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Theme 6 [SPACE]



Project: 607193 UERRA

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Uncertainties in Ensembles of Regional Re-Analyses

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First Workshop involving climate service providers

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UERRA User Workshop 3-4 February 2016

Météo-France, Toulouse

As part of Workpackage 8 (User Feedback) of UERRA two user workshops are planned: one half way, and one at the end of the project. Goals and set-up of both workshops differ, since at the time of the first workshop the UERRA data products will not yet be delivered, while at the second the final products and services will be presented to the users.

For both workshops the goal is to serve both users and providers:

For users:

- Sharing experiences with other users and providers of re-analyses data
- Getting advice from the producers of re-analysis datasets for specific appl.
- Learning about qualities and deficiencies of (regional) re-analyses data
- Getting informed on future re-analyses products
- How to use of uncertainty information
- How to assess the value of re-analyses data in user environment
- How to assess fitness for a specific purpose
- Tips&Tricks&Tools for using and evaluating re-analyses
- Improving (future) support for users of re-analyses data

For providers:

- Preparing for better services to users of re-analyses data
- Stimulating (proper) use of the data
- Assessment of user needs (data specification, tools, guidance,...)
- Find new independent observations that can be used for validation

[A plan and initial review of existing user consultation reports](#) was prepared and used during the organization of the 1st workshop which was held after the 3rd General Assembly of the project in Toulouse, France. This document briefly reports on this meeting.

Workshop preparation

Initially the announcement depicted below was send to 120 email addresses containing contact points from the former EURO4M project and related projects, the UERRA partners, the EUMETNET network and the EEA. The workshop was also announced several times during the re-analysis sessions of the 15th EMS Annual Meeting & 12th European Conference on Applications of Meteorology (ECAM), 07–11 September 2015, Sofia, Bulgaria.



UERRA user workshop



Where: Météo France, Toulouse

When: 3+4 February, 2016 (noon-noon)

Topics:

- Regional re-analyses: qualities and deficiencies
- Sharing experiences and getting advise
- Using uncertainty information
- Evaluation in a user environment; fitness for purpose
- Tips & Tricks & Tools

Project Website: www.uerra.eu



AGENDA of the Workshop

Wednesday 3 February
13.30-14.00 REGISTRATION.
14:00-14:15 Welcome and practical announcements (Per Unden, Eric Bazile)
14:15-14:30 Introduction to UERRA / Regional re-analysis (Per Unden)
14:30-15:30 Presentation by users (moderated by Gé Verver)
15:30-16:00 Coffee break
16:00-17:10 Presentation by users (moderated by Eric Bazile)
17:10-17:30 Specification of data produced by UERRA (Per Unden)
17:30-18:00 Summary/Conclusions/Discussion on user requirements (chair: Per Unden & L. Dubus)
18:30 ice breaker and buffet

Thursday 4 February
9:00-9:30 Evaluation, fitness for purpose and uncertainty assessment (Peter Jermey, UKMO)
9:30-9:50 Accessing EURO4M and UERRA data (Richard Mladek, ECMWF)
9:50-10:10 Visualization software tools (Else vd Besselaar, KNMI)
10:10-10:30 Evaluation software tools (Cristian Lussana Met.no /Michael Borsche DWD)
10:30-11:00 Coffee break
11:00-12:00 Discussion on user requirements (scientific, technical, support, etc) (chaired by Andrea Kaiser Weiss, DWD)
12:00-12:30 UERRA plans and setup of the 2nd UERRA user workshop (Chaired by Per Unden)
12:30 Closure

The agenda containing links to the presentations can be found at:

<http://www.uerra.eu/project-meetings/user-worshop-1.html>

Participants and User Applications

For the workshop 48 participants from 12 countries (18 from France) were registered (see ANNEX). Of this group, 19 were working on applications of re-analyses data and 10 were not related to UERRA.

Participants came from a wide range of sectors. Applications (potentially) using re-analysis data that were presented at the workshop were: Energy (wind, solar, demand), Insurance, Transport, Agriculture, Defense, Hydrology, Climate Impacts, Model evaluation, and Atmospheric Physics.

The participants were asked to very briefly present their interest in re-analyses, examples of use, requirements, etcetera. This was done in the first part of the meeting.

Discussion on user requirements

A significant amount of time was allocated to discuss user requirements for data as well as for scientific and technological support. Although a wide range of sectors were represented in the meeting, it was a clear advantage that all users either already worked with re-analyses data, or were interested to do so in the near future. About half of the participating users worked with re-analyses data before. Several examples were shown of the use of ERA-40, ERA-Interim, or analyses made for operational weather forecasts. Because of the need for very detailed information (often related to extreme situations) several participants used some form of statistical downscaling to get to the scale relevant for their specific applications. Although it is clear that not all requirements can be met with the UERRA products, the discussion on the future data products did not lead to significant changes in this list. Items not on this list, but considered useful by some participants were wind gusts at 100m height and CAPE (Convective Available Potential Energy) .

A short summary of the findings of the user presentations are listed in the table below. Although a significant number of users participated in the workshop, the requirements in the table are not exhaustive and priorities might change when a specific application is discussed more thoroughly. Typically, the matching of what is feasible to provide by re-analyses, and what specific users might want, is an evolving discussion, of which this workshop is a part.

Application	Parameters	Spatial resolution	Temporal resolution	Time span	Measures of uncertainty	Remarks
Climatological studies	radiation (integrated), precipitation, temperature, snow cover	as high as possible (down to 100m)	subdaily, daily, monthly	years to decades	min/max-range ensembles for uncertainty estimates	climatology studies, comparison with other data, model evaluation
Hydrology	precipitation, and all that is needed to initialize seasonal models		temporal homogeneity needed climatological use (change of obs. network, particularly for (extreme) daily temperatures	real-time production and period > 30 yr	reliability for spatial analysis scores and monitoring of data used	ensembles: needed for initialization of hydrological models, initialization of seasonal forecast models
Climate impact indicators	Daily 2m T_{max} , T_{min} , Precipitation				AN and FCST but for different variables and thus do not allow their combination, especially over longer time data	Timing of olive phenological phase; Annual variation of growing season length. Other climate indices (e.g. 1989-2010 avg # of ice days in January)
Ocean-Atmosphere interactions and Offshore Wind Energy	precipitation, wind		daily and 6hourly, (UERRA-proposal to provide 3,6,12,18 h output would be right	20yrs is enough	would usually use one deterministic series medians and percentiles based on ensembles would be nice to have	Moisture transport, statistical downscaling, wave energy flux, ocean-atmosphere coupling, diagnostics of climate variability and impact, model evaluation, variability, regional scale WRF and WRFA based simulations

Application	Parameters	Spatial resolution	Temporal resolution	Time span	Measures of uncertainty	Remarks
Climate Scenarios	All what RCM needs Wind speed	RCM on 12 km grid	Requirement: daily T_{min} , T_{max} , humidity, wind speed at chosen point, global solar radiation	1961-2011		Use of reanalysis data: Correcting RCM bias; Will compare homogenized data with UERRA reanalysis; To estimate time series with help of UERRA where measurement periods are too short (wind speed) Questions for UERRA: How to obtain data? What is real time resolution? Space resolution? Uncertainties? How to downscale? (is it possible? are there tools? Uncertainty?)
Transportation / Roads	Water/ice height snow type (height, density, liquid water content); Post-event reanalysis (precip, radiation, air temp., wind, humidity)	1-2 km resolution with all parameters At least 5-10 km in plains, and 1-2 km in mountains At least European scale	Combines many different data sources whatever is available (e.g. 5 min. radar)	Long period (30 years)	Short-term and real-time reanalysis of precipitation based on high resolution (time and space) radar data	Road weather, Post-event reanalysis Surface obs data fusion for purpose of road condition climatology Looking at winter parameters Such as mean number of days with snow and ice on the road > 0.05 mm and > 1 cm

Application	Parameters	Spatial resolution	Temporal resolution	Time span	Measures of uncertainty	Remarks
Consultancy to Energy, Defence, Insurance sectors	<p>main interest: temperature, solar radiation, wind speed, cloud cover, rainfall</p> <p>focus on wind speeds (50m and 100m height) mean wind speed and max (wind gusts)</p>	10 km (target: 2.5 km)	1 hour coupling frequency needed	The longer the better, 30 years, at least 20 years	own computations would strongly benefit from a new forcing dataset at a jointly better horizontal and temporal resolution (10 km, 1 hour)	<p>Use of Reanalyses data: Dynamical downscaling (using reanalysis for forcing) With HR model AROME (now : forcing ERA-I)</p> <p>Climate modelling correction</p> <p>Characterization of meteo-parameters over Europe or over the world</p> <p>Improved topography and rainfall data wanted (compared to ERA-I)</p>
Solar radiation studies	Water vapour and snow/ice cover from Harmonie; cloud amount, cloud base and top height	11x11km down to 2.5 km desirable, to cover 75 degrees north	1 hour			Modelling solar radiation, uses NWP fields as input
Wind energy Climate impact (vine yards) Predictability studies	10m wind speeds		Average daily anomalies		Forecasting skill assessment with FairRpss, FairCrpss	<p>To validate wind speed for weather types</p> <p>Winter severity index (climate change impact on vine yards) for climate change scenarios, and based on ERA-I</p>

Application	Parameters	Spatial resolution	Temporal resolution	Time span	Measures of uncertainty	Remarks
Energy production	Mean wind and wind gusts, air temperature, precipitation, river flow, water temp., solar irradiance	5-10km	1h resolution important for solar/ wind farms, storage (because of strong intra-daily variability)	Longer products (50 years)	needs uncertainties on all scales, needs coherence between T, RR, wind, solar radiances (close to that in obs.), intra-daily variability	<p>wind power, hydropower, solar energy, power plant cooling system</p> <p>wind and solar energy production over Europe, long time series</p> <p>wind speed at hub height for each grid point -> regional transfer function -> aggregation to country scale and adjustment of transfer function according to need;</p> <p>obs -> time series reconstruction for 30-50 years, based on ERA-I (ERA40) and obs. and statistics</p> <p>wants to use reanalysis to extend present day climatology</p> <p>reanalysis: for validation, for downscaling, for forcing</p> <p>special locations of interest, as well as: aggregate total wind power in zones, national balances</p>

Application	Parameters	Spatial resolution	Temporal resolution	Time span	Measures of uncertainty	Remarks
Physical process studies		ERA- I is not good enough			<p>Wants ensembles</p> <p>Large problems for extremes motivates high resolution</p> <p>Clear problems in near surface humidity from ERA-I (trends are no good)</p>	<p>Coastal low level jets;</p> <p>High resolution simulation of intense storms for process studies</p> <p>Portuguese climate change adaption portal</p> <p>Uncertainty analysis in climate predictions</p>
Insurance & wind storm risk	wind ; CAPE (Convective Available Potential Energy)	25km ok, 4km better			Ensembles are very useful	<p>Aiming at insurance market e.g. generation of 1000s of 'synthetic' storms</p> <p>Study events „in the tail“ of the distribution; not restricted to a certain period</p>
Boundary conditions for climate models RCM validation	3D for profile validation (in the boundary layer) wind speed at 10-150m			Long period	<p>Wind speed bias in the RCM</p> <p>Not really „upper air“ – wrong term used</p>	RCM: upper level wind climatology, lower boundary condition for RCM (RRA more detailed than global) and model validation

Table 1: A short summary of the findings of the user presentations at the 1st UERRA user workshop

Other observations/remarks made during the discussion were:

- DWD (Frank Kaspar) showed how re-analyses was used to assess homogeneity (and representivity) of time series of in-situ observations.
- Most users present at the workshop were not familiar with 'Feedback' information provided by the re-analyses systems, that could be helpful to detect inhomogeneity or biases in the observations.
- Many users were familiar with R-code and with GitHub.
- Many indices of extremes are based on relative thresholds (relative to the statistics of the time series itself), which makes them less sensitive to potential biases. However, several practical applications use absolute thresholds, which would likely require bias corrections applied to the re-analyses data.
- A difficulty encountered by users interested in assessment of trends is the inhomogeneity of re-analyses. An example was given from the Iberian Peninsula, which showed spurious trends derived from ERA40 data, probably caused by the changing number of observations being assimilated in this area causing a cold bias in the early years of this dataset. Users were interested to know how serious this effect is in the re-analyses data provided by UERRA. It was suggested however that for many applications the advantage of using additional observations in recent decades would outweigh the disadvantage of introducing inhomogeneity by doing this.
- It was concluded that easy access to re-analyses data is the most important requirement by users.
- Evaluation tools and visualization tools are of interest to a significant number of users
- A suggestion was made to provide wiki pages to inform users of re-analyses data, evaluation and visualization tools.
- An efficient way to exchange user experiences, and to compile Q&A's could be a forum on the internet. Also user meetings could be useful when all re-analyses datasets are available and data is being used.
- The plan to work with user data in the second workshop might not be feasible. The alternative could be working with station data from the European Assessment & Dataset (ECA&D).
- It was suggested to use the second workshop also to provide background information on the re-analyses methods and to learn what can be done / not done with the data. Presentations of examples of use would be helpful.

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