Geophysical Research Abstracts
Vol. 14, EGU2012-9339-1, 2012
EGU General Assembly 2012

The assessment of EUMETSAT HSAF Snow Products for mountainuos areas in the eastern part of Turkey

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Monitoring the snow parameters (e.g. snow cover area, snow water equivalent) is a challenging work. Because of its natural physical properties, snow highly affects the evolution of weather from daily basis to climate on a longer time scale. The derivation of snow products over mountainous regions has been considered very challenging. This can be done by periodic and precise mapping of the snow cover. However inaccessibility and scarcity of the ground observations limit the snow cover mapping in the mountainous areas. Today, it is carried out operationally by means of optical satellite imagery and microwave radiometry. In retrieving the snow cover area from satellite images bring the problem of topographical variations within the footprint of satellite sensors and spatial and temporal variation of snow characteristics in the mountainous areas. Most of the global and regional operational snow products use generic algorithms for flat and mountainous areas. However the non-uniformity of the snow characteristics can only be modeled with different algorithms for mountain and flat areas.

In this study the early findings of Satellite Application Facilities on Hydrology (H-SAF) project, which is financially supported by EUMETSAT, will be presented. Turkey is a part of the H-SAF project, both in product generation (eg. snow recognition, fractional snow cover and snow water equivalent) for mountainous regions for whole Europe, cal/val of satellite-derived snow products with ground observations and cal/val studies with hydrological modeling in the mountainous terrain of Europe. All the snow products are operational on a daily basis. For the snow recognition product (H10) for mountainous areas, spectral thresholding methods were applied on sub pixel scale of MSG-SEVIRI images. The different spectral characteristics of cloud, snow and land determined the structure of the algorithm and these characteristics were obtained from subjective classification of known snow cover features in the MSG/SEVIRI images. The fractional snow cover area (H12) algorithm is based on a sub-pixel reflectance model applied on METOP-AVHRR data. Knowing the effects of topography on satellite-measured radiances for rough terrain, the sun zenith and azimuth angles, as well as direction of observation relative to these are taken into account in estimating the target reflectances from the satellite images. The values of SWE products (H13) were obtained using an assimilation process based on the Helsinki University of Technology model using Advanced Microwave Scanning Radiometer for EOS (AMSR-E) daily brightness-temperature values. The validation studies for three products have been performed for the water years 2010 and 2011. Average values of 70% of probability of detection for snow recognition product, 60% of overall accuracy for the fractional snow cover product and 45 mm RMSE for the snow water equivalent product have been obtained from the validation studies. Final versions of these three products will be presented and discussed.

Key words: snow, satellite images, mountain, HSAF, snow cover, snow water equivalent