Geophysical Research Abstracts
Vol. 21, EGU2019-13881, 2019
EGU General Assembly 2019


# Interannual variability of coastal erosion at the Laptev Sea explained by large-scale atmospheric forcing

David Marcolino Nielsen (1,2), Mikhail Dobrynin (1), and Johanna Baehr (1)

(1) Universität Hamburg, Institute of Oceanography, Germany (david.nielsen@uni-hamburg.de), (2) International Max Planck Research School on Earth System Modelling, Max Planck Institute for Meteorology, Hamburg, Germany

Arctic coastal erosion is generally associated with local surface variables, such as air temperature, wind, sea-ice and waves. In this work, we explore associations between Arctic coastal erosion and larger scale atmospheric mechanisms. We use yearly-resolved erosion rates from three observation sites on the Laptev Sea coast, east of the Lena River delta, from the early 1980's until present. Atmospheric data is obtained from the European Centre for Medium-range Weather Forecasts (ECMWF) Reanalysis ERA-Interim, and from an assimilation experiment from the Max Planck Institute for Meteorology Earth System Model (MPI-ESM). Coastal change rates show high interannual variability, ranging from fairly stable to severely eroding, with annual mean values of up to 25.0 m/yr. Our analyses show that extreme erosion rates - measured during summer months - are associated with large-scale atmospheric circulation patterns in summer, and with air temperature anomalies in the precedent winter. These mechanisms, identified in ERA-Interim, are verified in the MPI-ESM simulations. Up to around 40% of the variance of the detrended annual series of erosion rates is explained by a linear combination of the precedent winter mean 2-meter temperature over Siberia, and Arctic Oscillation (AO) from spring and summer. Extreme erosion rates in ice-rich coastal segments and the summer AO index are strongly correlated (up to r=0.85). However, this association is not so strong in coastal segments where erosion is not thermally dominated. In summary, we show that large-scale atmospheric mechanisms explain, to a large extent, the interannual variability of erosion rates observed on the Laptev Sea coast.