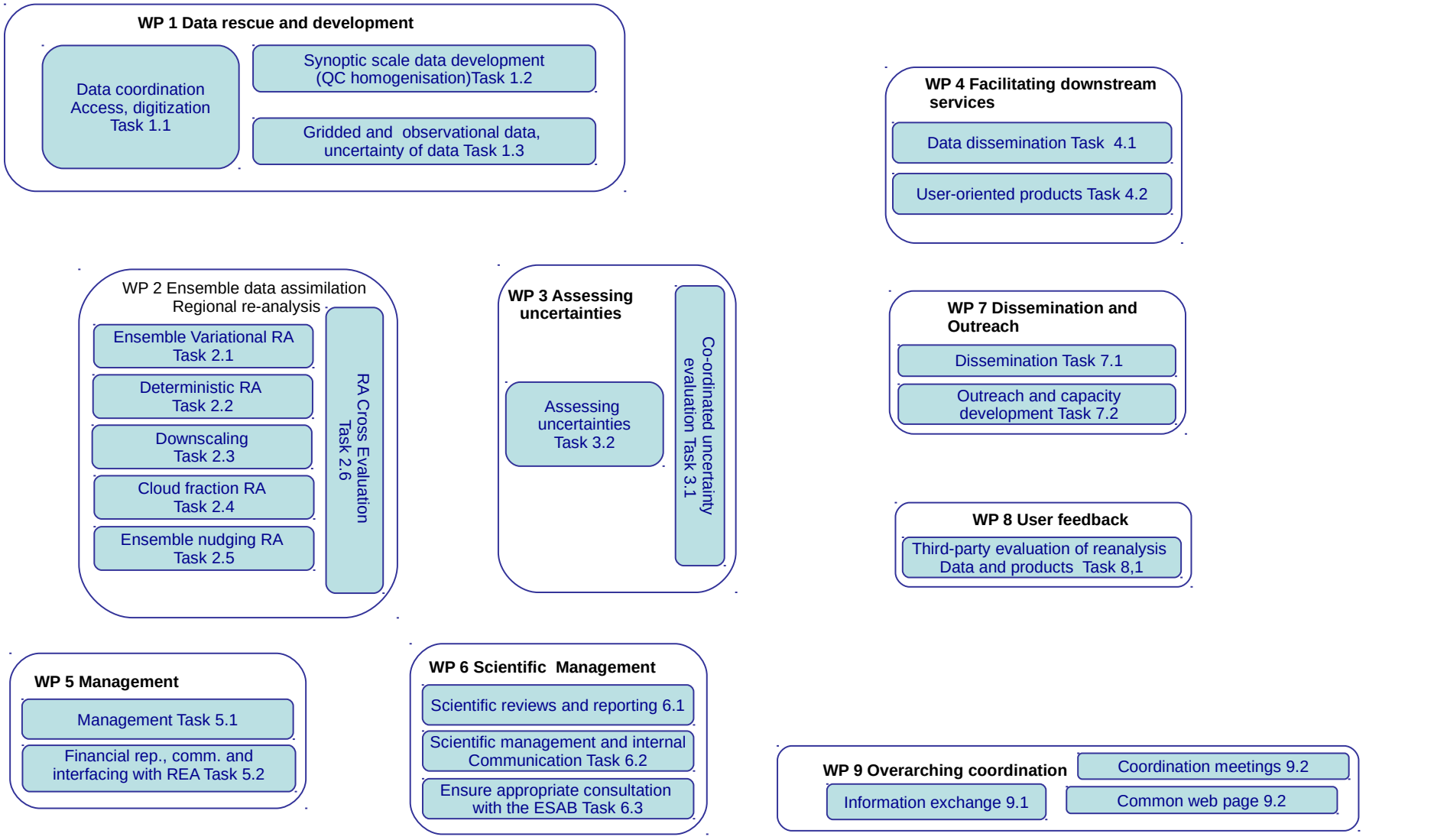
9 Work Packages



UERRA
Uncertainties in Ensembles of Regional ReAnalyses

WP1

SEVENTH FRAMEWORK PROGRAMME

- Data rescue
  - Fill in gaps in the from 1950 data
  - Sub-daily data
    - Less than on monthly scales but know where to find
  - Long term climate records from early 20th C
- Data development
  - Quality controls – consistency in time – networks
  - Homogenisation over time
  - Improvements

WP1

Data rescue

- URV some 3.6 M records
- NMA-RO som 0.3 M

Encourage to share national digitization efforts and get access to data

Input to MARS at ECMWF

Use in global and regional RA (WP2)

WP1

Continuing and extending the gridded data sets

- E-OBS and CRU

Development of new methods, transformation for precip, multiple realisations

=>

Uncertainties

WP2
Ensemble Data Assimilation

Met Office EDA

- Dowscaled from ERA-
- 20 members at 36 km
- Higher resolution control, 12 km
- From 1970s, satellite era

DWD / UBO Ensemble Kalman Filter EDA

universitätbonn
Rheinische
Friedrich-Wilhelms-
Universität Bonn

Hans-Ertel-Centre for Weather Research

Climate Monitoring Branch

- Regional reanalysis ensemble
  - COSMO on European CORDEX domain
    - 847x823 grid points
    - 40 vertical levels
    - preferably at 6km resolution, otherwise 12km
  - 10 – 20 ensemble members

WP2 deterministic models

- 11 km European 3D-VAR re-analysis 50 years
  - Very demanding in CPU and data resource
  - HARMONIE 2 model physics (ALADIN/ALARO)
  - Vegetation cover (cooperation MF)
  - Surface analysis improvements – soil
- (Deterministic MO at 12 km and UBO ~ 6 km)
- 5 km European 2D MESCAN (MF) cooperation
  - MESCAN developments – short runs – downstream from 11 km and 2 model physics
- 5 km European cloud MESAN analysis

Coupling the 2D surface analyses and a Surface Scheme

3D-Var Re-analyses at 10 km over Europe

Downscaling

5 Km over Europe

Observations

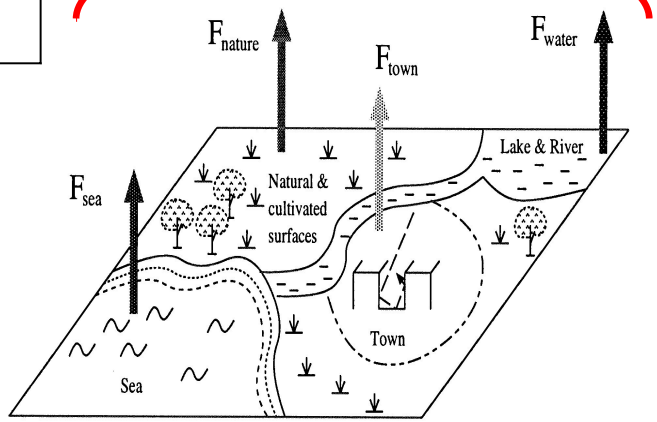
2D analyses at ~5 Km with MESCAN
T2m, Rh2m, Wind, RR

SW, LW

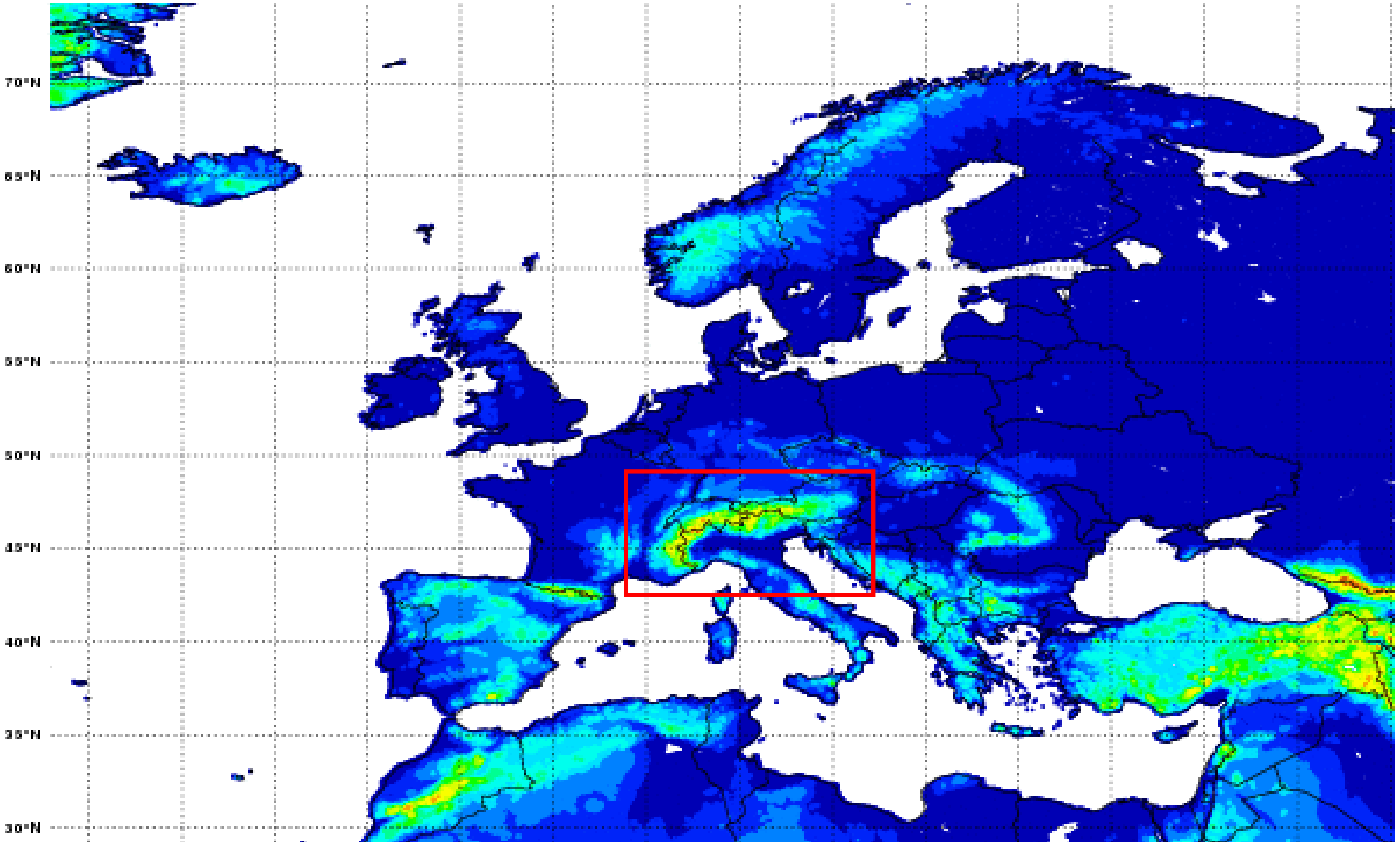
SH, LE, snow depth, snow cover, soil moisture, Ts_lake

SURFEX (V7): Surface Externalized
(www.cnrm.meteo.fr/surfex) with a sophisticated snow scheme (Vionet et al. submitted) and the lake model: Flake (Mironov, 2008)

Hydrological Model (TRIP)



EURO4M domain 5km



Sub-regions not part of the project but may be carried out

Model	MO control	MO ensemble	HARMONIE (SMHI/MF) deterministic 2 versions	COSMO Ensemble (Univ. Bonn, DWD)
Assimilation	4D-VAR hybrid Ensemle transform filter	-”-	3D-VAR	Ensemble transform filter
Resolution	12 km 70 levels	36 km 70 levels	11 km 65 levels	6/12 km 40 levels
Ensemble		20	2 physics vertion for a part of the period	10-20 members
Period	1978-2013		1961-2013	5 years
Observations	Conventional and satellites		Conventional plus large scale constraint from ERA	Conventional and satellite

Model	MESAN	MESCAN	HYPE	SURFEX/ TRIP
Type of model	2D sophisticated Statistical interpolation	-”-	Hydrological physical model	Surface flux model hydrol. physical model
Background	Downscaled HIRLAM or Climatologically adapted	Interpolated HARMONIE model	HARMONIE or ERA precipitation and temperature	MESCAN atmospheric variables incl. preciptitation
Observations	Surface and climate networks and radar precip	Surface and climate networks	Discharge for validation	-
Resolution	5 km	5 km	Catchment areas Median 215 km^2	25 km → river discharge
Time period	1982 – 2011 for cloudiness	1961-2013	30 years	30 years

WP3 objectives

Evaluation of regional re-analyses (and ensembles) and assessment of their measures of uncertainty.

Contribute to overall assessment of re-analyses for climate monitoring of extremes.

WP3 Objectives

- Evaluate deterministic, ensemble and downscaled reanalyses
  - Spread and differences in ensembles (&WP2)
  - Compare with independent ECV datasets
- Establish consistent knowledge of uncertainty
  - Common evalution procedure
  - Apply this on all reanalyses
  - Apply on sub-regions
- Synthesize results

WP3

Independent data sets:

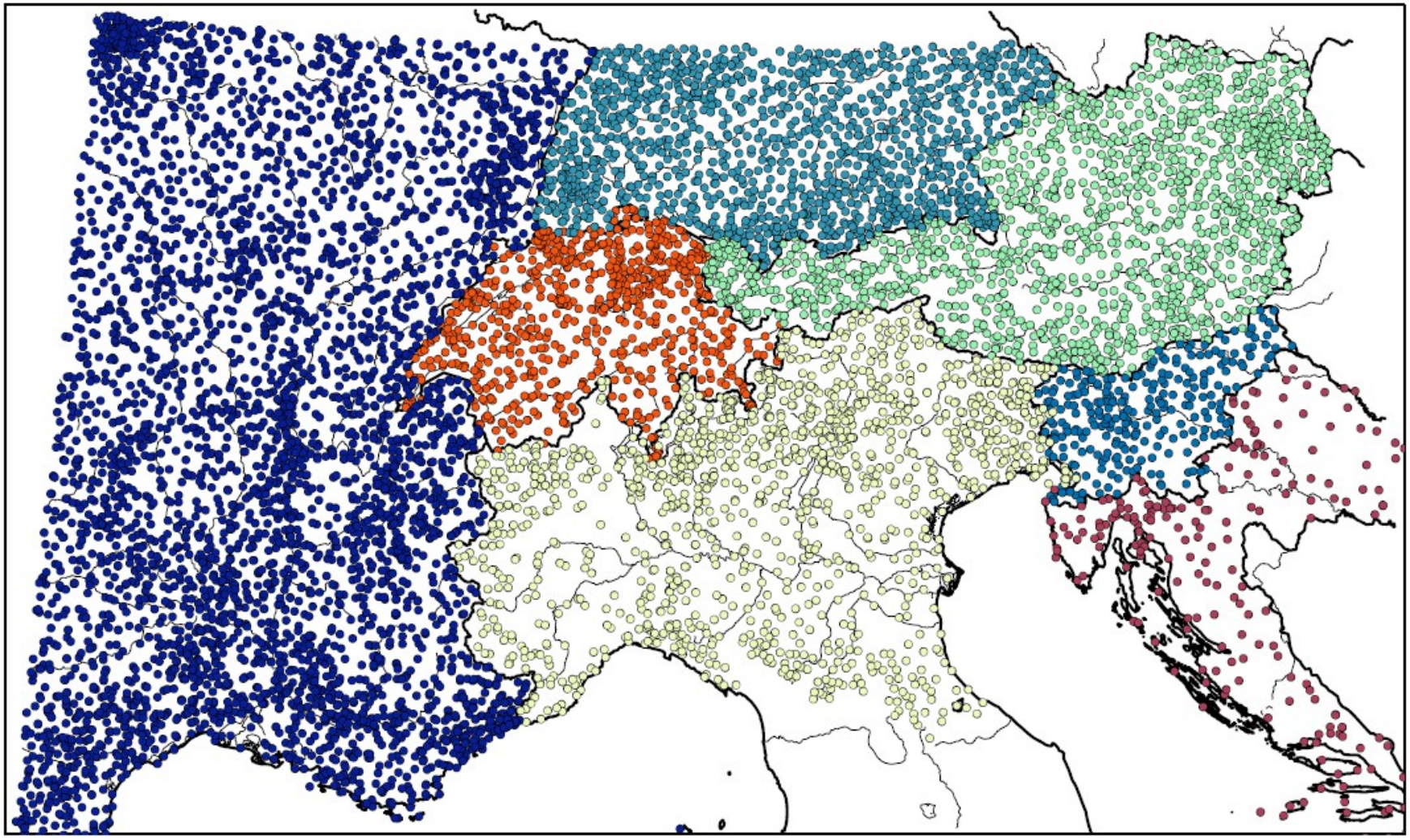
Validations against observation-gridded data sets

- E-OBS
  - 25-50 km and varying data density (sometimes low)
  - Depending on interpolation method
- Sub-regional high resolution other data sets!..

WP3

- Space based
  - CM-SAF
  - ESA-CCI soil moisture, albedo, snow
- GPCC precipitation
- Sub-regional gridded data sets, Alpine and more
  - (Nordic and possibly others)
- Downstream products:
  - Hydrological models and discharge data

Alpine Gridded Dataset



WP3

- Constistency and dependency of different grids
  - Effective resolution ?
- Climate trends
- ECVs and special climate features - extremes
- Can the RA reproduce these and use for climate montioring?
- Homogenity in time

WP3

=> Quantification of uncertainty

- Statistical modelling, probabilistic approaches
- Time-space covariances
- Uncertainty as a function of scale

WP3

Early WS

- Common methodology and software decided on
- Statistical methods applied on all data sets and with gridded or high res gridded as a basis
- Minimum set of evaluation scores ensuring compatability
- Translate into language understood by users

Evaluation WS

WP4

- MARS and Web map service – ECMWF, KNMI
- ESFG services
- Hydrological off-line modelling
  - Validation of re-analyses against river discharge data
- User oriented products
  - Climate indices
  - CIBs

ECMWF expertise: Dataset definition

- Definition of data sets
  - Re-Analyses (15, 40, Interim, CLIM, 20C), TIGGE, Observation Feedback Archive, EURO4M, ...
  - Homogeneity
    - Common terminology (parameter names, file names,…)
    - Common data format (format, units, …)
    - Definition of an agreed list of products (Parameters, Steps, levels, …)
  - Widen usage of data: multi-model inter-comparison, interoperability
  - Quality assurance
- Standard formats:
  - Fields (GRIB)
  - Observations (BUFR), recently in ODB

WPs 5, 6, 7, 8, 9

- Management
  - SMHI project administration , web site & hosting
- Reporting
- Scientific coordination
- Outreach and dissemination
- User feedback
- Climate Indicators (CIBs)
- User involvement and consultation
- Overarching coordination of the 5 Projects

WP connections