

## Preparing the Operational Copernicus Climate Change Service

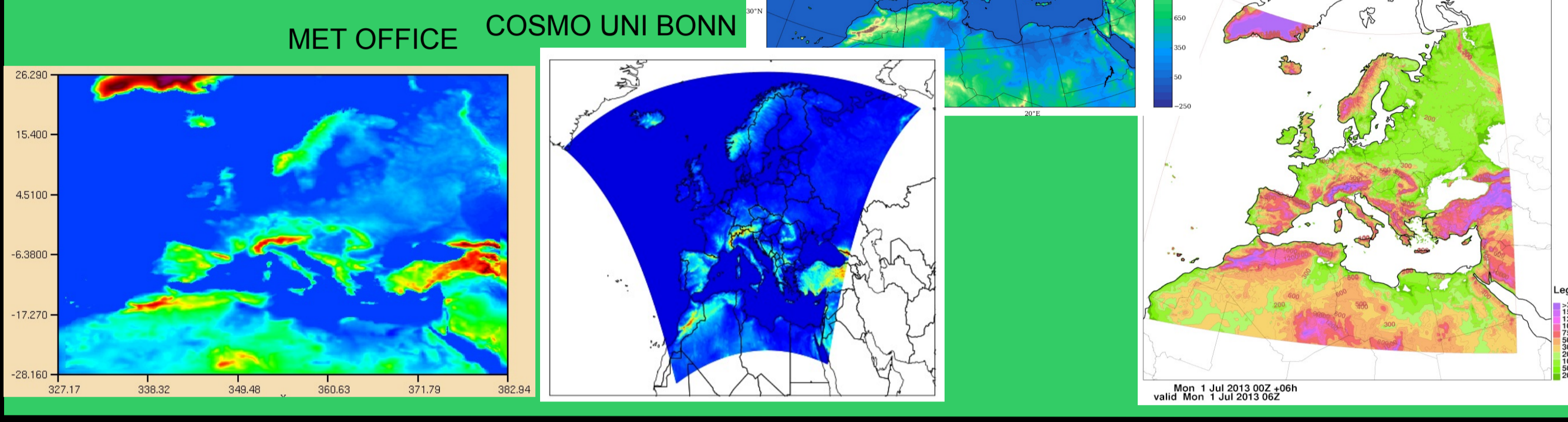
Produce European regional meteorological reanalyses of Essential Climate Variables for several decades; provide observations for reanalyses; provide data services and user information

**Builds on the previous EURO4M FP7 project but extends in several directions:**

Estimate uncertainty; produce ensembles of reanalyses including multiple models; increase grid resolution; extend time spans; extend observation record; improve gridded data sets and estimate underlying uncertainty

## REGIONAL REANALYSES

### Domains & orography



### 3D reanalyses covering the full atmosphere

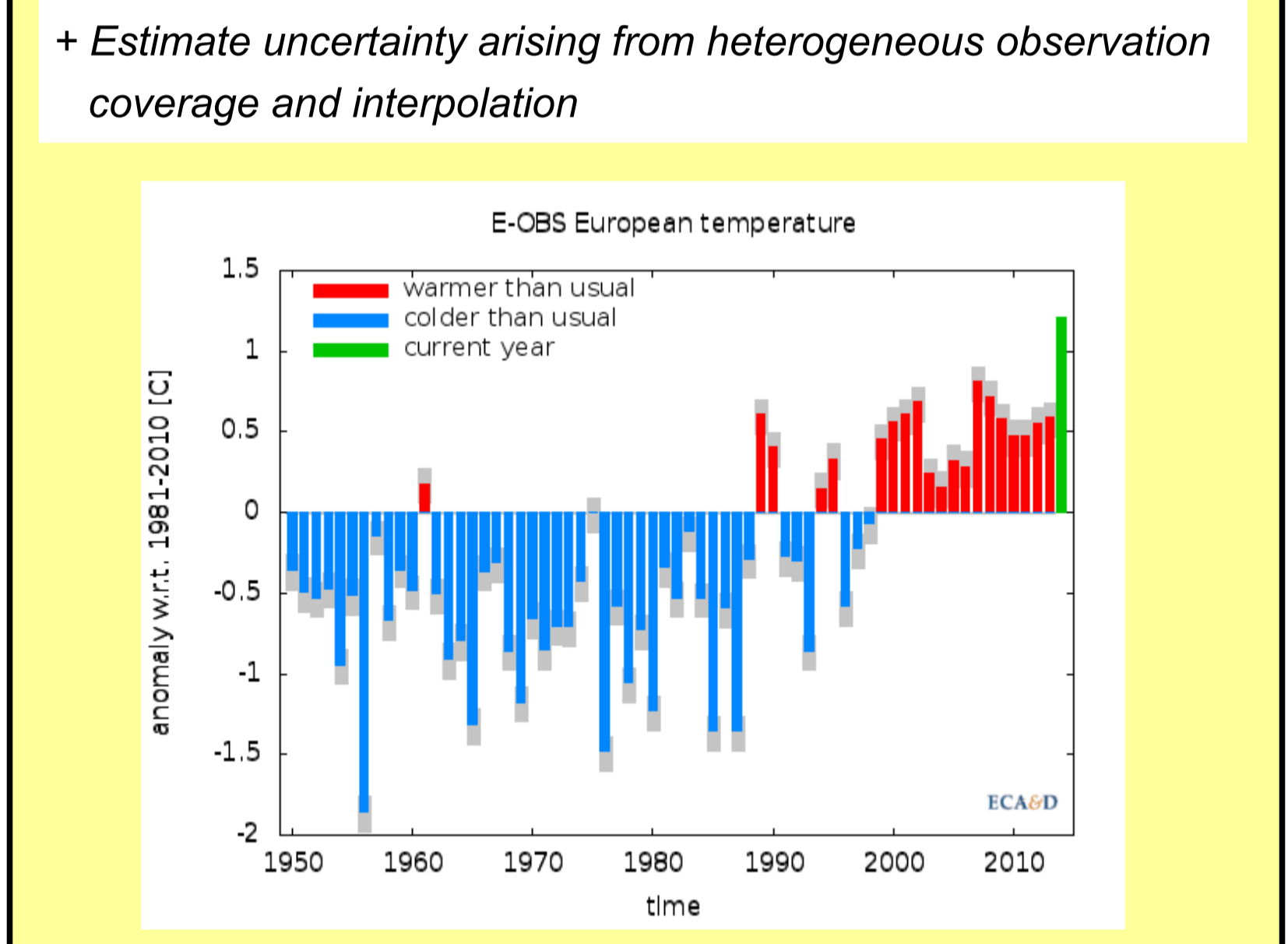
Met Office	SMHI/MF	HERZ - DWD
Hybrid 4D-Var, Ensemble of 4D-VARs	HARMONIE 3D-VAR	LETKF and Ensemble Nudging
1 Control 12 km 70 levels ~ 20 members 24 km ensemble	1 member 11 km 65 levels 2 members physics	1 Control 12 km 40 levels 10-20 members 12 km ensemble
ensemble ~1978 -2013	deterministic ~1961-2013 5 years ensemble	deterministic 1997-2013 ensemble ~5 years
Conventional obs, satellite data, precip.	Conventional obs, Large scale constraint from ERA	Conventional obs
boundary forcing from global ERA reanalyses (ERA-40, -Interim, coming -SAT or -5, incl. Ensembles)		

### 2D surface field analyses driven by 3D reanalyses

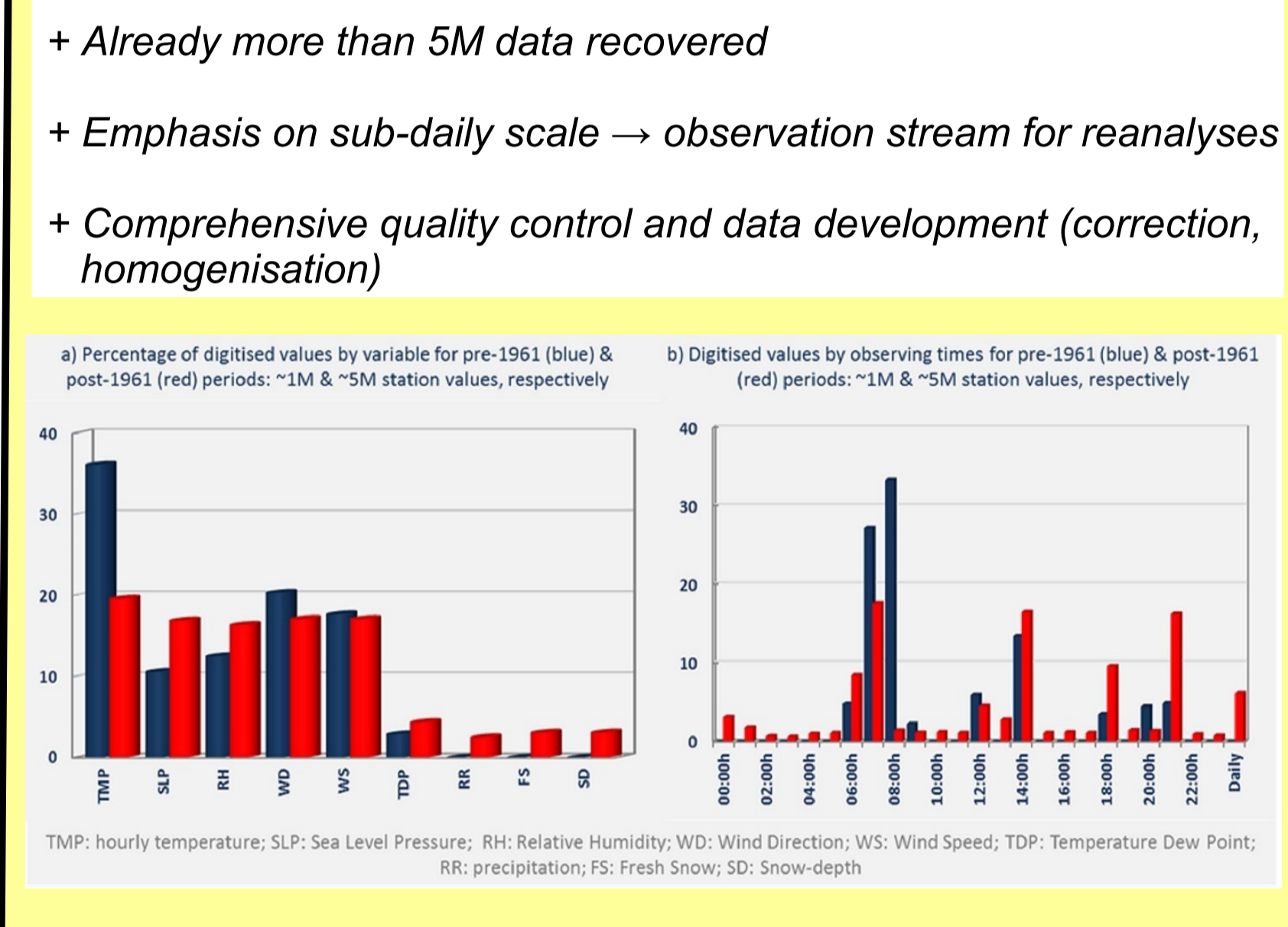
MF/SMHI MESCAN	SMHI MESAN
2D advanced statistical interpolation	2D advanced statistical interpolation
Downscaled ALADIN model background	Downscaled 3D HIRLAM climatological adaptation background
Surface and climate stations T, Td, precipitation	AVHRR, METEOSAT SEVIRI and MIVRI
5 km resolved T2m, Td, 10m wind, precipitation	5 km Cloud fraction
1961 - ~2013	~1982 - 2013

## OBSERVATIONS

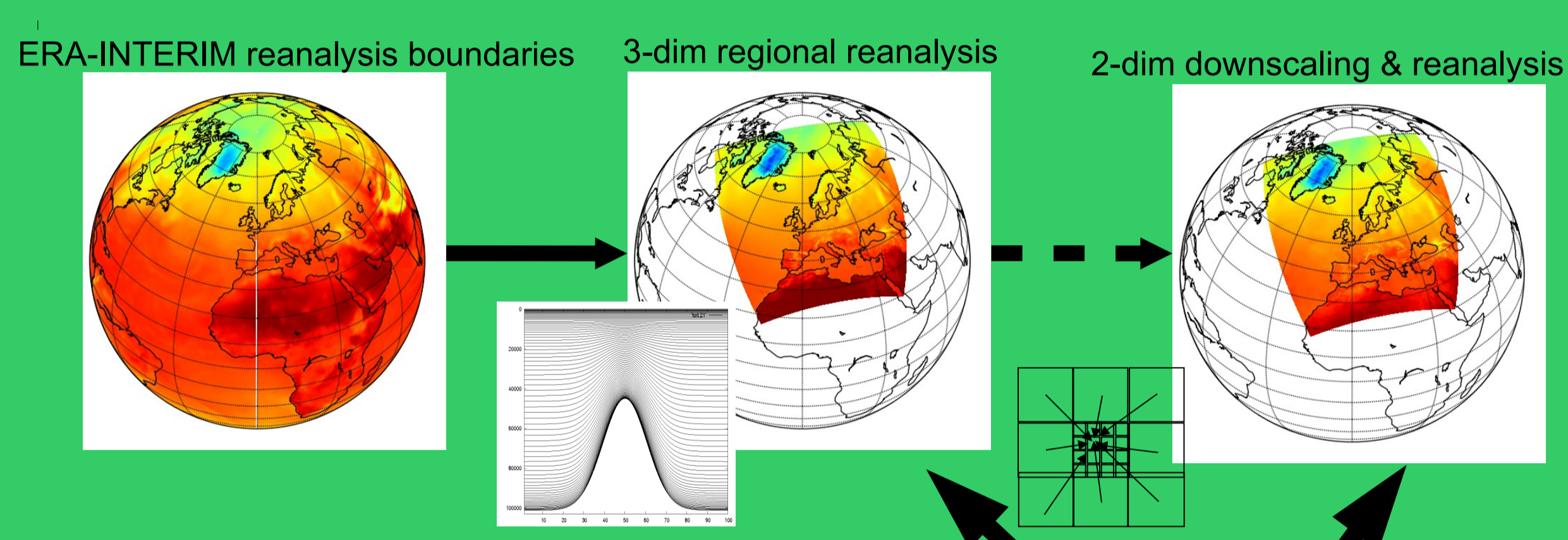
### Enhancing gridded observations E-OBS



### Data rescue of historical observations



+ Regional reanalyses driven by global forcing and upper-air and surface observations using frozen systems  
+ Multi-model and -technique ensembles of reanalyses  
+ Surface and upper-air parameters



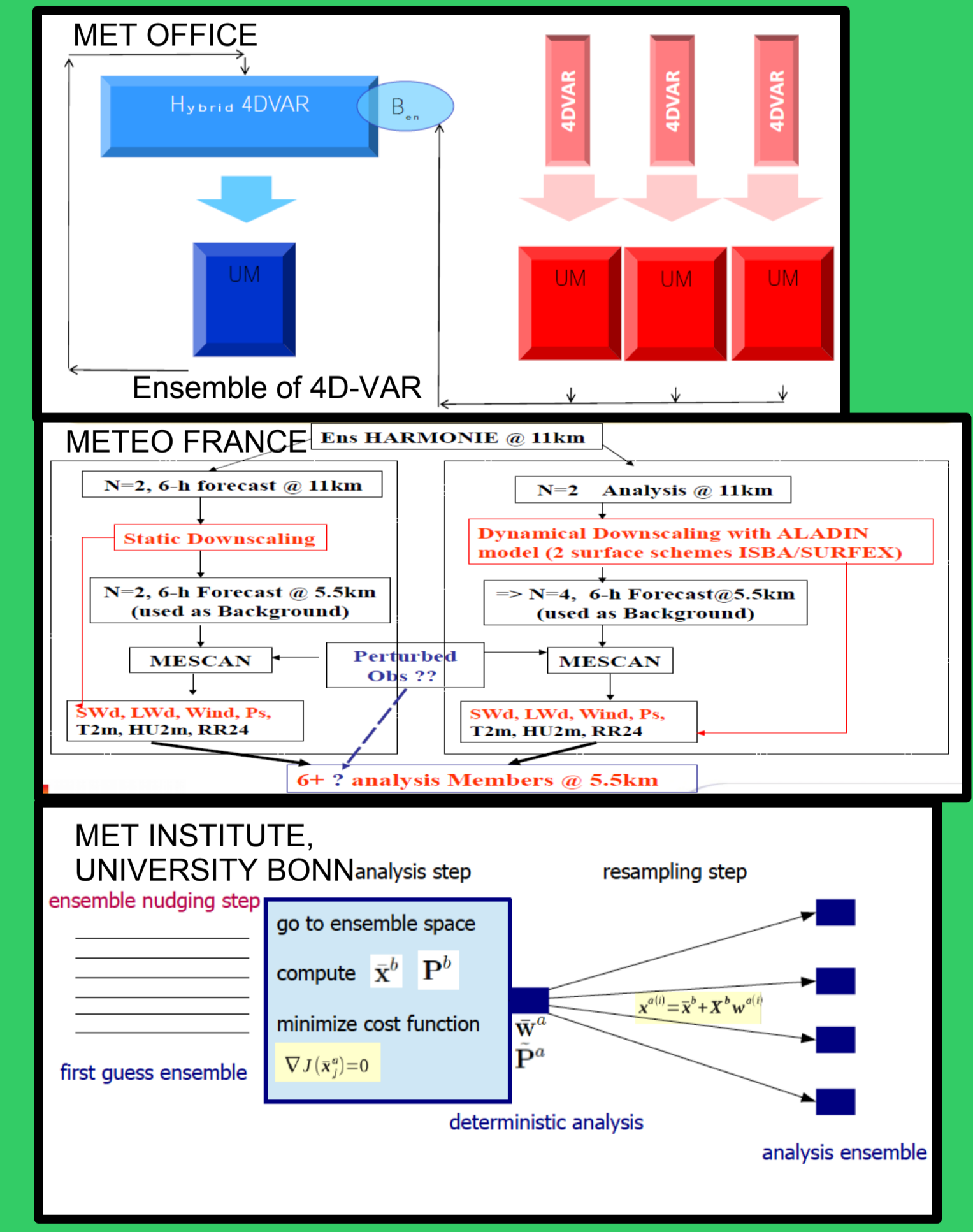
## USERS

- + Climate information
- + Bulletins for public
- + Information for policy makers
- + User interaction
- + Evaluation and fit for purpose
- + Information and training

### Reanalysis products

- + Upper air ensemble reanalyses (1978 - )
- + Upper air reanalysis (1961 - )
- + 2D surface reanalysis (1961 - )
- + 3D ensemble reanalysis (5 years)
- + Perturbed physics upper air and 2D surface reanalyses (5 years)

## DATA ASSIMILATION

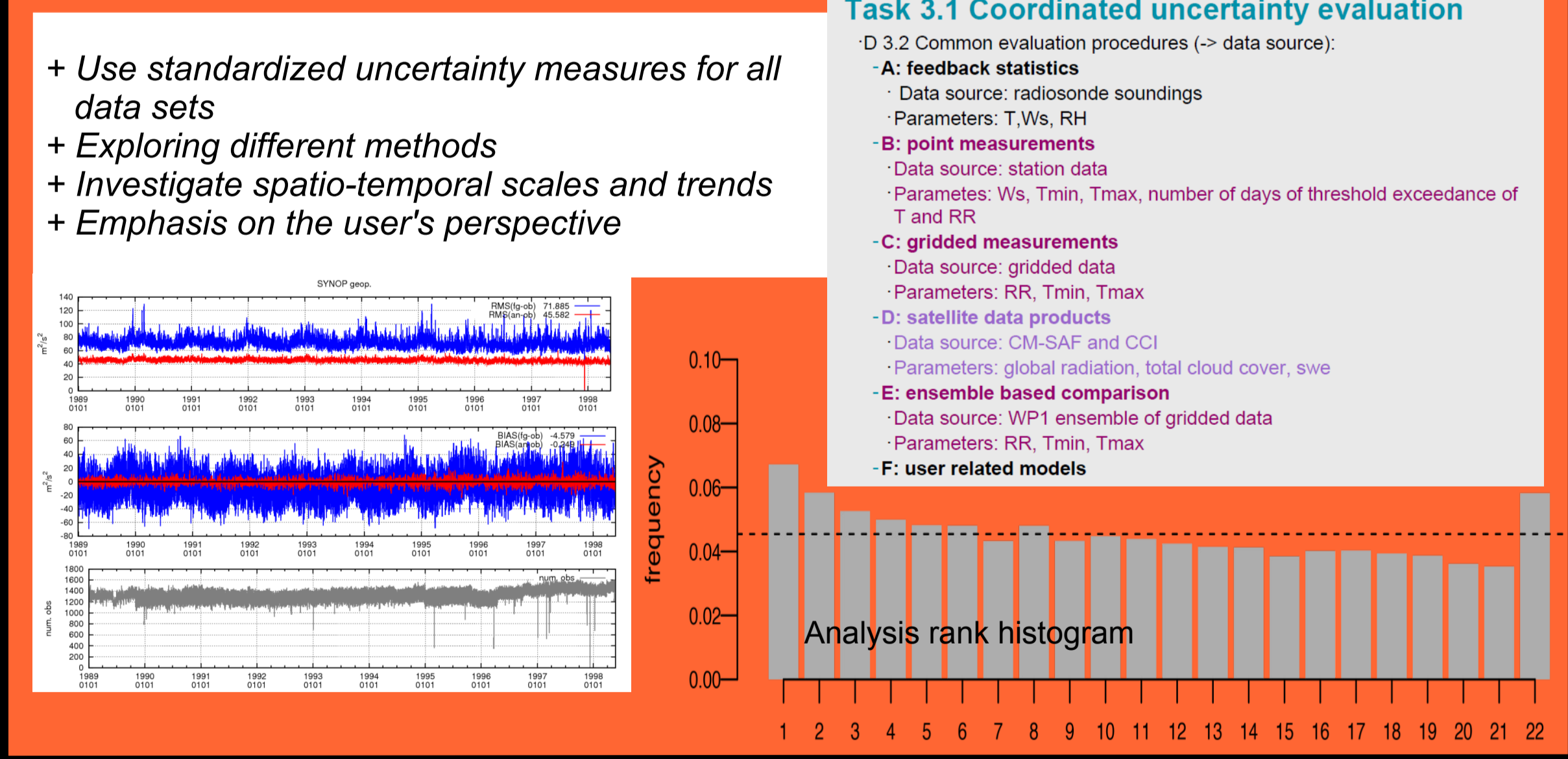


## ARCHIVING IN MARS

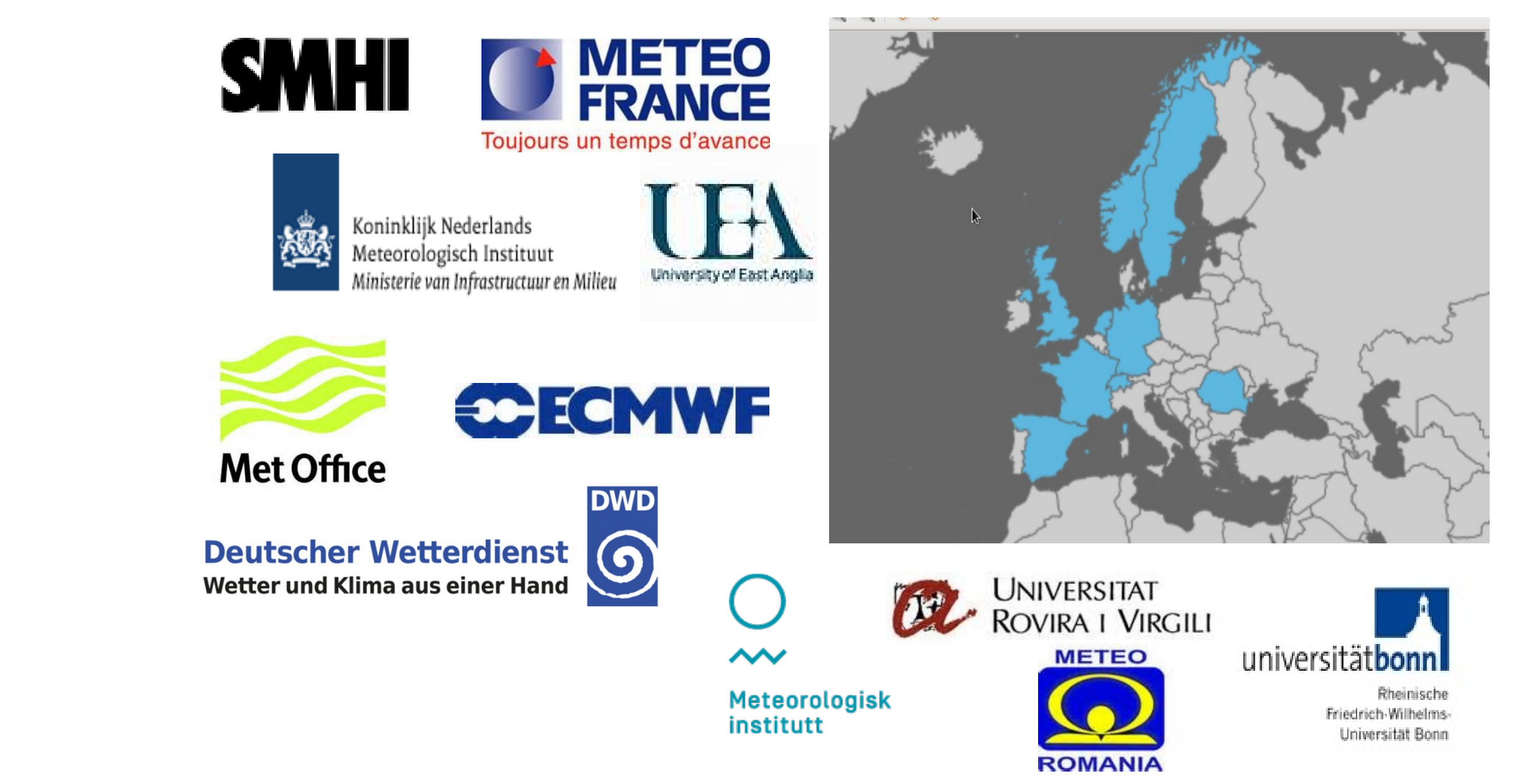
- + The common UERRA archive is MARS at ECMWF
- + Data services from MARS and ESGF interface
- + Web Map Servers
- + Visualisation through Metview and WMS

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## UNCERTAINTY ESTIMATION



## Project partners



## 5 precursor FP7 projects

- Among 5 pre-operational Copernicus Projects (SPACE 9.1 call)
- ERA-CLIM2 European Reanalysis of the Global Climate System
  - UERRA Uncertainties in Ensembles of Regional ReAnalyses
  - QA4ECV Quality Assurance for Essential Climate Variables
  - CLIPC A Climate Information Portal for Copernicus
  - EUCLEIA European Climate and weather events: interpretation and attribution

