Project Database of ICP Forests
PROJECT DESCRIPTION

PROJECT INFORMATION

Project title:	Mapping the spectral imprint of the 2018 drought at the ICP Forests plots
Project ID:	157
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Background:

The weather conditions in 2018 provide a unique large-scale drought experiment that offers the chance to develop and test remote-sensing techniques for monitoring drought impacts from space. Drought and particularly the effect of "hotter" drought is globally an underestimated threat to tree mortality (Allen et al., 2015).

Impacted forest health condition may manifest itself by discolouring, defoliation, and wilting. All these symptoms will result in a decline of alive, photosynthetic active vegetation that can be observed in-situ, but also from space via vegetation indices and their deviation from normality. The degradation of the crown condition may reduce evapotranspiration cooling capacity an thus result in positive feedback to drought (Teuling et al., 2010). Indicators of forest health such as defoliation can be observed and monitored in the field like it is done in the frame of the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests operating under the UNECE Convention (ICP Forest) at Level I monitoring plots. However, also remote sensing techniques offer a vast and exponentially increasing repertoire of products related to vegetation activity and health (Lausch et al., 2016; Meng et al., 2018; Millar et al., 2018). Most frequently vegetation indices and their deviation from normality, so-called anomalies, are applied to retrieve information on vegetation health status (Norman et al., 2016).

Objective:

The objective is to map the drought 2018 situation using remote-sensing derived vegetation indices (NDVI, NDWI) at the ICP Forests plots.

Questions:
Compared to 2016 and 2017 does the drought 2018 year result in a spectral anomaly?
Are the vegetation indices related to the crown condition observation?
Which other factors (soil, LAI, tree species) define the observed pattern of vegetation indices?

Methods:
Since July 2015, images of the Sentinel-2a satellite are produced globally every five days with a spatial resolution of 10 m and with 13 bands in the visible, near infrared, and short wave infrared part of the spectrum. Here we propose to use this freely available images to extract the inter- and intra-annual dynamic of vegetation indices for the period 2016 to 2018. Spectral deviations of vegetation indices in summer and autumn from the commonly moist spring conditions will serve as a proxy for impacted forest health conditions. The crown condition data at the Level I plots (2016 to 2018) will be used for ground-truthing the satellite derived data. Leaf area index, soil solid phase, and soil water data will help to stratify the analysis of the linkage between in-situ observation and remote sensing data.
Successful spatial mapping of the 2018 drought imprint at the ICP Forests plots could represent a baseline to intersect the spatial pattern with potential causal factors and as such represents a cornerstone to understand the susceptibility and resilience of forest ecosystems to future drought impacts.