Progress and plans for the Met Office reanalysis

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http://www.uerra.eu/

ECMWF, Shinfield Park, RG2 9AX, Reading, United Kingdom
11-13 November, 2014

ECMWF

Core-Climax Coordination Meeting Towards Exchanging Reanalysis Observation Feedback and Blacklists

November 2014, ECMWF

Paul Poli et al

WP2 MetO deliverables

D2.1/M21 Develop ensemble-variational capability

D2.2/M24 Prepare extra observations (cloud fraction, disaggregated precipitation accumulations)

D2.3/M30 Preliminary report with ensemble diagnostics

D2.4/M42 Ensemble diagnostics report and documentation

D2.14/M45 Evaluation of the regional reanalyses + uncertainty (with SMHI, DWD, UB)

DP2.1 Capability

Regional reanalysis,

from 1978,

using observations from ECMWF MARS archive,

with an ensemble to provide uncertainty estimates.

EURO4M – Met Office

2008-9 Two year pilot reanalysis, deterministic 4DVar

Provided capability to

- Run NWP systems at ECMWF, including suite cycling
- Read and process observations from MARS BUFR
- Use ERA GRIB start files and boundary conditions
- Archive in GRIB format to MARS
- Validate regional reanalysis fields (ECVs, precipitation)

EURO4M

KNMI, De Bilt, April 2010

UERRA

Met Office, Exeter, March 2014

UERRA – Met Office

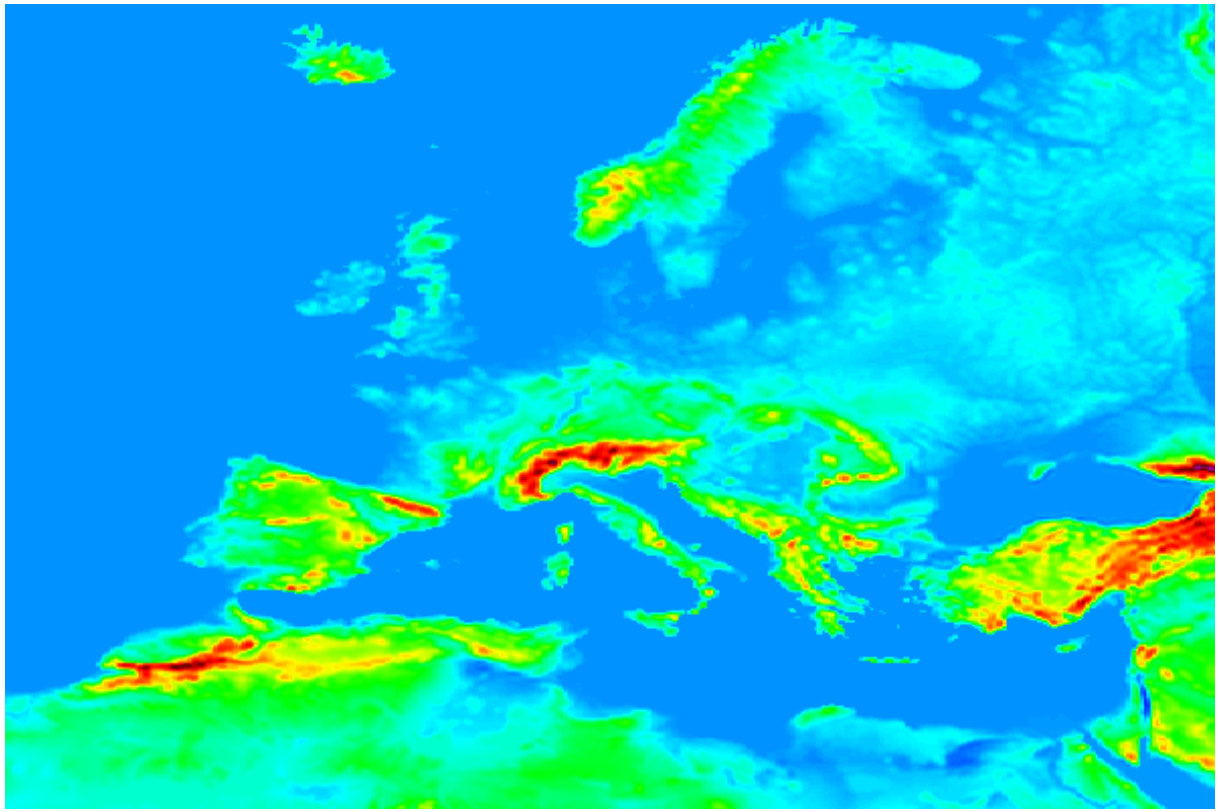
1978-now ensemble-variational reanalysis

Need to add

- Update NWP systems at ECMWF, including ODB
- Generate observation reject lists
- Access new datasets of old obs: reprocessed ground-based GPS, AMVs
- Assimilate TOVS radiances
- Regional update of surface fields
- Ensemble-variational assimilation system

EURO CORDEX domain

CO-ordinated Regional Climate Downscaling Expt



Deterministic control 12km

Ensemble probably 24/36km

Observations

Met Office

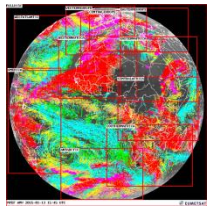
UERRA Uncertainties in Ensembles of Regional ReAnalyses

ECMWF

Land Synop

Sondes

Ships & buoys

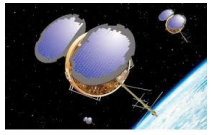


AMVs

(EUMETSAT)

Aircraft

(A)TOVS/AIRS/IASI/SSMIS/SEVIRIclear

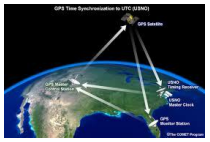


GPSRO

Elsewhere

SYNOP cloud

(ISD ?)



GroundGPS

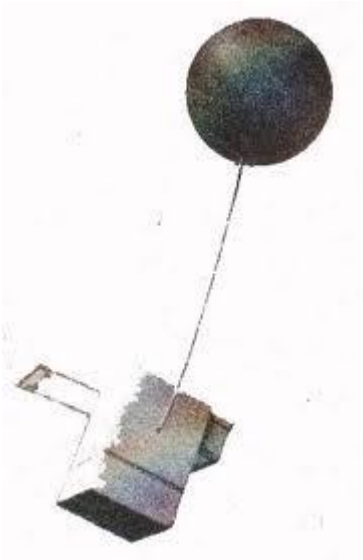
(EUREF Repro2)

Scatwinds

(ERS2, SeaWinds)

Observation rejection lists

- *Based on monthly monitoring of O-B.*
- *UKMO operational system is old, inflexible, not portable.*
- *New system being written:*
  - *in python*
  - *based on ODBs*
  - *flexible, portable, and easy to modify*
  - *already working for surface T, RH*



(Jemma Davie)

Station list for surface reports

Inputs for each variable and observation type:

- O-B values from previous month (or months if few obs)
- Previous station list

Process for each variable and station ID:

- Calculate % of O-B values > thresholds
- If many obs fail on bias, std dev or % gross errors → reject
- If station/variable was previously rejected → use stricter limits

Pressure is processed differently:

- Put O-B values into 1hPa bins and find peak (mode)
- If peak far from 0 → reject
- Calculate bias and std dev O-B near peak
- Compare bias and std dev to thresholds and whether previously rejected or corrected to decide whether to reject, correct or neither

Outputs: Station list

- Stations/variables to reject
- Pressure bias correction

(Jemma Davie)

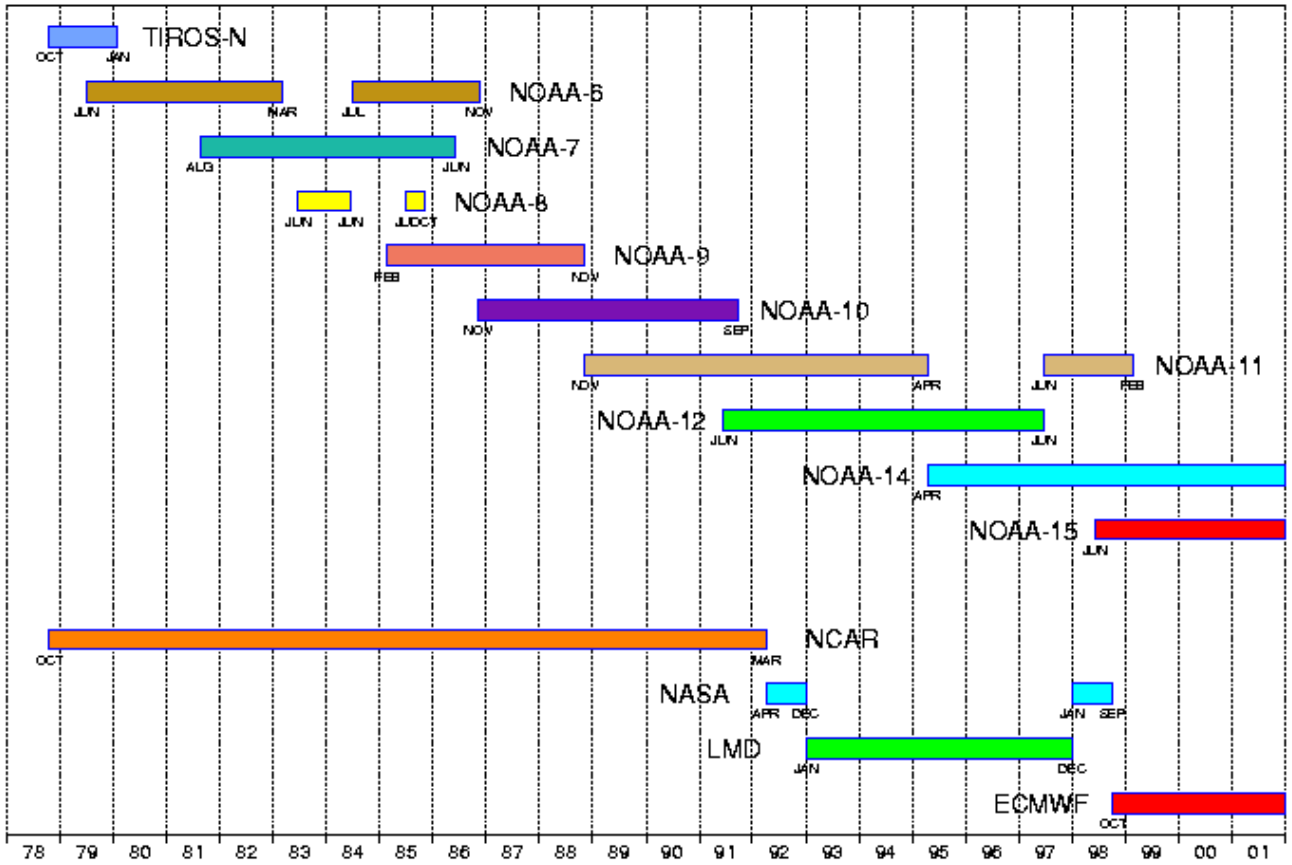
Station lists: Plans

Extend surface scheme to upper air and aircraft including bias correction for temperatures

Ground-based GPS: monthly monitoring

Satellite radiances, AMVs and GPSRO:
choose which instruments to use for what periods based on ERA-Interim

TOVS sounding instrument



1978 ⟶ 2001

(Amy Doherty)

TOVS progress

- Retrieve data from ECMWF MARS
- Convert to level with AAPP
    - convert counts to radiances
    - map MSU to HIRS fields-of-view
- Process in 1DVar
    - quality control
    - monitoring
    - retrieve skin temperature

(Amy Doherty)

TOVS plans

- Process in 4DVar (coded, not tested)
- Test for all satellites in the series
- Run trials to test impact

(Amy Doherty)

Surface boundary conditions

•*HadISST2 (0.25^{o} lat/lon)*

•*NESDIS IMS bulletins*

•*Land surface data assimilation (EKF),*

•*screen-level obs and ASCAT BUFR*

Satellite BC

- *VarBC*

$$bias = c^{scan} + \sum_{i=1}^{n} ci^{air} f(x_b)$$

Airmass-dependent bias correction of satellite radiances (based on Harris and Kelly, 2001)

VarBC will give smooth and automatic updating

(DingMin Li, Andrew Lorenc , Dale Barker)

- *Thanks to Richard Renshaw*

Variational Bias Correction

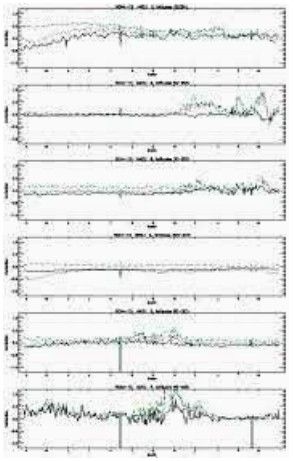
Progress:

- Basic scheme coded and tested in 4DVar

Plans:

- Separate VarBC minimisation for channels not assimilated (passive channels, new instruments)
- Tune adjustment timescales

  e.g. varying with ERA-Interim bias volatility



Plans for 2015

- Automated stationlists for surface, upper air, aircraft
- VarBC tested, spinning up new instruments
- Trial of TOVS data
- Surface fields generated/analysed for regional model
- Trial and assess ensemble-variational DA
- ...ready to start production runs early 2016

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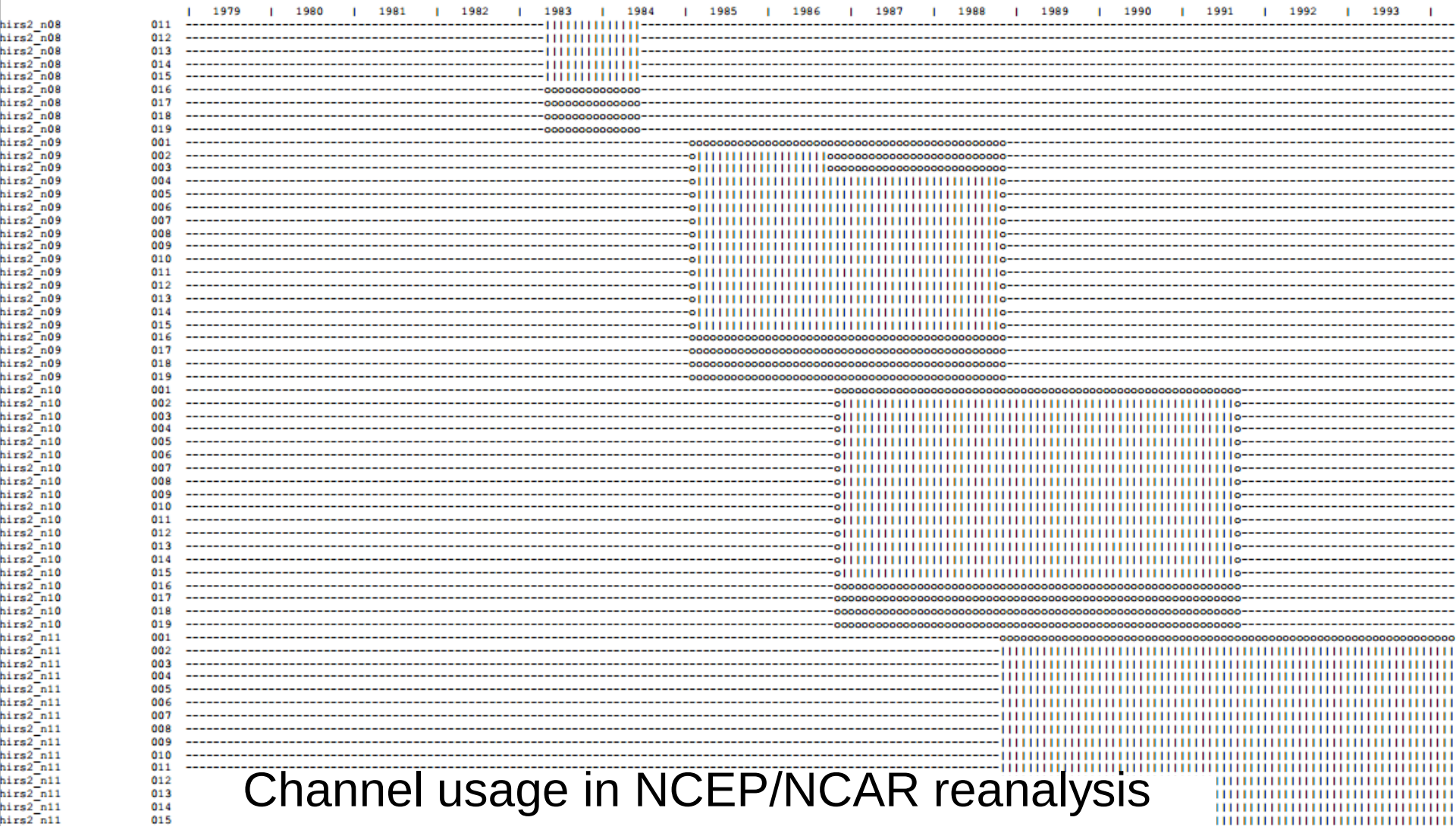
Core-Climax Coordination Meeting Towards Exchanging Reanalysis Observation Feedback and Blacklists

Core Climax

SEVENTH FRAMEWORK PROGRAMME

COordinating earth observation data validation for RE-analysis for CLIMAte ServiceS



Channel usage in NCEP/NCAR reanalysis

Jack Woollen, NOAA

Feedback Workshop Summary

Paul Poli & David Tan

- Many potential users for obs feedback information
- Feedback info is in many different formats
- Most reanalyses don’t make this available anyway

Recommendation:

- Work towards a common format
- Make feedback available, with tools + documentation

http://www.coreclimax.eu/?q=Feedback

Thank You