Comparison of snow cover products from PROBA-V, Landsat and MODIS on big data platforms

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Abstract:
Snowmelt is an important and dynamically changing water resource in mountainous regions around the world. In this framework, remote sensing data of snow cover data provides an essential input for hydrological models to model the water contribution from remote mountain areas and to understand how this water resource might alter as a result of climate change. Traditionally, however, these remote sensing products show a trade-off between spatial and temporal resolution (e.g., 16-day Landsat at 30m vs. daily MODIS at 500m resolution). With the advent of PROBA-V 100m product this trade-off can partially be tackled by having data that corresponds more closely to the spatial and temporal variations in snow cover typically observed over complex mountain areas.
This study provides a quantitative analysis of the trade-offs between the state-of-the-art snow cover mapping methodologies for Landsat, MODIS and PROBA-V and applies them on big data platforms such as Google Earth Engine (GEE) and RSS (ESA Research Service & Support) CloudToolbox, which can be seen a precursor of the upcoming PROBA-V Mission Exploitation Platform (MEP).
Analysis of the differences in derived snow cover areas from PROBA-V, Landsat and MODIS reveals the importance of understanding the spatial and temporal scales at which variations occur. Large spatial variability within a MODIS pixel complicates the performance of retrieval methods for MODIS time series, especially over complex mountain areas, whereas the large temporal variability, on the other hand, constrains the validity of time series of Landsat retrievals. Given these constraints, PROBA-V 100m snow products provide a promising avenue for improved snow property mapping over complex regions.