METU FMI

EUMETSAT HSAF SNOW COVER PRODUCTS: H10 and H34

EUMETSAT H SAF

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Introduction

Reliable snow cover extent is of vital importance in order to have a comprehensive understanding for present and future climate, hydrological, and ecological dynamics. Development of methodologies to obtain reliable snow cover information by means of optical remote sensing (RS) has long been one of the most active research topics of the RS community. In this study EUMETSAT snow cover products namely H10 (Figure 1) and H34 (Figure 3)are presented. The generation chain for flat/forested areas, developed and tested by FMI, is actually run at the SAF for Land Surface Analysis (LSA-SAF), in Portugal, and data are disseminated by EUMETCast. TSMS, receives the SEVIRI image data via EUMETCast and performs the processing tuned to mountainous areas (Figure 2).

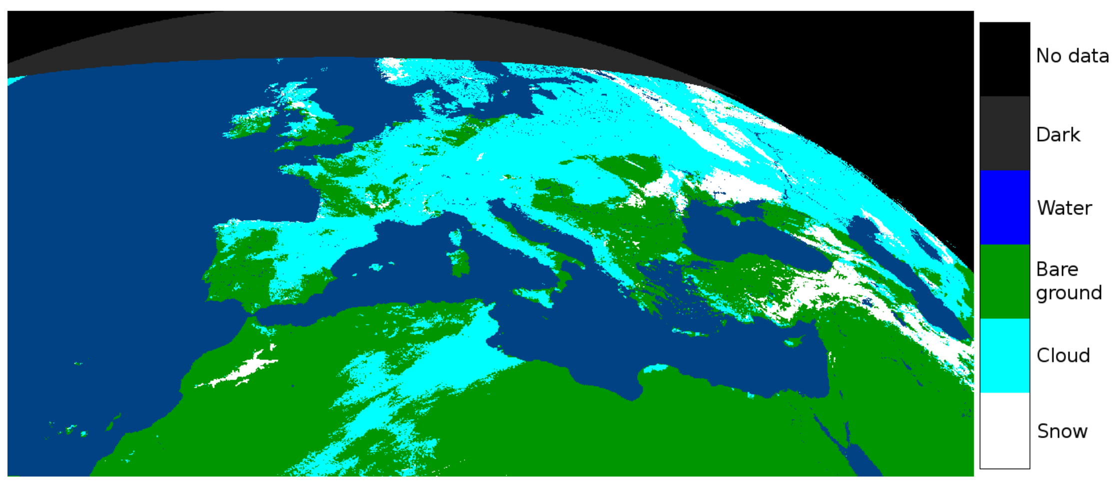

Figure 1. H10 product for 01.02.2018

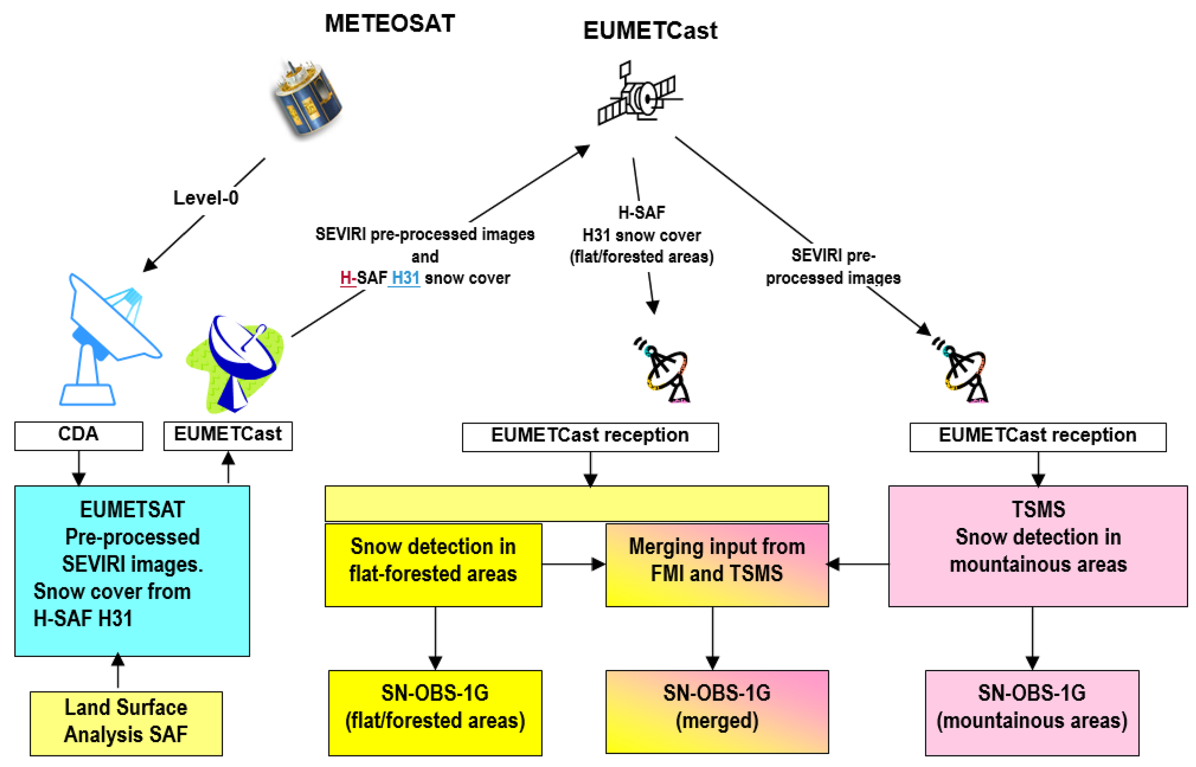

Figure 2. Conceptual architecture of the SN-OBS-1 (H10 and H34) chain.

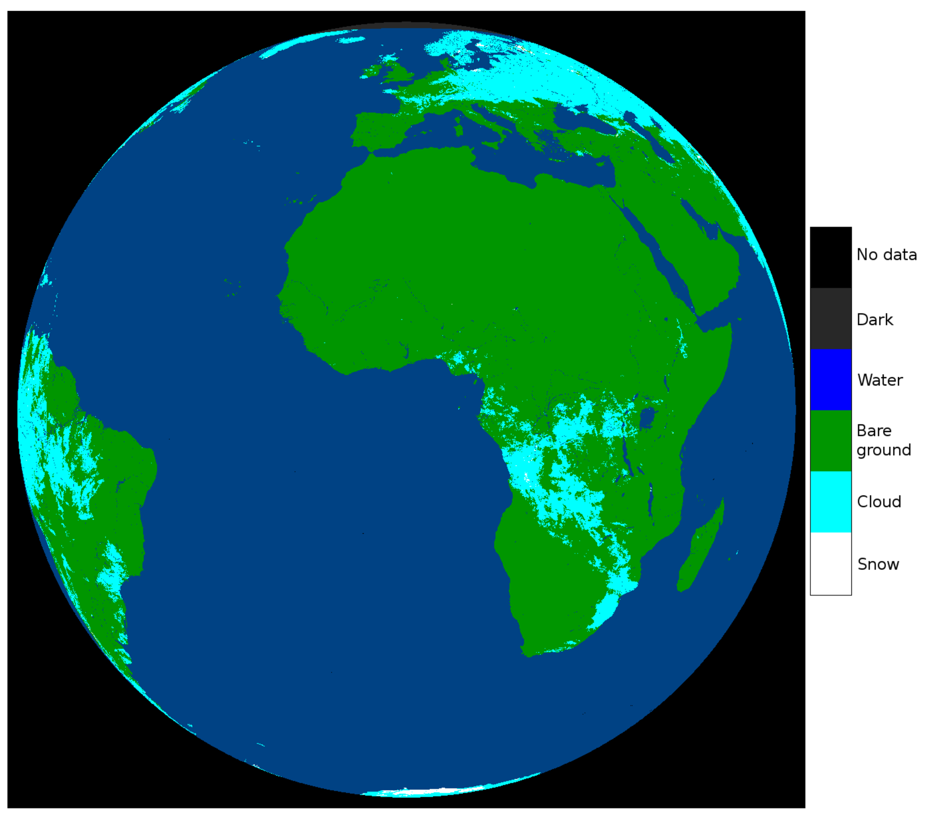

Figure 3. H34 product for 27.10.2017

Snow Cover Algorithm

Product SN-OBS-1G (Snow detection (snow mask) by VIS/IR radiometry) is based on multi-channel analysis of the MSG SEVIRI instrument onboard Meteosat satellites. For the flat/forest areas H-SAF H31 product where its algorithm is basically a threshold method based on the different properties of the snow covered and snow free surfaces and clouds (Figure 4) (Siljamo and Hyvärinen, 2011). For mountainous areas all individual 15 minute images acquired during a day are subjected to a series of threshold tests based on spectral signatures and temporal stability criteria (Figure 6). The mountain mask is applied in the merging of the flat/forest and mountainious products (Figure 6).

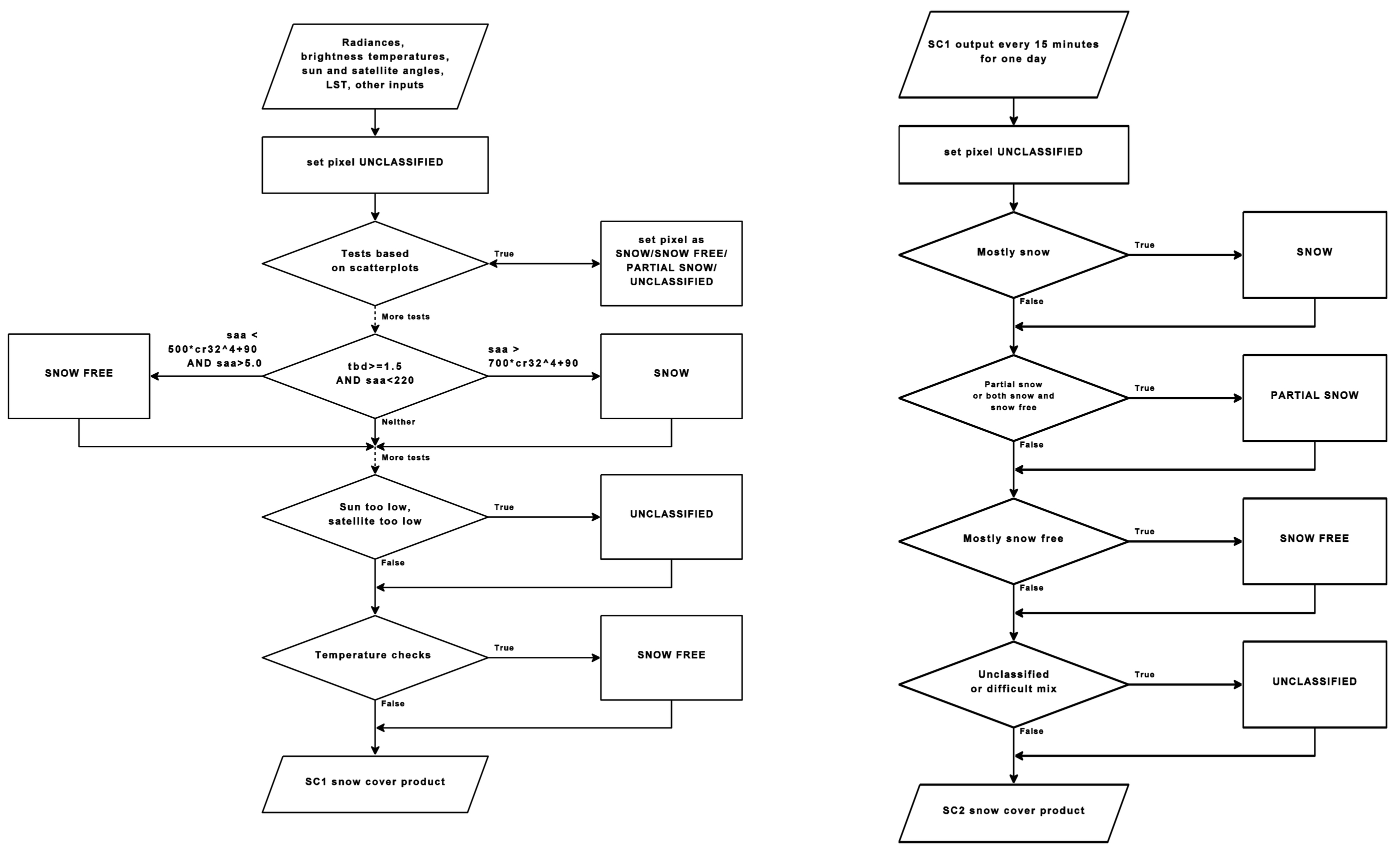

Figure 4. Simplified structure of the single image part (SC1) and daily part (SC2) of the HSAF H31 snow cover algorithm

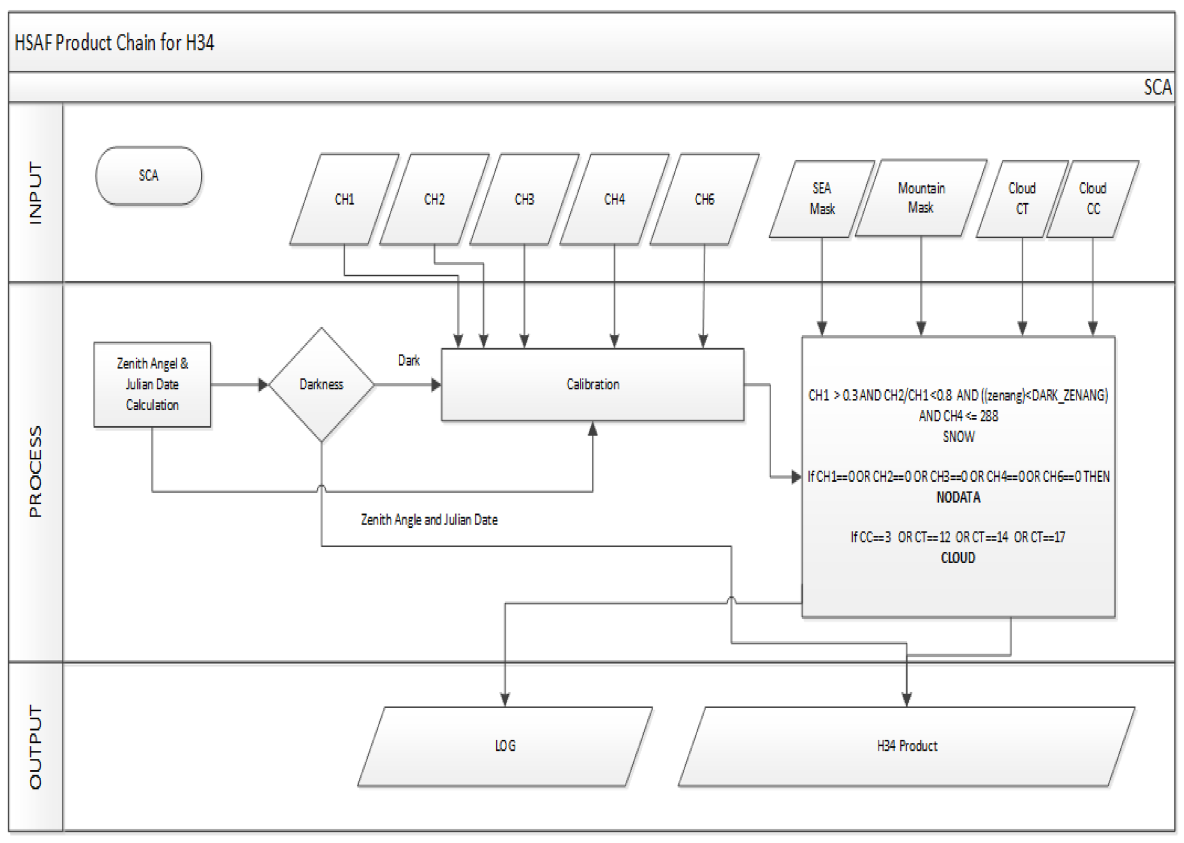

Figure 5. HSAF H34 snow cover algorithm for mountainous areas

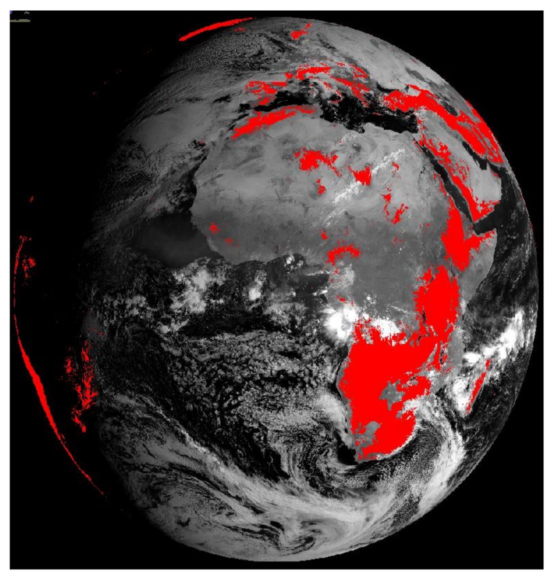

Figure 6. Mountainous mask

Validation with Ground Data

Validation has been performed over Belgium, Finland, Germany, Italy, Poland and Turkey (Figure 7). The results are obtained for every snow season (Figure 8)

Score	Threshold Flat/Mountain	Target Flat/Mountain	Optimal Flat/Mountain
POD	0.80 / 0.60	0.85 / 0.70	**0.99 / 0.99**
FAR	0.20 / 0.30	0.15 / 0.20	**0.05 / 0.05**
POD = a/(a + c)		FAR = b/(a + b)	

		Reference Dataset	
		Snow	No Snow
Analyzed dataset	Snow	*a*	*b*
	No Snow	*c*	*d*

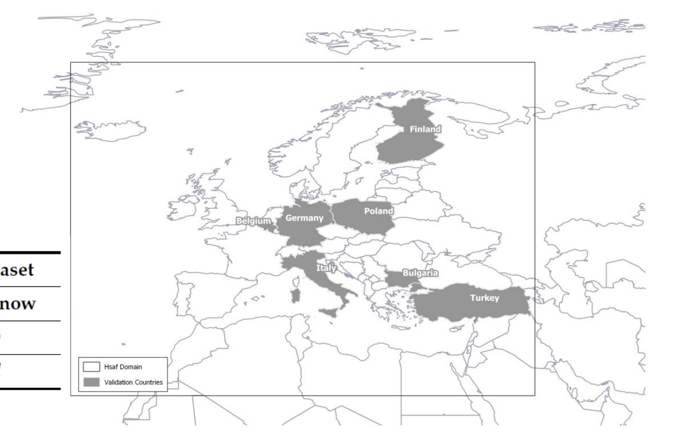

Figure 7. Countries involved in validaiton activity

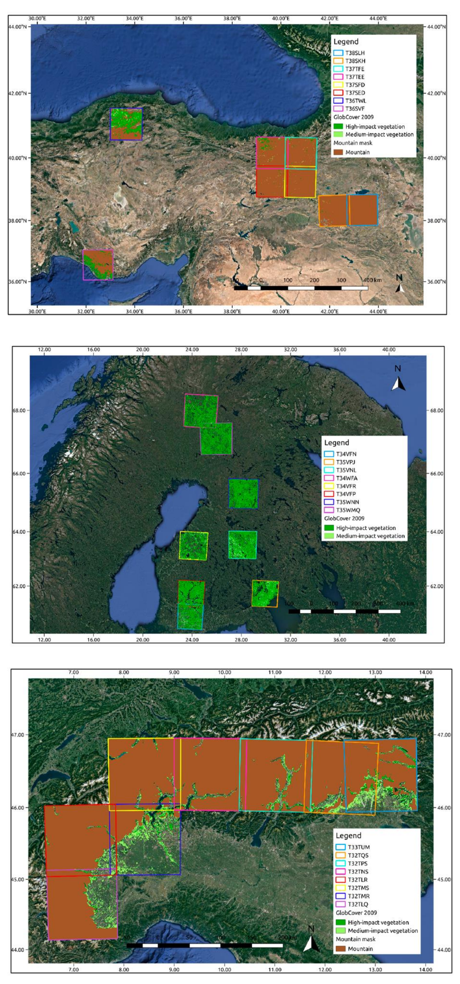

Figure 8 Results of continious validation study

Validation with other Satellite Data

Validation of H10 has been performed with other satellite products like Sentinel (Figure 9) (Piazzi et al., 2019) and MODIS (Figure 10) (Surer et al. 2014).

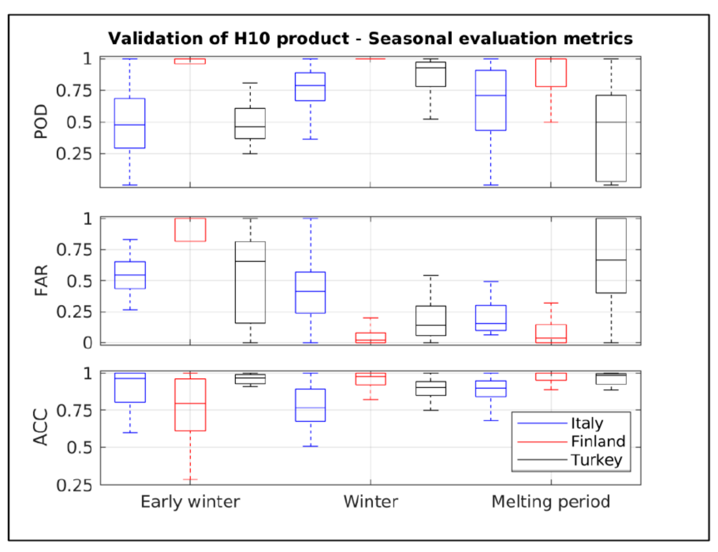

Figure 9. H10 snow product comparison with Sentinel snow poduct for 2018

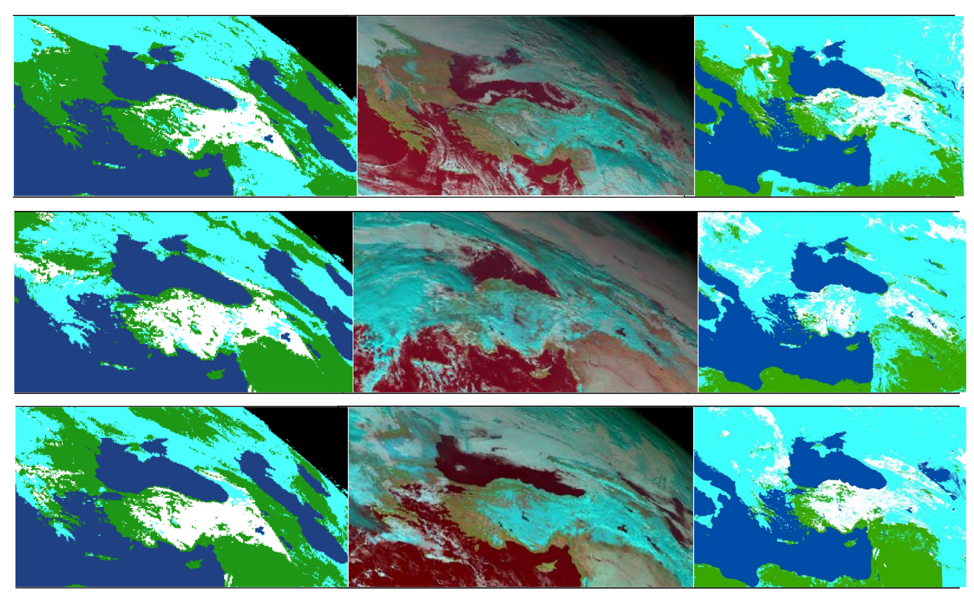

Figure 10. H10, SEVIRI RGB (532) and MOD10 A1 images of 18.12.2016 , 11.01.2017, 02.02.2017

Discussions

- Analysis shows that MODIS snow product overestimates the cloud coverage over some areas where hazy clouds and snow on the ground is hard to be separated. H10 finds more snow and less cloud compared to MODIS snow product.
- The analyzed satellite datasets of Sentinel 2 snow cover generally reveal a higher agreement over flat/forested areas (PODH10 equal to 0.98 than in mountainous regions (over Italian Alps, PODH10 equal to 0.78.
- Good temporal resolution and daily basis availability make H10 and H34 snow products valuable data sources to understand present and future climate, hydrological, and ecological dynamics.

Snow coverage analysis

H10 product has been used to analyze the snow cover area change at a basin scale for Karasu basin located in mountainous region in Turkey (Upper Euphrates) (Figure 11).

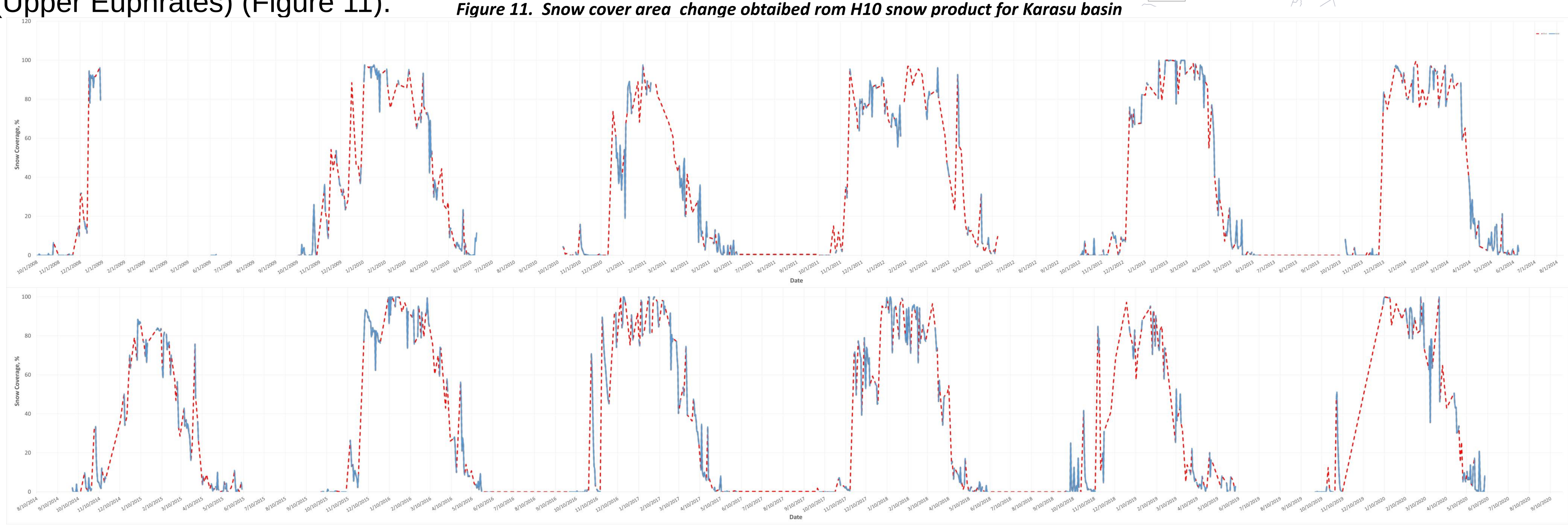

Figure 11. Snow cover area change obtaibed rom H10 snow product for Karasu basin

References

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