

ILMATIETEEN LAITOS Meteorologiska institutet Finnish meteorological institute

H-SAF Snow Products

Contribution by FMI and TSMS/METU





H-SAF snow products

- H-SAF: EUMETSAT funded satellite application facility (SAF) for Support to Operational Hydrology and Water Management
 - <u>http://hsaf.meteoam.it/</u> (H-SAF project coordinated by Italian Meteorological Service)
- 4 snow products:
 - H10: Snow/No Snow
 - H11: Dry/Wet Snow
 - H12: Fractional Snow Cover (% covered by snow)
 - H13: SWE (Snow Water Equivalent)
 - Additional products modified from H10 H13
 - Also H22 related to snow: Snowfall intensity (CNR/Italy)



HSAF SNOW PRODUCTS



- Snow Recognition Product (H10)
- Snow Status Product (H11)
- Fractional Snow Cover Product (H12)
- Snow Water Equivalent Product (H13)



'HSAF Snow Product Chain at TSMS'



H10 Snow / No Snow product

•Based on SEVIRI data

•Algorithm for flat lands developed within L-SAF

•Product is a merge of mountainous areas (Turkey) and flat lands (Finland)

•Product is **operational**

•Global daily MetOP/AVHRR SC product under development (25th Sept 2012)









Available at ftp://ftp.meteoam.it



HSAF domain with mountain mask







H10 possible end uses

- As is; simple product to check where in Europe there is snow
- Input to other, more sofisticated snow products
- Input to weather models
- Input to climate models



Validation of H10

- Already operational
- Results received so far for the OR2 are excellent
 - 7/2011 6/2012
 - Finland / Turkey / overall
 - N: 6523 / 5035 / 11558
 - POD: 0.97 / 0.87 / 0.90
 - FAR: 0.04 / 0.08 / 0.07
- No current plans for algorithm changes
- Planning for MTG not yet relevant



H11 Snow status product

•Uses H10 as background data

•For areas covered with snow a radiometer interpretation is made for dry / wet snow differentiation

•Originally based on AMSR-E instrument but after its failure new baseline is SSMI/S instrument

•AMSR-E version passed Operational Readiness Review but due to the baseline change is again "in development"



March 1, 2011



H11 possible end uses

- Quite similar product to H10
- As is; simple product to check where in Europe there is wet / dry snow
- Input to other, more sofisticated snow products
- Input to weather models
- Input to climate models



H12 Fractional Snow Cover product

- Product describes the percentage of Snow Covered Area (SCA) within product pixels (0-100%)
- Based on NOAA-18 and NOAA-19 data (spectrometer), possibility to use METOP data later on
- Uses Finnish Environment Institute SYKE Snow Covered Area-algorithm (*SCAmod*)
- Forest transmissivity map derived by SYKE is used for flat lands
- Mountainous areas are produced by Turkey and flat areas by Finland. The H12 product is merged in FMI.
- Product is **operative** since Feb 2012.



Example of SCA-product 23th March 2010





H12 possible end uses

- As is; H12 gives more detailed information of snow melt compared to H10
- Input to weather models
- Input to climate models
- Input to hydrological models (estimating onset of snow melt, river discharge)



H13 Snow Water Equivalent Product

- Product describes Snow Water Equivalent (SWE) in mm
- Based on AMSR-E radiometer and since the failure of the instrument new baseline will be SSMI/S (thus still "in development")
- Mountainous areas are produced by Turkey and flat areas by Finland. The H13 product is merged.
- For mountainous areas SWE is derived using radiometer data only.
- For flat areas SWE is an assimilation of ground based snow depth observations and satellite data
- RMSE of H13 product for Finland ~ 35 mm (flat lands) and for Turkey (mountainous areas) ~ 45 mm



Example of H13 SWE product





H13 possible end uses

- As is; Information of snow extent, snow melt line, amount of snow
- Input to weather models
- Input to climate models
- Input to hydrological models (two most important parametrs)
 - Onset of melt
 - Maximum amount of SWE





Validation Results



January, 2010-March, 2010



January, 2011-March, 2011



January, 2012-March, 2012

04.01.2013



Major European EO-projects including the mapping of Snow Water Equivalent (SWE)

ESA GlobSnow

30-year-long daily hemispheric SWE time-series for climate research

1st product generation ready



- 25 km resolution
- SSM/I and SMMR (+ AMSR-E)
- Gridded archive data as input (Easegridprojection)
- Demonstration of NRT activities
- Aiming to ECV record

EUMETSAT H-SAF

Near-Real-Time (NRT) operational products for hydrology and NWP at continental scale

Under development

EC-GMES CryoLand

Delivery of regional end-products for dedicated users (downstream service)

At starting phase

Methods

- 10 km resolution
- SSMI/S (AMSR-2)
- Native L2 NRT data as algorithm input (lat/lonprojection)
- Implementation (first) to Europe

 High-resolution products (sub-drainage basin level) tailored for individual users

 Assimilation techniques using mw radiometry + SAR (+ optical data)



Data availability

- All data and documentation is available for all interested free of charge
- More information from
 - <u>http://hsaf.meteoam.it/</u>