Geophysical Research Abstracts
Vol. 21, EGU2019-2879, 2019
EGU General Assembly 2019


# Coupling subtidal and intertidal evolution: morphodynamic processes and feedbacks at the Suriname coastal fringe, derived from Landsat Earth Observations in Google Earth Engine

Job de Vries, Barend van Maanen, and Steven de Jong
Faculty of Geosciences, Utrecht Univeristy, Utrecht, The Netherlands (j.devries4@uu.nl)

The coastal region of Suriname is low-lying, flat and highly vulnerable for anticipated sea level rise. At the same time, this area is essential for agriculture, fresh drinking water, protection against erosion and flooding, and human settlement. Along-shore migrating mud banks, influenced by wind- and wave dynamics, add to the complexity by providing alternating phases of increased sedimentation resulting in mangrove colonization and coastal erosion accompanied by mangrove loss. With limited quantitative (field)data available on bathymetric evolution, vegetation dynamics and hydrodynamic forcing, this research focuses on utilizing remote sensing possibilities, provided by the Google Earth Engine (GEE) platform, to unravel coastal morphological responses caused by migrating mud banks for the entire coast of Suriname. More specifically, this study aims to quantify decadal-scale changes in the key characteristics (e.g., size, shape, migration rate) of the subtidal portion of the mud banks, and how this determines spatio-temporal trends in the intertidal surface area and mangrove coverage.

A thorough analysis, in both space and time, is required to investigate the relevant morphological units and coastal features. Due to the notable size and the relatively slow movement (+/- 2km/yr.) of mud banks, the full coverage of the Landsat image collections between 1985 and 2018 is utilized. The processing possibilities of the Google Earth Engine platform are used to correlate spectral information, suspended matter concentrations and characterize morphological change. A novel thresholding approach, for delineating land and water based on the Normalized Differenced Water Index, has been applied to distinguish coastlines and the intertidal area. Image classification approaches are tested for their applicability to capture the shape and drift of mud banks. After correcting for atmospheric disturbances, tidal- and seasonal influences, the footprints of mud banks, caused by the high sediment concentrations, can be determined. The developed approach for mud bank extraction is evaluated with bathymetry measurements. Spatio-temporal footprint variations then provide a unique opportunity to accurately reconstruct the cyclic patterns of mud bank movement and unravel correlations with mangrove growth and morphological developments in the intertidal zone.

Through this integrated approach, based on satellite imagery, we investigate the relative contributions of natural forcing mechanisms on coastal changes. In addition, human activities along the Suriname coast are increasingly interfering with this naturally induced variability. We will therefore also focus on locations where mangrove removal has resulted in rapid coastal erosion. In the end, this will allow us to differentiate between anthropogenic and natural drivers of coastal change. This type of information is crucial and highly needed when analysing sediment dynamics and morphological behaviour in light of accelerating sea level rise and increased pressure on the coastal system of Suriname.