Quantifying and reducing uncertainties

Work package 4
DWD, ECMWF, FFCUL, RIHMI, UNIBE, UNIVIE, UVSQ

ERA-CLIM2 Review Meeting Jan 19, 2017
## Status of Deliverables

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D4.2
Updated Radiosonde bias adjustments

- Improvements on RS-T in various aspects
  - Smaller trend heterogeneity, more stations, extension back to 1939
  - Annually varying adjustments
  - Adopted for ERA-5, paper in preparation

- Humidity adjustments
  - Back to 1979, not yet all stations included
  - Paper to be submitted
D4.3, 4.5, 4.6, 4.9
Quality Control Activities

• Reports almost completed (4.5 by end of January)
• Essential to feed back flags, corrections into source data sets
• Not only data but also metadata
• 6-monthly update cycle agreed
### ERA-CLIM Metadata-Base (surface stations)

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Coimbra: 1955 – Change of barometer
Lisbon: 1896, 1994 – Change of barometer
Porto: 1923 – Station closed during 1920-1922 – probable change of barometer

The list contains the breakpoints that coincide with metadata changes and one for which we can make a case for a non-documented metadata change (1923 in Porto is not documented).
D4.7 Verification of Precipitation
D4.8, D4.10, D4.11
Global energy, water, carbon cycles
Comparison with other reanalyses
Low frequency variability and trends

- 5-6 papers on coupled energy budgets
- Carbon cycle diagnostics using CERA20C as driving input
- Story line for reports prepared by UNIVIE
- CERA20C quite competitive
Obs-CERA20C standard dev. 700 hPa 1959/60, from 00h,12h launches
Same for Obs-NOAA 20CR V2c
Same for Obs-ERApreSAT
Obs-Reanalysis departure
Standard deviation profiles 1959/60

Falkland Islands

Vienna

CERA20C an
ERA20C an
20CR v2c an

preSAT an
preSAT bg

8K
6K
Carbon reanalysis: evaluation of CERA-20C ORCHIDEE simulation

- Land Use variant: LUCMIP6, LUCMIP5
- Meteo Forcing: CRUNCEP
- Model version: ORC-CMIP5
- CO₂ Inversion: MACC2

Net Carbon fluxes

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<th>Tropic</th>
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<td>PtGCC / Year</td>
<td>-2.5</td>
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</tbody>
</table>

Legend: Green for LUCMIP6, Red for LUCMIP5, Blue for CRUNCEP, Purple for ORC-CMIP5, Orange for MACC2
Tropical Temperature Trends 1979-1999

WP4 progress report January 19, 2017
Fig. Annual time series Africa.

Fig. Annual time series India and Monsoon area.

Fig. Annual time series Eurasia.
Data portals, visualization tools

- Continuous development until end of project

- http://www.ecmwf.int/en/research/climate-reanalysis
- http://transcom.globalcarbonatlas.org/
- http://srvx1.img.univie.ac.at/raobvis/
Conclusion

• High capacity has been built for
  - for full coupled reanalysis of 20th century
  - Correcting data and metadata errors
  - Evaluation of fluxes through climate system
  - Including carbon cycle for long reanalysis
  - Answering pressing research questions (e.g. low frequency variability)

• Full reanalysis of 20th century will harvest the seeds planted
  - EU should do the harvest!
  - Support via research projects needed
Upper air data base

- Ensure continuous updating, versioning
- Data format should be fit for Copernicus Climate Data Store and for assimilation into reanalyses
- Upper air data inventory at FFCUL, METEO-France
Rationale for EU follow on project

- Assimilation in presence of strong observation density gradients
- Coupled diagnostics, flux validation
- „Ultimate“ solution for RS-T using GPS-RO as reference – GAIA-CLIM
- Evaluation of ensembles
  - apply EMOS, BMA to reanalysis ensembles, observation ensembles?
- Prove positive impact of rescued data
continued

• Update and include new ISPD version
• Continue data rescue (e.g. METEOSAT1 images, whaling log books) and feedback analysis
• Rescued data often not in shape to be assimilated or not CDR
• Carbon data assimilation? Feasible?
• Coupled long term SST assimilation
Achievements to be promoted into Copernicus

- Homogenized UA data consistent with GPS-RO – consistent anchor back to beyond 2001
- Energy budget diagnostics
- After further tests: RH and wind homogeneity adjustments.
- Feed QC flags into sources
• WP2-WP4 interaction
• Meteorological input for carbon models crucial
• CRUNCEP increases Primary production fluxes by 50% compared to CERA20C, net fluxes sometimes opposite
• Soil freezing important for co2 fluxes in extratropical boreal regions