



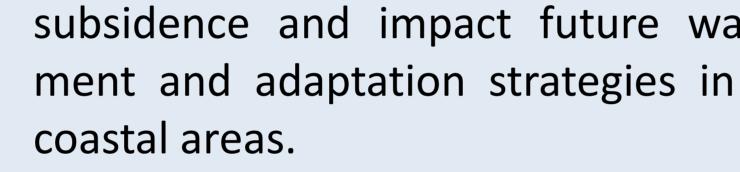
Flooding hazard and risk mapping are major Challenges are amplified in some areas due to topics in low-lying coastal areas before even subsidence from natural and/or anthropogenic considering the adverse effects of sea level rise causes. Subsidence of even a few mm/y may over (SLR) due to climate change. While permanent time greatly impair the safety against flooding of inundation may be a prevalent issue, more often coastal communities and must be accounted for floods related to extreme events (storm surges) in order to accomplish the economically most have the largest damage potential.

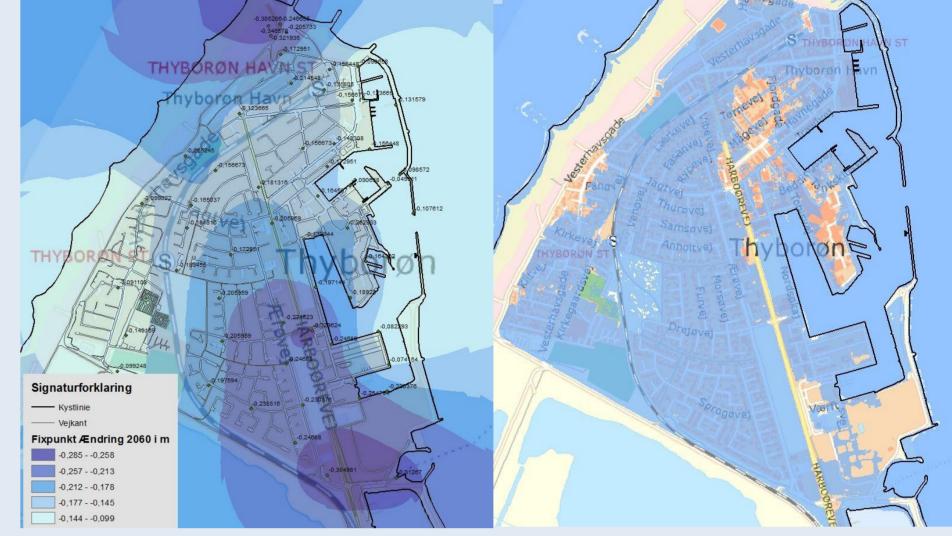
Research

The project (2014-2017) develops and tests a probability of occurrence are provided. variability, and extremes with a very low

practice oriented method for combining extreme Land movement is researched with a focus on water level statistics and land movement in short term surface height variability in the coastal flooding hazard mapping and in climate groundwater-ocean interface that, together with change adaptation schemes. From extreme value longer term processes, may cause substantial analysis of tide gauge records, statistics that subsidence and impact future water manageallow also for projections of SLR, meteorological ment and adaptation strategies in flood prone

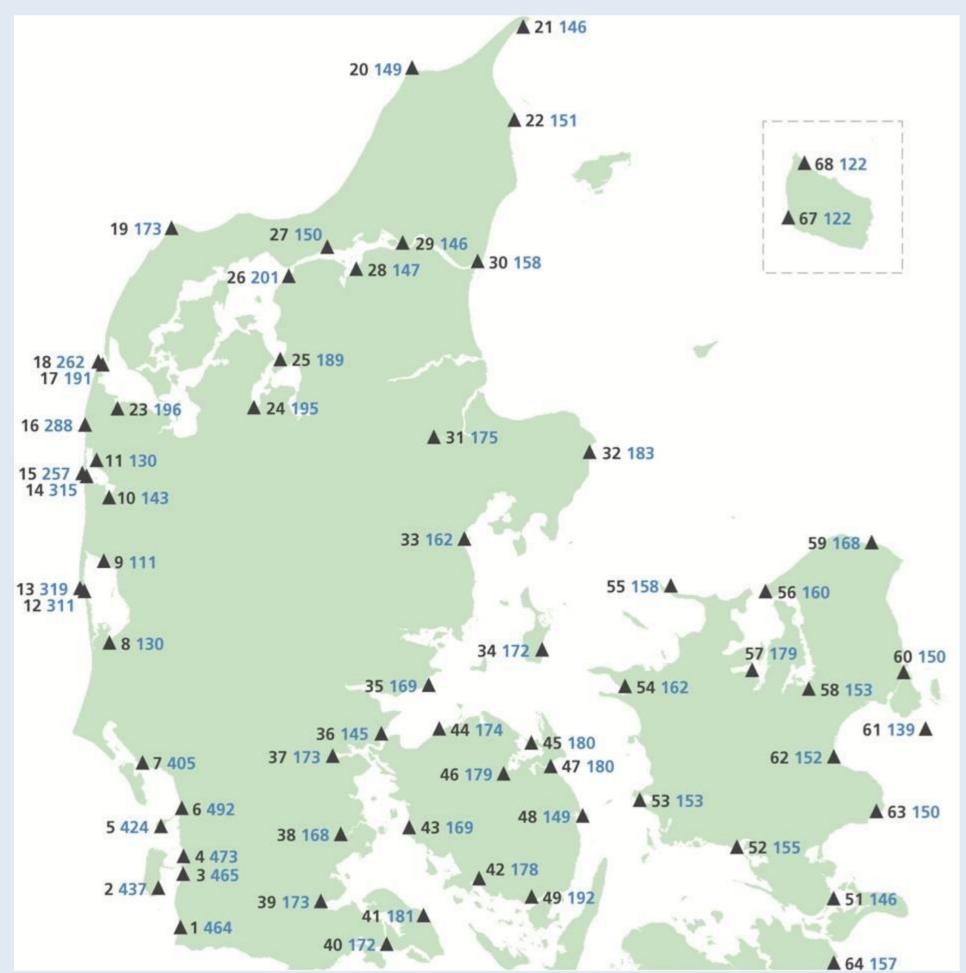
viable protection and management options.





Subsidence pattern (left) and max potential flooding extent for a 100 yr event in 2060 in Thyborøn with uplift (1 mm/y), local subsidence and SLR (3 mm/y). Vertical reduction between MSL and land surface today is 4-10 mm/y (Preliminary results).



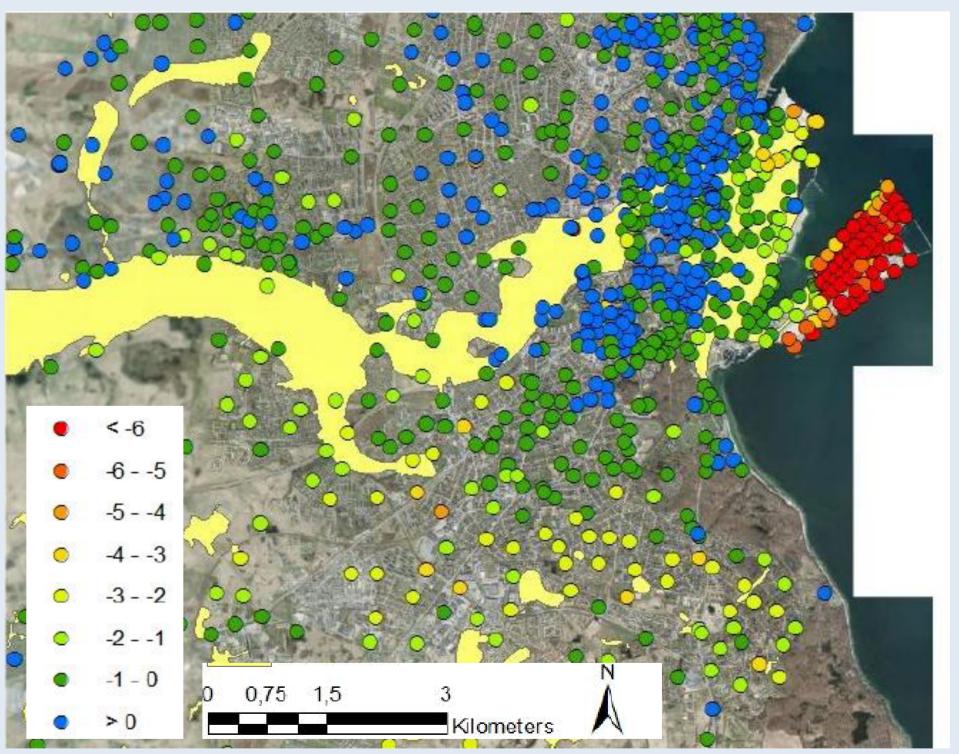


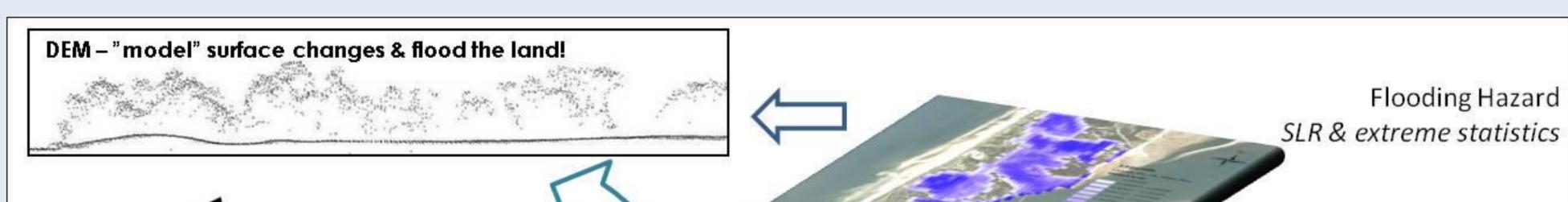
100 year return levels (blue) in cm DVR90 (trend-free) for 68 Danish tide gauge stations in current statistics (From Sorensen et al. 2013).

On location

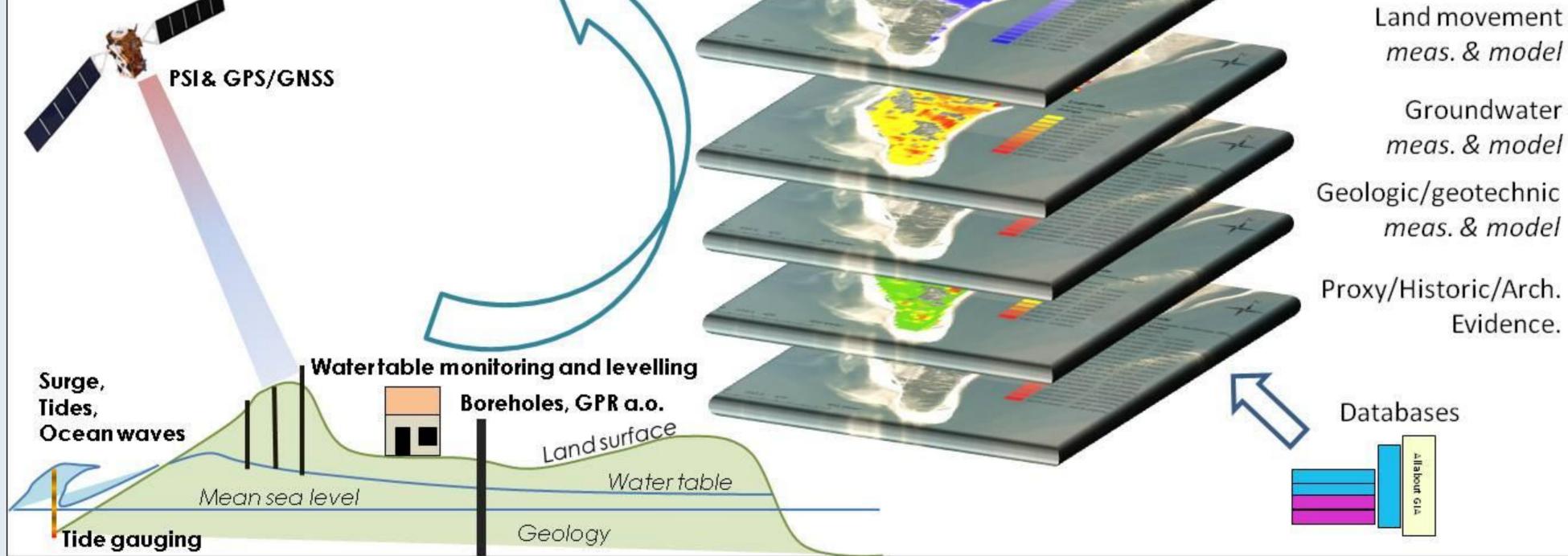
Field studies' results from repeated precise levelling, GPS setups, and ocean and groundwater level monitoring in Thyborøn and Aarhus are integrated into geological and geophysical data and modelling work to explore the nature and causes of the subsidence encountered, and to explore new ways of utilizing data in relation to coastal flooding hazard mapping. Results may then e.g. be projected in a Digital Elevation Model (DEM) to give more realistic future surface and flooding level representations.

The town of Thyborøn on the Danish North Sea coast.





Local rates of land movement (mm/y) at Aarhus on the east Jutland Kattegat coast from repeated levelling. Yellow areas are below 3 m DVR90 (Preliminary results).



Sketch of the setup. Field studies, statistics and existing measurement and modelling efforts are combined to yield more detailed information on land subsidence and to improve flooding hazard assessments.

meas. & model

Outcome

The interdisciplinary research approach calls for collaboration across levels of research. Backed by research communities, public sector organisations and other stakeholders with a pronounced interest in planning tools, the project will draw attention to often overlooked factors in water research and climate change adaptation in Denmark.

WATER DTU Seminar the 28th – 29th October 2014

