Geophysical Research Abstracts
Vol. 20, EGU2018-17443, 2018
EGU General Assembly 2018

Dynamics of peat soils in the 'Green Heart' of the Netherlands measured by satellite radar interferometry

Floris Heuff, Gert Mulder, Freek Van Leijen, Sami Samiei Esfahany, and Ramon Hanssen

Delft University of Technology, Civil Engineering and Geosciences, Geosciences and Remote Sensing, Netherlands (f.m.g.heuff@tudelft.nl)

The Rhine-Meuse-Scheldt delta is shaped by natural and manmade landscapes. Over many polder areas, soils are drained to be used as pastures. Around 30% of the pastures are situated on peat soils, of which many are located in the western part of the Netherlands, known as the 'Green Heart'. Peat is composed of organic materials that oxidize and emit greenhouse gases when exposed to air as a consequence of the draining. Oxidation of peat soils results in volume reduction and subsequent subsidence. As a result, the groundwater level rises relative to the surface. Consequently, the soil needs to be dewatered to keep it sufficiently dry for farming, resulting in more oxidation, and therefore more subsidence. This process is bound to continue until the peat soils have disappeared completely. The societal cost of land subsidence due to peat soils are estimated to be 5200 million euro for urban areas and 200 million euro for peatland pastures, for a period until 2050.

Measuring the subsidence is not straightforward, if not impossible, with conventional terrestrial geodetic means as soft soils make it impossible to install fixed benchmarks for repeated surveying. Satellite InSAR surveys have yielded promising results over spatially limited areas [1], but suffer from the very fast temporal decorrelation over pastures [2].

Here we processed and analyzed surface deformation over the entire Green Heart region using Sentinel-1 SAR images, which yields a time series of data with a typical revisit rate of 2 days. An improved time series InSAR algorithm was applied, including atmospheric phase corrections aided by the Harmonie numerical weather model.

We evaluate the observed surface dynamics in relation to peat layer thickness and compare differences between sandy, clay and peat soils.

[1] Morishita, Y., & Hanssen, R. F. (2015). Deformation parameter estimation in low coherence areas using a multisatellite InSAR approach. IEEE Transactions on Geoscience and Remote Sensing, 53(8), 4275-4283.

[2] Morishita, Y., & Hanssen, R. F. (2015). Temporal decorrelation in L-, C-, and X-band satellite radar interferometry for pasture on drained peat soils. IEEE Transactions on Geoscience and Remote Sensing, 53(2), 1096-1104.