GLOBAL SNOWPACK
PROCESSING AND ANALYSIS OF SNOW COVER TIME SERIES
FOR CLIMATE CHANGE ASSESSMENT ON A GLOBAL SCALE

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Global SnowPack background information
The Global SnowPack is a set of snow cover products derived from medium resolution remote sensing data. Daily snow cover maps are combined and analysed to produce information about early season (SCD_{ES}), late season (SCD_{LS}), and overall snow cover duration (SCD) within a hydrological year.

\[
SCD = \sum_{i=1}^{n} \left( S_{i} \right) \quad SCD_{ES} = Fd - SCD_{aFd} \quad SCD_{LS} = Fd + SCD_{aFd}
\]

(\text{Eq. 1}) \quad \text{(Eq. 2)} \quad \text{(Eq. 3)}

- \( n \): number of observations for a hydrological year
- \( Fd \): fixed date of maximum snow cover extent (Jan 15 for Northern, Jul 15 for Southern Hemisphere)
- \( S_{i} \): cloud-free dataset of snow cover for a given day
- \( aFd \): SCD before (bFd) and after (aFd) the fixed date

Data Sources and processing
For the years between 2000 and 2014, the MODIS daily snow cover products MOD10A1 and MYD10A1 are used as the basis for the calculation of the Global SnowPack. For years prior to 2000, AVHRR was selected as the primary data source. While the MODIS snow maps are available as thematic Level 3 products, the AVHRR data come as Level 1B and require additional pre-processing. This is performed relying on Terascan and the AVHRR Processing Over Land, Cloud and Ocean (APOLLO) scheme.

Results, status of processing, and outlook
Figure 2 illustrates the SCD for the hydrological year 2012/2013. ~100,000 MODIS tiles are processed per year. As of today, the full global archive of MODIS data has been processed to derive SCD, SCD_{ES}, and SCD_{LS}. The analysis of AVHRR on the other hand is only finished for selected study sites in Central Asia and constitutes a challenging task for the future.