



Seventh Framework Programme  
Theme 6 [SPACE]



**Project: 607193 UERRA**

Full project title:  
**Uncertainties in Ensembles of Regional Re-Analyses**

**Deliverable D3.7:  
Workshop on the synthesis of evaluation  
results**

WP no:	3
WP leader:	DWD
Lead beneficiary for deliverable :	DWD
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Project: 607193 - UERRA





# UERRA Evaluation workshop, 01. December 2017

## Tarragona, Spain

### **1. Introduction**

Within the European Union funded project UERRA a number of regional reanalysis data sets were produced with different models and data assimilation techniques. The UERRA product portfolio includes deterministic reanalyses, ensemble reanalyses as well as downscaled reanalyses, with a focus on the uncertainties of the reanalyses. As part of Workpackage 3 (Assessing uncertainties by evaluation against independent observational datasets) the UERRA reanalysis products were evaluated, using a set of dependent and independent climate variables datasets.

Starting from the common evaluation procedures (deliverable D3.2) defined at the begin of the project, and from common routines (deliverable D3.3), uncertainties of UERRA regional reanalyses were assessed and findings are summarized in deliverable D3.6.

At the 1.12.2017 an evaluation workshop of WP3 took place in Tarragona, Spain. The workshop constitutes the deliverable D3.7, where all the findings of the evaluations performed in WP3 were presented and scientifically discussed. The following document summarizes the main outcomes and most important topics of the workshop.

In addition to the WP3 participants, also interested users were invited to attend the evaluation Workshop (D3.7). Several users which participated in the second user workshop (D8.3), which was organised one day earlier at the 30.11.2017, also benefitted from attending D3.7.



## 2. Preparation

An initial announcement was sent to the UERRA partners and distributed via user's lists:



### UERRA -User Workshop -Evaluation Workshop

Bringing together the users and providers of European reanalysis  
30 November + 1 December 2017, Tarragona, Spain



#### Topics:

- Principles of reanalysis systems used in UERRA
- Demonstrating data access and visualisation
- Strengths & weakness of the different datasets
- Assessing uncertainties and fitness for purpose
- Evaluation of UERRA wind, temperature, precipitation, radiation and climate indices

Everybody interested in using UERRA regional reanalyses is invited.  
The 2nd UERRA User Workshop will take place on Thursday (30/11, starting at 8:30). User Workshop participants are also invited to join the Evaluation Workshop on Friday morning (1/12, ending at 13:00). There is no registration fee. Lunches will be provided on both days.  
Visit <http://www.uerra.eu> for additional practical information and registration.



## 3. Participants

In total, there were 36 participants from various European national agencies and private companies, with 28 of them already involved in the UERRA project, and 8 completely independent users. The latter came from a range of sectors and countries, namely from an insurance company, from the energy sector (wind and solar), agencies responsible for hydrology, agriculture and forestry agriculture applications, and scientists working on model validation.

## 4. Agenda of the workshop

A short overview of the programme is listed below. Workshop contributions were provided by MO, KNMI, NMA-RO, MI, EDI and DWD.



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Chair: Per Unden

**08:30** Overview – Methods for evaluation (Deborah Niermann)

**08:40** What can we learn from DA output and what not (Richard Renshaw)

**09:00** Comparison of wind speeds against station observations (Deborah Niermann)

**09:20** Comparison of drought indices (Roxana Bojariu)

**09:40** Comparison of indices based on temperature and precipitation (Gerard van der Schrier)

**10:00 – 10:20** Coffee

**10:20** Evaluation of reanalyses for precipitation in complex terrain: the Alps and the Fennoscandia (Cristian Lussana and Francesco Isotta)

**11:00** Comparison against satellite data (Michael Borsche)

**11:20** Discussion and draft for user guide (Andrea Kaiser-Weiss)

**12:00 -12:30** Remaining challenges and Conclusions

The agenda can also be found at the UERRA webpage, with links to the presentations at:

<http://uerra.eu/project-meetings/ga5-and-workshops/195-evaluation-ws-programme.html>

## 5. Topics

The key issues of the WP3 workshop have been firstly the presentation of the evaluation work, done during UERRA. Secondly, the user guidance material was presented and discussed, to ease the uptake from external users and thus enlarge the community of potential users.

### 5.1. Presentation of evaluation work

The evaluation work in WP3 includes the use of the essential climate variables (ECV's) which were found of particular user interest, based on questionnaire replies from more than 2500 users (see CORE-CLIMAX deliverable D5.52). Users' main interest covers wind speed, temperature, radiation, precipitation, and several climate indices.



For assessing the reanalyses uncertainties for these expected user applications, five evaluation methods were applied:

1. Feedback Statistics
2. Comparison against station observations
3. Comparison against gridded station observations
4. Comparison against satellite data
5. Ensemble based comparison

Each method has own advantages and disadvantages that are reported in deliverable D3.6 and were presented in the first part of the user workshop. In the following, the main outcomes of the evaluation work are listed:

- Feedback statistics are not often used in evaluation procedures outside the production, but they can provide a lot of information about the model behaviour as well as the observation quality.
- Feedback statistics can reveal time dependencies, systematic errors or discontinuities
- They can be used for developing a blacklist (which observation records should be neglected and which not).
- In the reanalysis, significantly higher weight is given to the background model than to the observations.
- The comparison against station observation is difficult to interpret because of representativity issues (i.e., comparing point measurement to grid cell is not comparing like with like).
- The comparison against gridded station data depends on the quality of the data set, with the gridded observations not suitable to be considered as “truth” in data sparse regions. Due to inhomogenous station density, the results can vary.
- The use of satellite datasets provide a source of complete and independent radiation data for Europe, the quality though is not sufficient to serve as a reference data set.

**For windspeed:**

- Over the sea, wind speed on large scales agree generally very well between various reanalysis systems. Over land, the differences between various reanalysis systems are twice as high as over the sea.
- The regional systems show an added value against ERA-Interim.
- The wind speed bias depends on the model system (model topography), the selected location, and also the wind speed (as wind speed has a Weibull distribution, depending on location).
- The bias increases in higher elevated areas due to larger differences of model and observation height.

**For drought related indices:**

- The investigation of drought related variables show an overestimation of precipitation and evaporation of the MO reanalyses over Romania, but spatial features are quite well captured by the reanalysis.
- Temporal evolutions of precipitation in observations and the MO deterministic reanalysis correlate quite well on monthly and daily time scales.



- A large part of inter-month and inter-annual variability of the potential evapotranspiration in the warm season over Romania is well captured by the MO deterministic reanalysis.
- The use of the MO deterministic reanalysis data to build drought indices for analyzing droughts variability and change at fine spatial scales seems a good choice, having in mind that the above mentioned indices are expressed in standardized deviations from a reference interval.

#### **For 2m temperature and climate indices:**

- The investigation of 2m temperature, compared to E-OBS, shows an overall good reproduction of variability (seasonal cycle), which depends again on the selected area.
- Further climate indices based on Tmin and Tmax highlight issues with temperature extremes.
- Harmonie is too warm in the summer and too cold in the winter while UM is too warm in both extremes.
- For many situations, reanalyses offer a more suitable alternative to observations, due to better parameter estimation in data sparse areas. However, special care for extremes is needed, i.e., requires bias removal.

#### **For precipitation:**

- The evaluation of model precipitation includes the use of high resolution gridded data sets based on statistical interpolation. Complex terrain regions over the Alps and Fennoscandia are considered.
- Except COSMO, the regional RA's tend to overestimate precipitation amounts and frequency.
- In regions of low station density the RA's show better small scale structures than gridded datasets, while in regions with higher station density the downscale data sets (e.g. Mescan) show added value.
- For the Alps COSMO-REA6 and COSMO-REA12 show the best results, while for Fennoscandia Harmonie is the model that can reproduce higher precipitation in Norwegian mountains just as well as dry areas in Lapland.
- A scale dependent analysis shows worse results for complex topography, smaller catchments and higher precipitation amounts.
- All model systems can reproduce the annual cycle quite well.

#### **For global radiation:**

- Increased biases over complex topography are not necessarily due to issues in the reanalysis system but also due to problems of radiation estimates in the satellite datasets.
- The decision which reanalysis performs best depends on the region and chosen parameter.
- There are high annual correlations ( $>0.8$ ) over land for all reanalyses.

The evaluation results can not provide an overall winner that outperforms the other reanalysis systems, rather they point to the strengths and weakness of regional reanalyses



datasets and highlight various issues that have to be kept in mind when using specific evaluation methods. In particular it was pointed out that the model performance varies strongly with location and also with temporal scale.

## 5.2. Discussion of the User Guide

The development of user friendly material is essential for the success of the UERRA project, and to ensure the users benefit from WP3, the optimum communication had been discussed. The users of the new UERRA datasets need further information and support, which will be provided in the user guide. The following topics were discussed in the workshop:

- Technical support (access to data via MARS archive) are implemented with links to further deliverables ( D7.2, D8.4).
- A model description should mention the various provided levels (model level, pressure level, height level).
- For the properties of reanalysis ensembles ( measures of unvertainties) a short summary of D2.14 is possible, because users do not read the whole report.
- The discussion where to provide known issues ( in the user guide or at a wiki page on the UERRA website) show that it will be difficult to be up to date, if further problems occur
- It was discussed what additional parameters are of users interest and not evaluated yet: snowcover, hail, boundary layer parameters, wind gusts.
- The comparison against global reanalyses ( Era-Interim, ERA5) were highlighted, because they are often used by the users at the moment. To convince users of added values of regional RA's the comparison is helpful.

## Further Reading

Reanalyses and user needs with respect to Climate Change Services, Deliverable D5.52 of project. Available at <http://www.coreclimax.eu>

Borsche, M. et al.: Preliminary table summarizing common evaluation procedures shared among WP3 partners. Deliverable D3.2 of project: 607193 UERRA. Available at <http://www.uerra.eu/publications/deliverable-reports.html>

Borsche, M. et al.: A portable starting set of algorithms to support the common evaluation procedure. Deliverable D3.3 of project: 607193 UERRA. Available at <http://www.uerra.eu/publications/deliverable-reports.html>

Niermann, D. et al.: Scientific report on assessment of regional reanalysis against independent data sets. Deliverable D3.6 of project: 607193 UERRA. Available at <http://www.uerra.eu/publications/deliverable-reports.html>