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H-SAF Snow products and their use in applications

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H-SAF snow products

- **H-SAF: EUMETSAT funded satellite application facility (SAF) for Support to Operational Hydrology and Water Management**

  - http://hsaf.meteoam.it/

  - Originally 4 snow products:

  - H-10: Snow/no snow

  - H-11: dry/wet snow

  - H-12: fractional snow cover (% covered by snow)

  - H-13: SWE (snow water equivalent)

  - Additional products / product codes, for example LSA-SAF derived H31

H10 Snow / No Snow product

- Based on SEVIRI data
- Algorithm for flat lands developed within LSA-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)
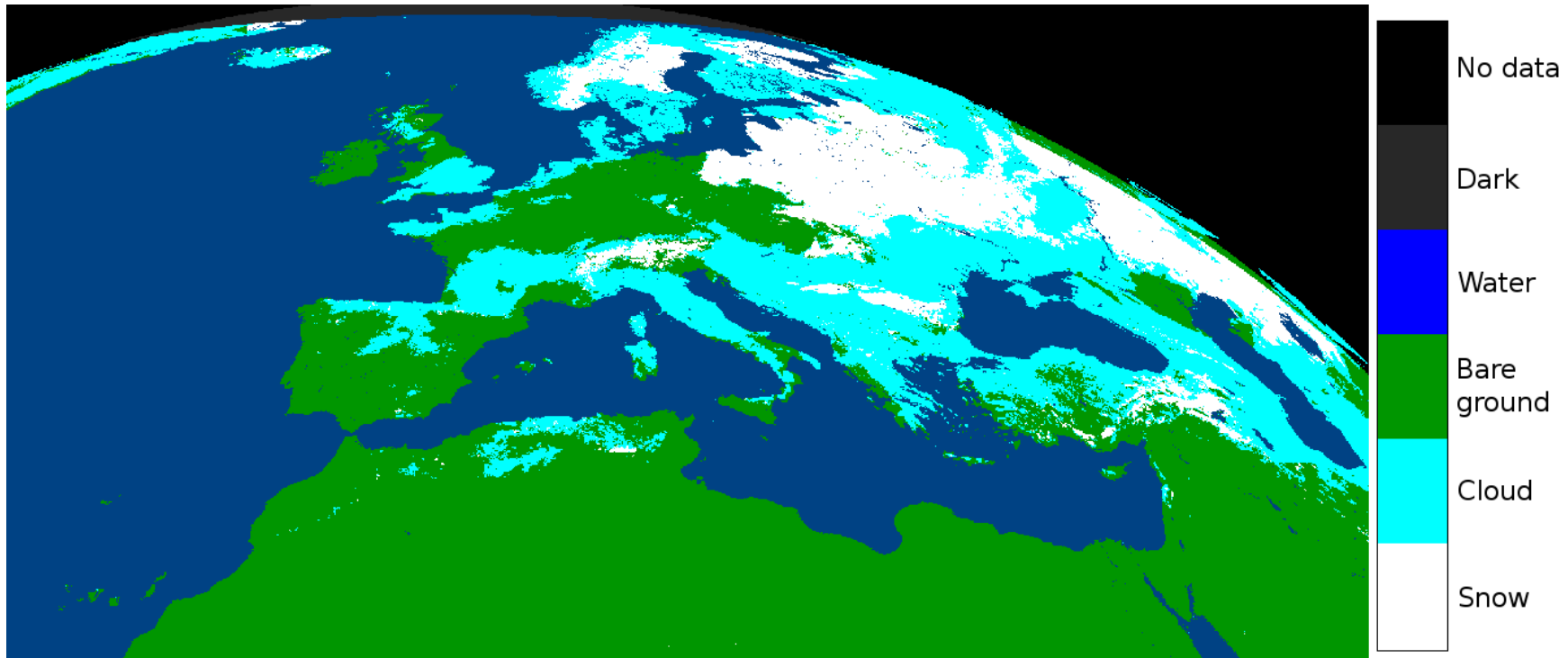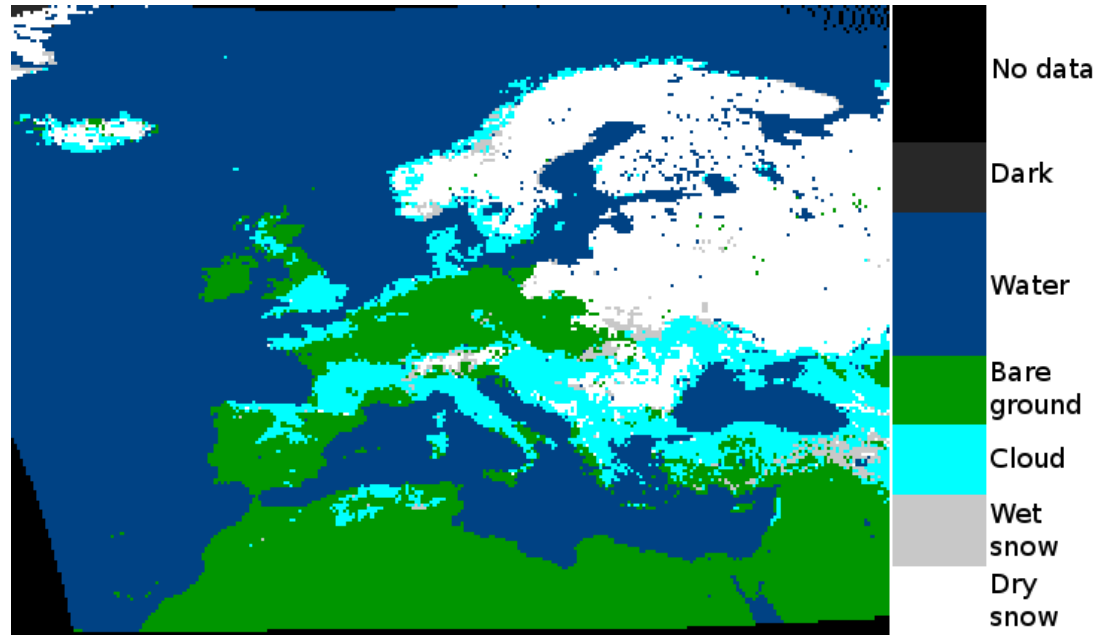
H10 possible end uses

- 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

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
- SSMI/S version is **pre-operational**

March 1, 2011

No data

Dark

Water

Bare ground

Cloud

Wet snow

Dry snow

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
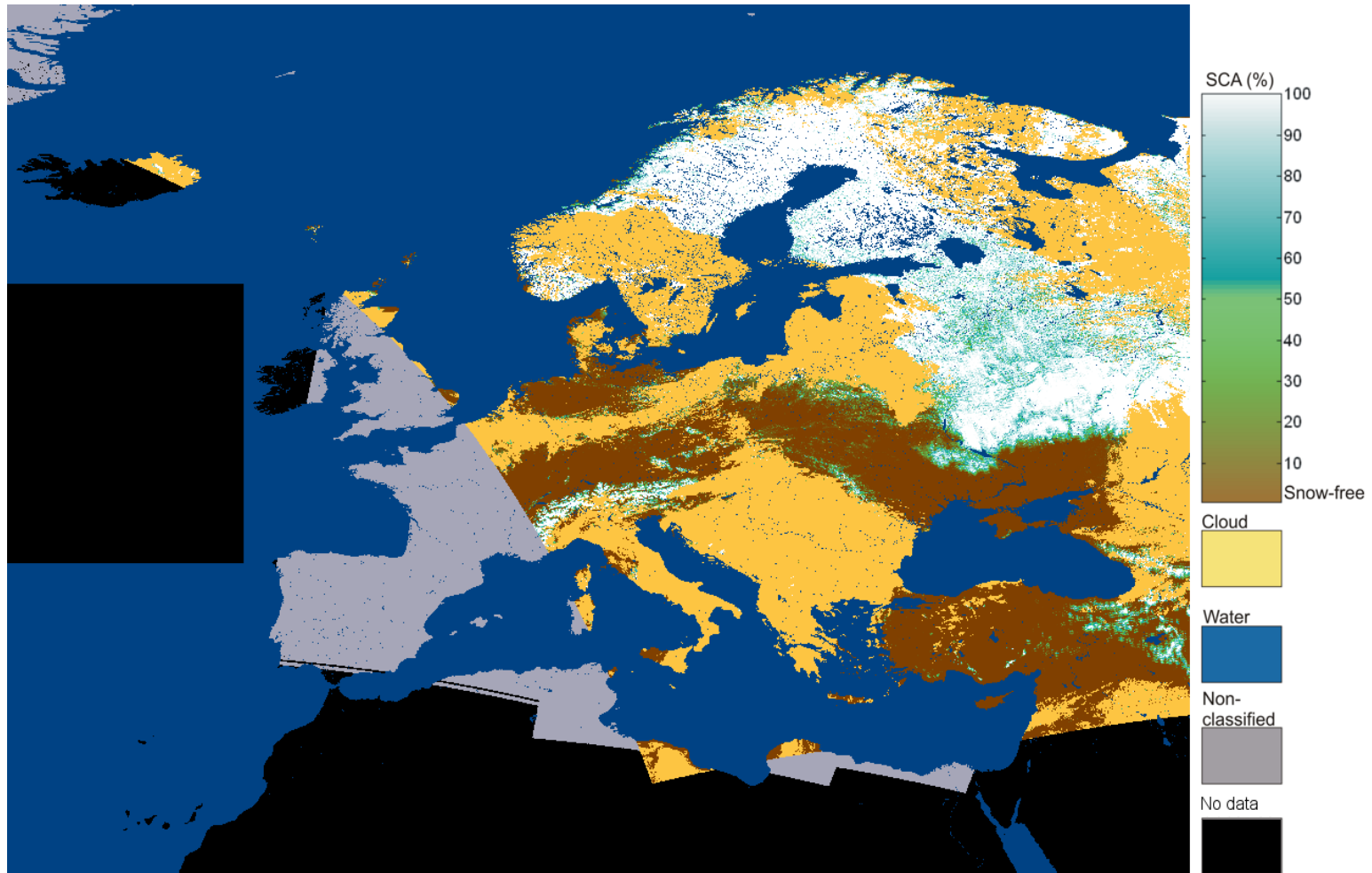
- Input to climate models

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

- 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 **pre-operational**

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

- SSMI/S based version is **operational**

- 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
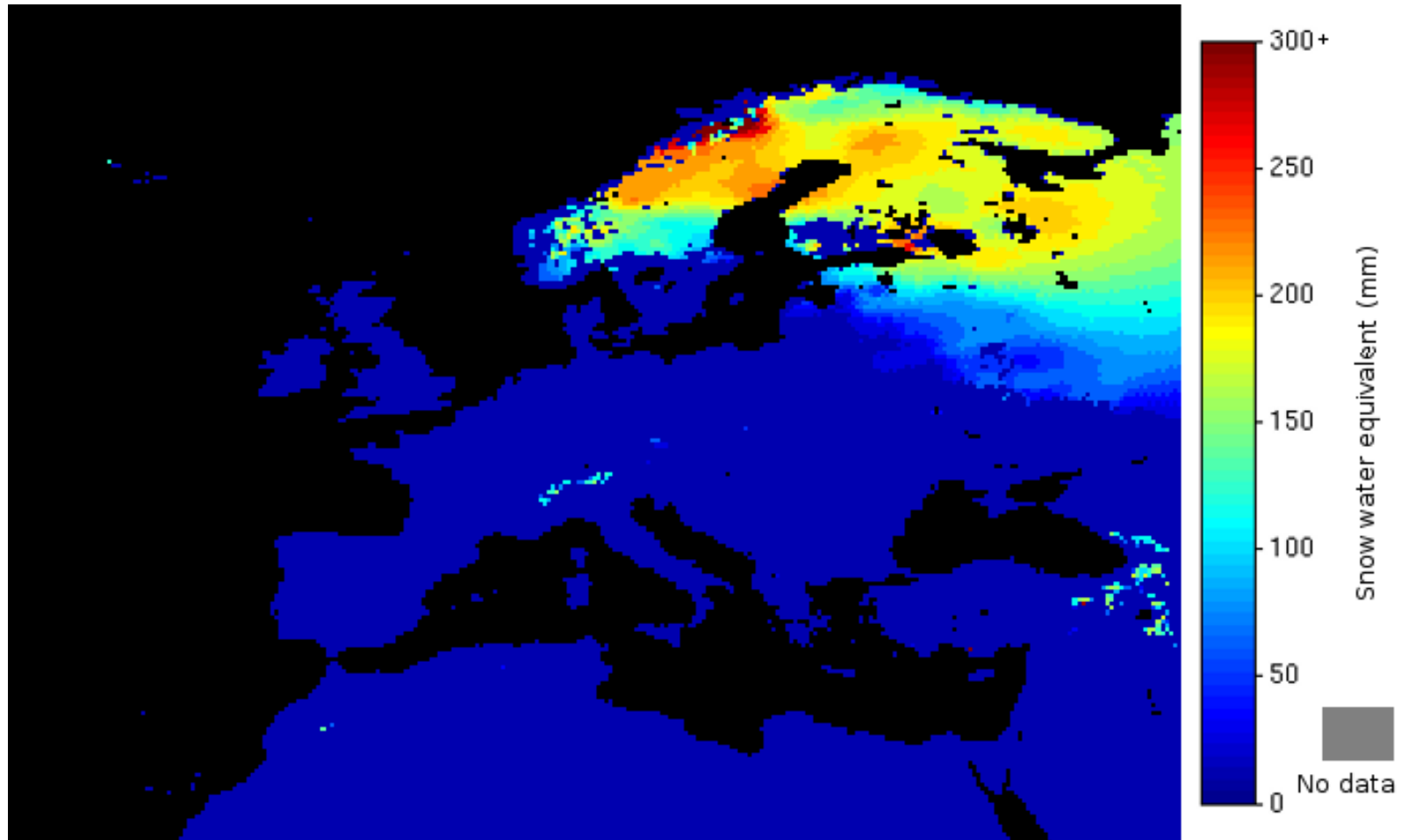
H13 possible end uses

- As is; Information of snow extent, snow melt line, amount of snow

- Input to weather models

- Input to climate models

- Input to hydrological models

  - Maximum amount of SWE

  - Time of max. SWE
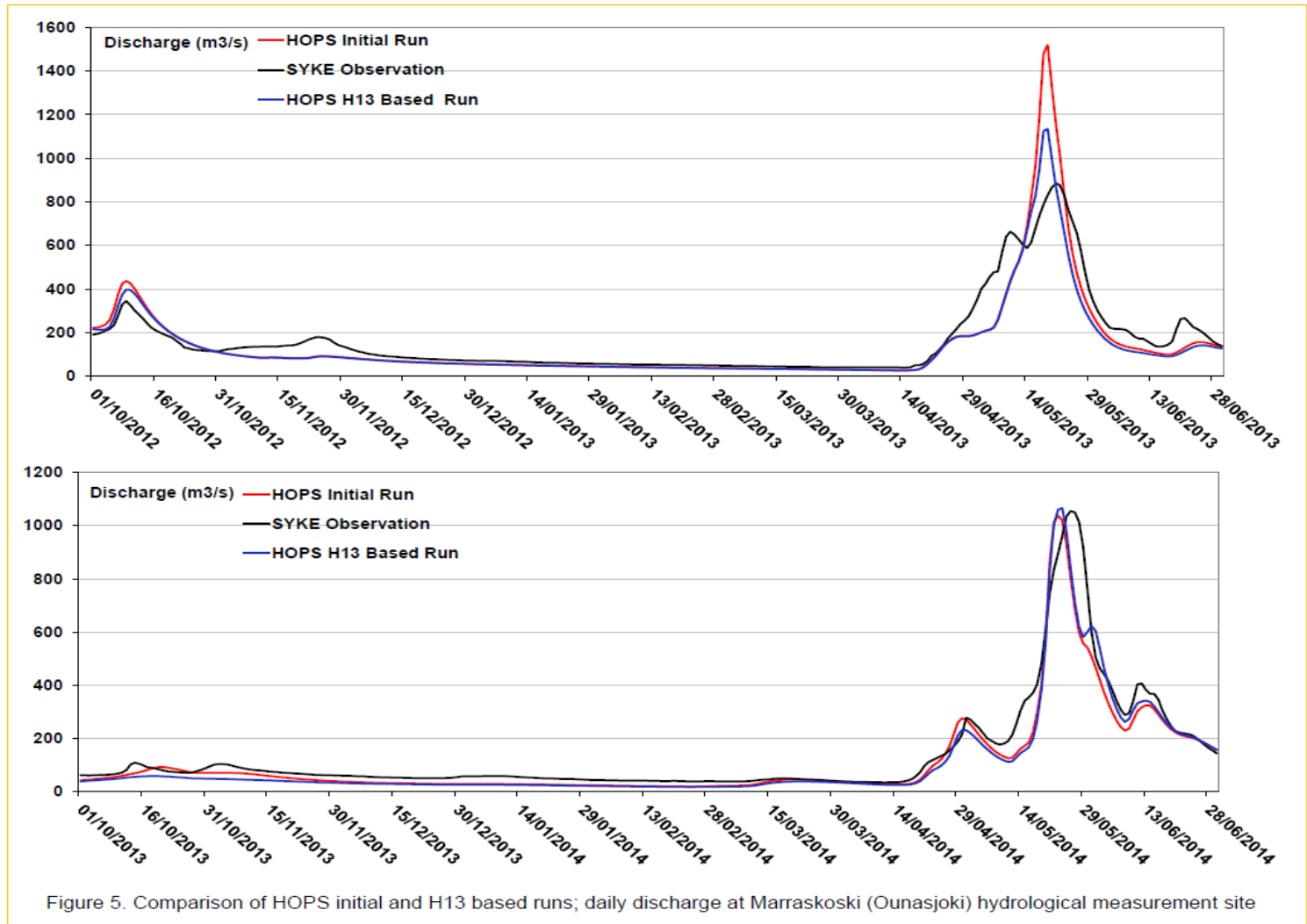
H13 as input to hydrological model I

Figure 5. Comparison of HOPS initial and H13 based runs; daily discharge at Marraskoski (Ounasjoki) hydrological measurement site
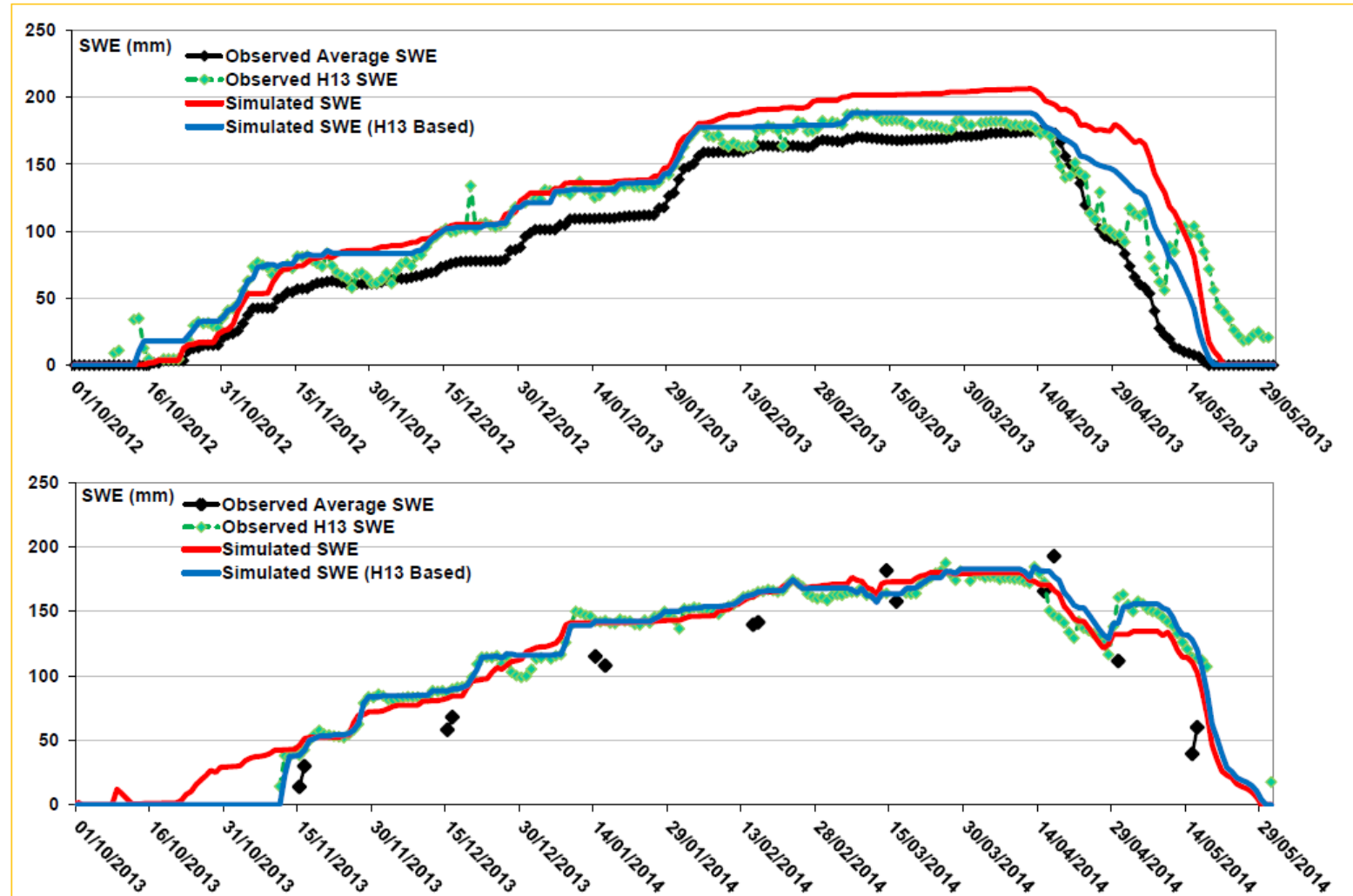
H13 as input to hydrological model II

Figure 6. Comparison of observed and simulated SWE; average of 3 HOPS cells against corresponding average of 3 in-situ sites

Additional snow products

- Different versions and development states of the previously mentioned products

- H31/32 Snow status product
  - Snow status products derived from L SAF
  - Only for flat lands
  - H31 snow status, MSG disk coverage with SEVIRI pixel resolution
  - H32 snow status, global coverage with AVHRR pixel resolution (Metop)
  - Products are operative

- H34/35/43 Snow status product
  - H34 second generation product, succeeding H31 and H10
  - H35 second generation product, succeeding H32 and H12
  - Products are in development

  - H43 Snow detection (snow mask) by VIS/NIR of MTG FCI
  - Product is in development

Data availability

- **All data and documentation is available for all interested free of charge**

- **More information from http://hsaf.meteoam.it/**

  - The FMI H-SAF project team:

    - Matias Takala: project management, H13

    - Cemal Melih Tanis H11

    - Niilo Siljamo: H31/32

    - Panu Lahtinen: H10, H12

    - Kati Anttila: H12

    - Jaakko Ikonen: hydrology

    - Kari Luojus: H13

    - Ali Nadir Arslan: coordination between projects

    - Prof. Jouni Pulliainen: head scientist