Schweizerische Eidgenossenschaft
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CONSORTIUM FOR SMALL SCALE MODELING
COSMO

Snow Analysis

At MeteoSwiss

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Offenbach, Snow analysis meeting, March 2018

Snow analysis

DWD software package v1.24 for computing **snow water equivalent**, adapted and optimised for complex topo and use of SEVIRI mask (**2009**).

Cressman analysis

- interpolation of ***snow depth*** information
- weight depending on generalized distance

Type of information used by the Cressman analysis

- *observed snow depth*
- *observed 6 hour precipitation* and previous analysis
- *model snow depth* (first guess)
- *relative weights* depends on observation density

Compare with satellite data (SEVIRI embarked on MSG)

- always use latest state of ***composite snow map***
- remove/add snow from Cressman analysis to match snow map, controlled by associated snow map *quality flag*

Snow analysis – SEVIRI snow map

EUMETSAT fellowship (M. de Ruyter de Wildt, **2006**), to derive a satellite based **snow map**, including associated quality flag.

General problems

- *obscurance* of the surface by clouds
- *confusion* of ice clouds and snow (similar spectral signatures)

Solution

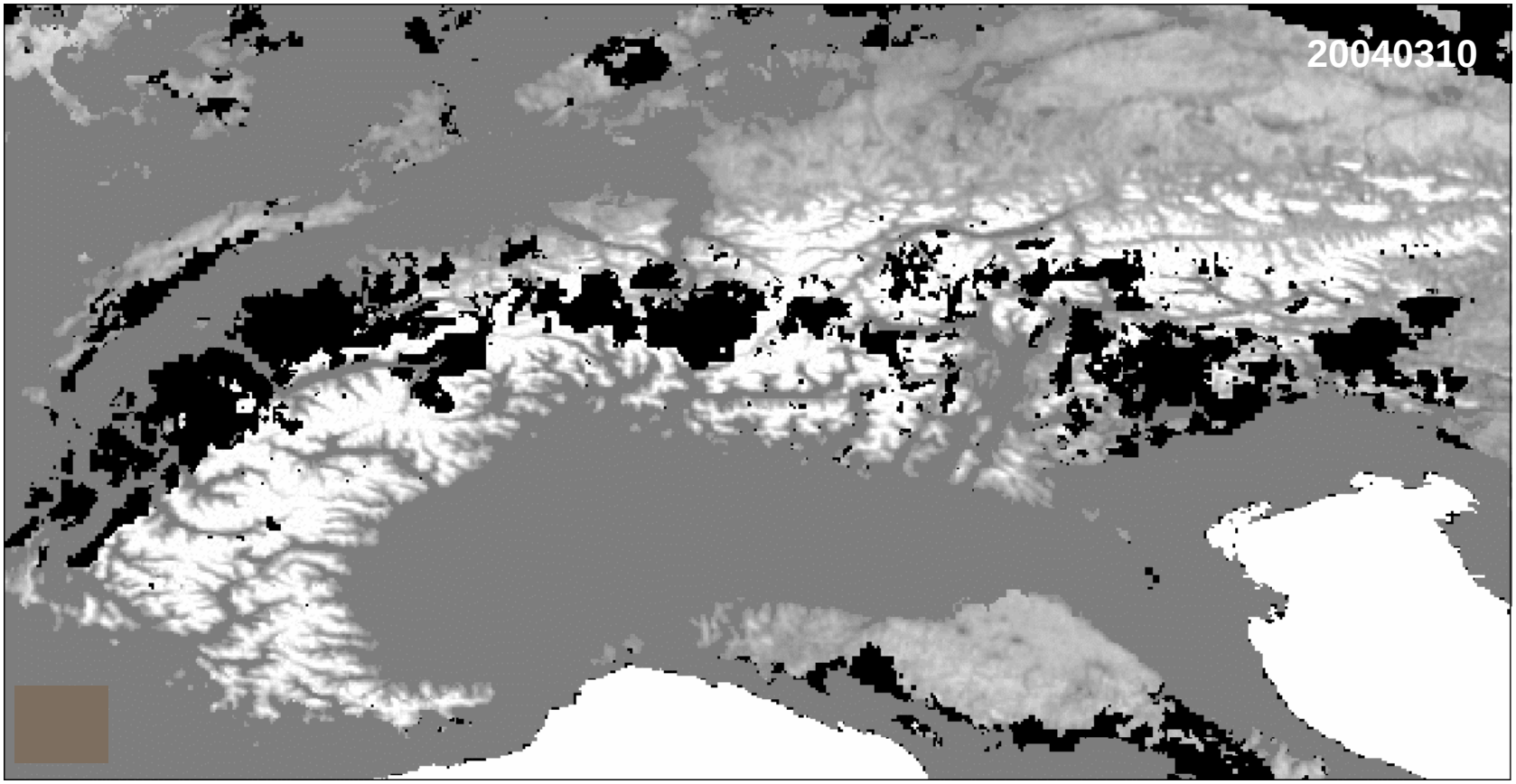
- combine ***high temporal frequency*** information
  → use MSG SEVIRI (15' update)
- detect *dynamic behaviour of clouds* for improving the discrimination between clouds and snow
- detect all *cloud-free instances* to reduce obscurance of surface by clouds
- *quality flag* as function of age of pixel information, solar zenith angle, proximity of clouds

Snow analysis – SEVIRI snow map

EUMETSAT fellowship (M. de Ruyter de Wildt, **2006**), to derive a satellite based **snow map**, including associated quality flag.

- [1] De Ruyter de Wildt et al., *Operational snow mapping using multitemporal Meteosat SEVIRI imagery*, 2006 http://www.sciencedirect.com/science/article/pii/S0034425706005086
- [2] De Ruyter de Wildt et al., *A snow cover map in the Alps for assimilation in operational meso-scale numerical weather prediction and based on MSG data*, User manual - part 1: scientific documentation, version 1.4, 5.2007
- [3] De Ruyter de Wildt et al., *A snow cover map in the Alps for assimilation in operational meso-scale numerical weather prediction and based on MSG data*, User manual - part 2: technical documentation / software user manual, version 1.4, 5.2007

Snow analysis – SEVIRI snow map



Near real time, high resolution (1.5-2km), composite, partial snow cover

Based on: Meteosat SEVIRI

Snow analysis – Some issues

- Conversion between observed snow depth and model snow water equivalent depends on *non-observed snow density*
- Missing or uncertain information on snow characteristics when snow is added through *use of snow mask*
- Missing or uncertain information on *partial snow cover*

- **Complex topography**:
  Analysis mostly blind towards snow depth *altitudinal gradient and azimuthal dependency* (limited in-situ sampling)

- **Multi-layers snow model**:
  Missing information on *snow pack stratification*