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MODIS-BASED MAPPING OF THE GROWING SEASON AND PLANT PRODUCTION IN RELATION TO CLIMATE ON SVALBARD FOR THE 2000-2014 PERIOD

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The study area is the High Arctic archipelago of Svalbard, located between 76°30' and 80°50'N. The goal of this study is first to use MODIS Terra data to map the growing season on Svalbard for the 2000 to 2014 period interpreted from field observations, and then to analyze the relationship to climate and annual plant production.

Due to a short and intense period with greening-up and frequent cloud cover, all the cloud free data is needed, which requires reliable cloud masks. We used a combination of three cloud removing methods (State QA values, own algorithms, and manual removal). This worked well, but is time-consuming as it requires manual interpretation of cloud cover[1].

Phenological field observations along tracks close to the village Longyearbyen on Svalbard has been established. The onset of the growing season was then mapped by a NDVI threshold method, which show high correlation ($r^2=0.60$, $p < 0.001$) with field observations of flowering of polar willow. For mapping the end of the growing season a combination of different methods have to be used, depending on the land cover type.

On average for the 15-years period, the onset of the growing season occurs after July 1st in 68% of the vegetated areas of Svalbard. The mapping revealed large variability between years, however, no clear trend in onset of the growing season for the 2000-2014 period was found. The MODIS mapped onset of the growing season shows significant correlation with June and early July temperatures, but the analyses also indicate that snow rich winters probably delay the onset in some areas. On the eastern and northern parts of the archipelago, the onset of the growing season might correspond with the timing of the melting sea-ice. A preliminary study also indicate that time-integrated NDVI from onset of the growing season to peak of the season correspond with field measurements of annual plant production on graminoids, and show two-fold variations between a short/cold growing season compared with a long/warm growing season.

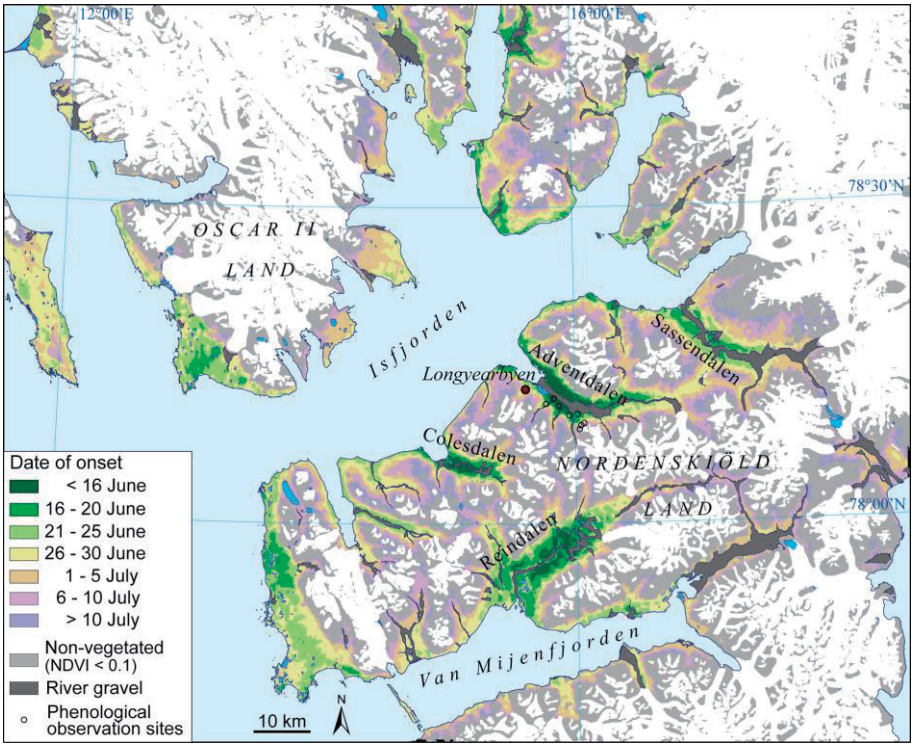

Figure 1. Time of onset of the growing season of central parts of Svalbard, based on mean values from the MODIS-NDVI dataset for the period 2000–2013.

[1] Karlsen, S.R., A. Elvebakk, K.A. Høgda & T. Grydeland. 2014. Spatial and Temporal Variability in the Onset of the Growing Season on Svalbard, Arctic Norway - Measured by MODIS-NDVI Satellite Data. Remote Sensing. 6: 8088-8106.