

A cloud reanalysis using a NWP model together with data from polar-orbiting and geostationary satellites

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European cloud cover reanalysis using best available data at any given time, 1982 - 2013

Horizontal resolution:

5.5 km MESAN EURO4M (but maybe 22 km HIRLAM EURO4M).

Time resolution:

Hourly for the period 1982– 2013 (2013 not yet available).

Observations:

CMSAF polar orbit AVHRR cloud mask 1982 – 2009.

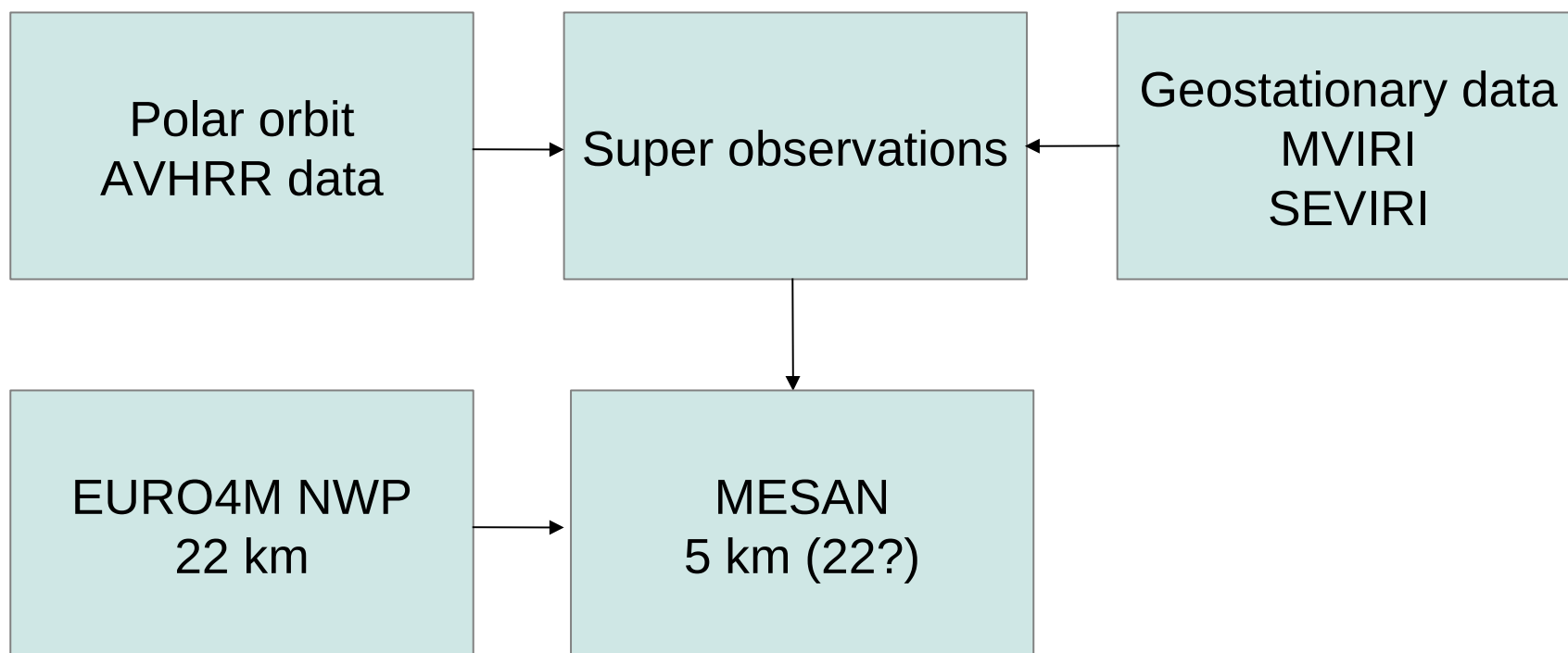
CMSAF geostationary SEVIRI cloud mask 2004 – 2012.

CMSAF geostationary MVIRI cloud albedo 1983 – 2005

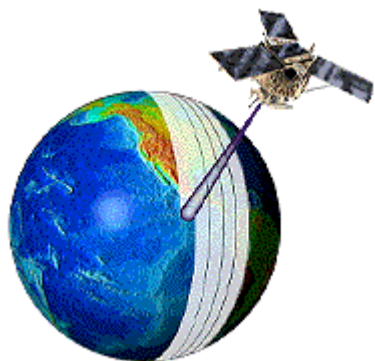
First guess:

EURO4M 22 km HIRLAM 3DVar, 1982 – 2013.

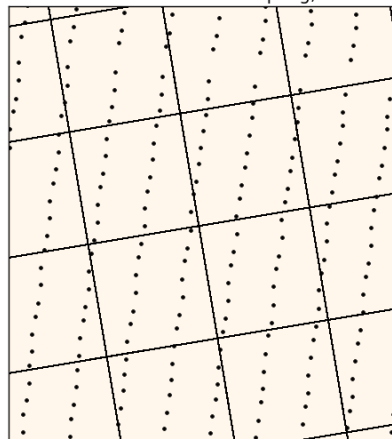
Processing chain



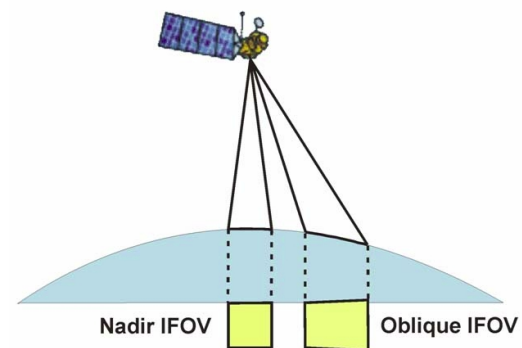
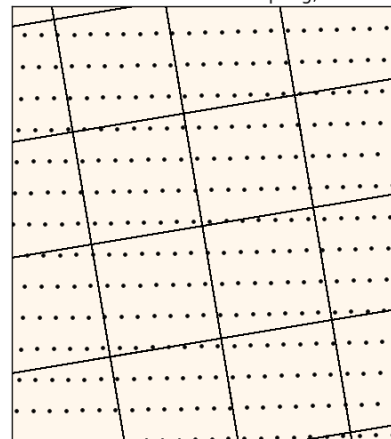
North



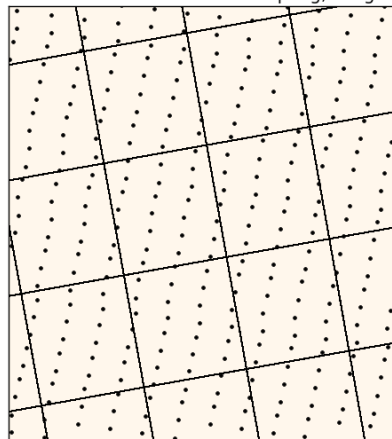
HIRLAM E4M and AVHRR sampling, Brussels



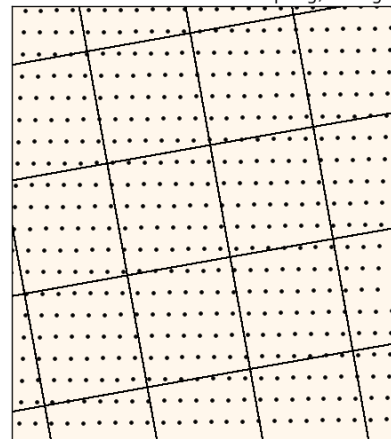
HIRLAM E4M and SEVIRI sampling, Brussels



HIRLAM E4M and AVHRR sampling, Malaga

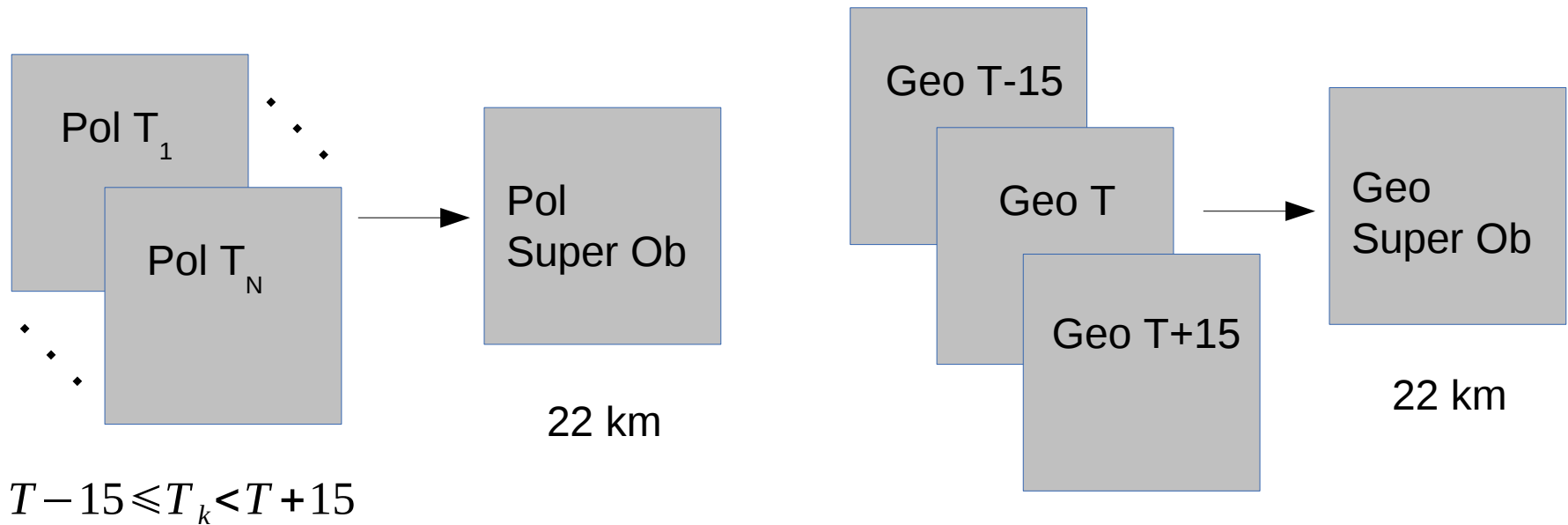


HIRLAM E4M and SEVIRI sampling, Malaga



South

Super observations



Analysis on the hour or for the hourly mean?

Super observations, cont.

Use the quality and scan geometry information available in CMSAF products to calculate weights:

$$w = f(\text{quality flags}, \text{sat angles}, \text{time delta})$$

Calculate cloud fractional cover as a weighted fraction of cloudy pixels within a HIRLAM grid box:

$$CFC = \frac{\sum w_i CM_i}{\sum w_i}$$

Mesan: Optimal Interpolation

$$x_a = x_b + K (y - H(x_b))$$
$$K = BH^T (HBH^T + R)^{-1}$$

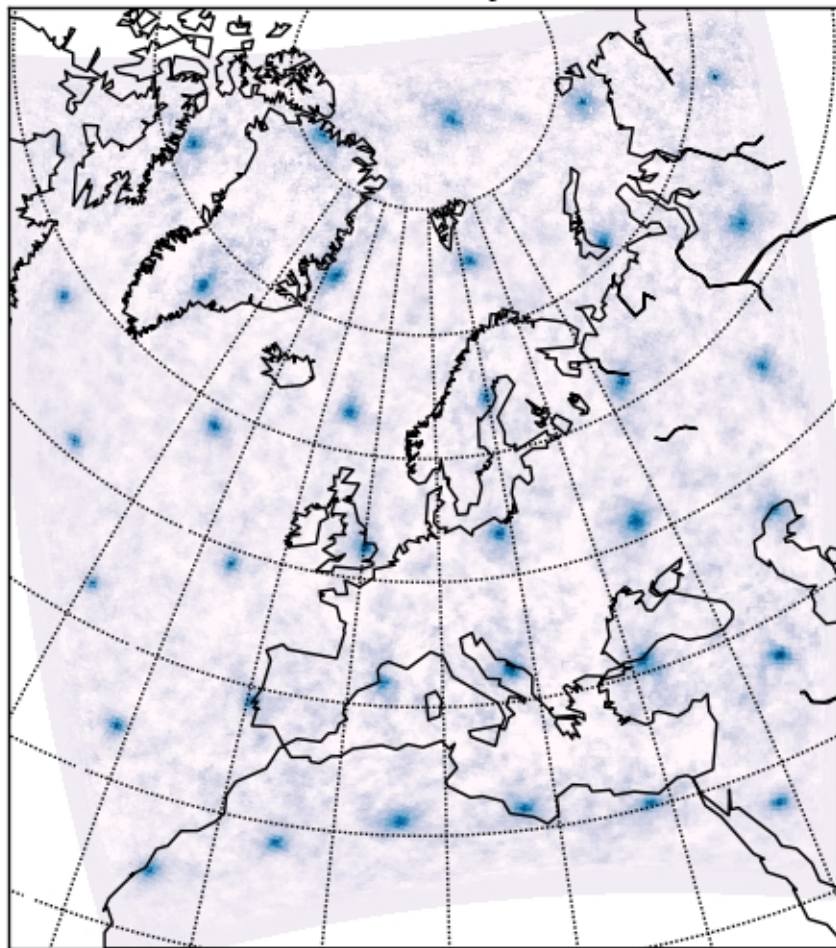
B matrix options

- Diagonal after Fourier transform, i.e. homogeneous
- Empirical functions (Gauss etc)
- HIRLAM NMC statistics (fc differences)

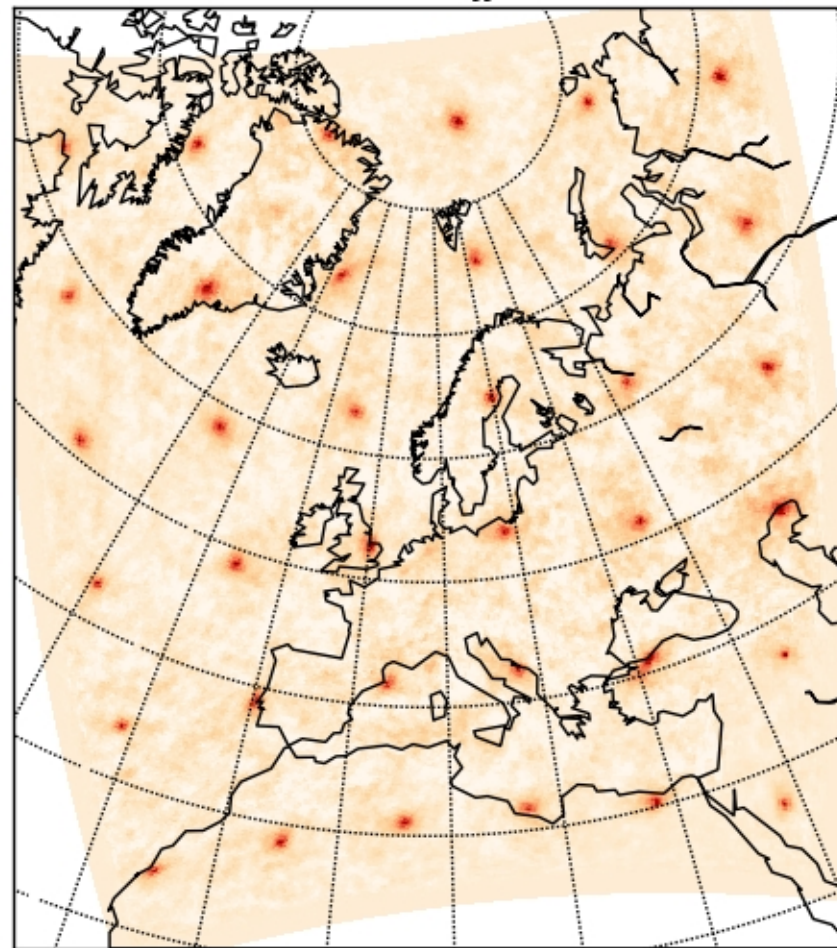
R matrix options

- Diagonal (including SO quality information)
- Diagonal after Fourier transform, i.e. homogeneous

HIRLAM NMC ctot, DJF 1982-2010



HIRLAM NMC ctot, JJA 1982-2010



Progress

Extracted and transferred to NSC for processing:

CMSAF polar orbit AVHRR cloud mask 1982 – 2009.

CMSAF geostationary SEVIRI cloud mask 2004 – 2012.

CMSAF geostationary MVIRI cloud albedo 1983 – 2005.

HIRLAM EURO4M (22 km) cloud fraction.

Concerns

Is a 5 km analysis meaningful?

- Cloud fraction defining scale (25 km in CMSAF).
- First guess at 22 km.
- AVHRR (GAC) and MVIRI/SEVIRI @ 4-5 km.

Resources (indicative 7 pm, all work during 2015)

- Only 2.6 pm allocated.
- Extra resource to be assigned (how much time?).