SPECIAL PROJECT PROGRESS REPORT

Progress Reports should be 2 to 10 pages in length, depending on importance of the project. All the following mandatory information needs to be provided.

Reporting year	2017
Project Title:	Regional European re-analysis with ALADIN for UERRA (RERA)
Computer Project Account:	spserera
Principal Investigator(s):	Heiner Körnich Per Undén
Affiliation:	SMHI
Name of ECMWF scientist(s) collaborating to the project (if applicable)	Richard Mladek Martin Ridal, Jelena Bojarova, Esbjörn Olsson, Ulf Andrae, Alexandra Ohlsson
Start date of the project:	1/1/2017
Expected end date:	31/12/2018

Computer resources allocated/used for the current year and the previous one
(if applicable)
Please answer for all project resources

		Previous year		Current year	
		Allocated	Used	Allocated	Used
High Performance Computing Facility	(units)	-	-	66,000,000	46,740,252
Data storage capacity	(Gbytes)	-	-	254,400	254,400

Summary of project objectives

(10 lines max)

This project is a continuation for the production of a regional European re-analysis data set from 1961 to present-day with the shared ALADIN-HIRLAM system. The resolution is 12 km horizontally and 65 levels vertically. In this continuation project we will finish the historical runs and the data will be archive on MARS. Over a shorter period, a sensitivity study will be performed to examine the impact of dynamic vegetation on the regional reanalysis. The results from the proposed project will contribute directly to the European FP7 project UERRA - Uncertainties in Ensembles of Regional Re-Analyses with 12 institutes from 7 EU countries, Switzerland, Norway and an international organisation (ECMWF), coordinated by Per Undén. UERRA will provide long-term datasets of Essential Climate Variables (ECVs) on the European regional scale in order to support adaptation action and policy development.

Summary of problems encountered (if any)

(20 lines max)

Speed of the ECFS access was a bottleneck, when we archived all data stored on ECFS into MARS. Unfortunately, it was not possible to archive directly in MARS while producing the data, since we had not agreed on the details of the data format within the UERRA-project.

When the default configuration of GRIB_API was changed on CCA and CCB and the code was re-compiled, one experiment of ours had a hiccup or two and it took some weeks to get it running again.

Summary of results of the current year

In the first half year of the special project, we have finished the reanalysis production with the shared ALADIN-HIRLAM system for the period 1961 to 2015, and also for the shorter time series of 2006 to 2010 with two model physics packages. Specifically, we have used the ALADIN model with the HARMONIE scripting system for the long time series. Thus, we have completed the production of the European UERRA-ALADIN regional reanalysis data set with 55 years of data. For the shorter period, we have also produced the UERRA-ALARO reanalysis with the ALARO model and the same scripting system as above.

During the production the reanalysis data was stored on ECFS, as the details how to store all UERRA reanalyses in MARS took some time to be agreed upon. During the past half year, SMHI with the support of ECMWF were able to retrieve all UERRA-ALADIN reanalysis data from ECFS and store it on MARS. The UERRA-ALADIN reanalysis can now be retrieved from MARS via the following address (http://apps.ecmwf.int/mars-catalogue/?origin=eswi&class=ur) or with the following keywords:

class=ur,
expver=prod,
origin=eswi,
stream=oper

The UERRA-ALADIN reanalysis was verified against observations and compared also with the performance of the global reanalyses ERA40 and ERA-interim that were used on the lateral boundary conditions for UERRA-ALADIN.
For the 2m-temperature, UERRA-ALADIN is generally showing a smaller standard deviation for the difference between reanalysis and observation than the global reanalyses (Fig. 1), indicating higher quality for the user in the regional reanalysis. However, the systematic difference is often larger in UERRA-ALADIN than in the ERA-reanalysis. Furthermore, the systematic difference

shows a diurnal cycle, suggesting issues with the diurnal cycle in the regional reanalysis, especially during summer season (upper panel in Fig.1). It should also be noted that the improvement by UERRA-ALADIN compared to ERA-reanalysis is larger for ERA-40 (upper panel of Fig. 1) than for ERA-interim (lower panel of Fig. 1).

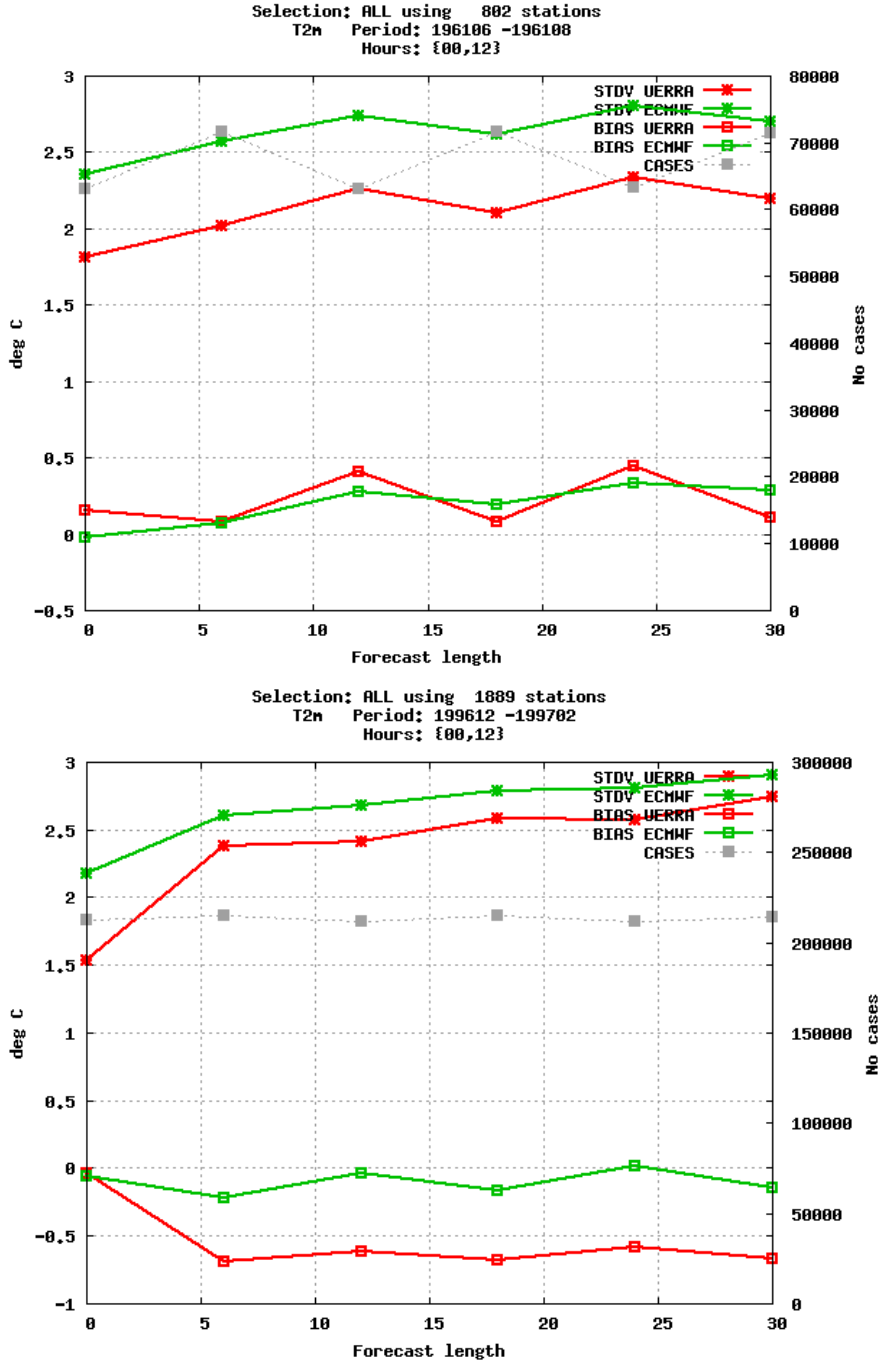

Figure 1: Bias and standard deviation for difference between reanalysis and observation for 2m-temperatur as a function of forecast length. Upper panel for July to August 1961, lower panel for December 1996 to February 1997.

For the 10m-winds, the UERRA-ALADIN reanalysis is generally closer to the observations compared to both ERA-reanalyses, and both for the standard deviation and for the mean difference. An example is shown in Fig. 2 for the autumn season of 2000.

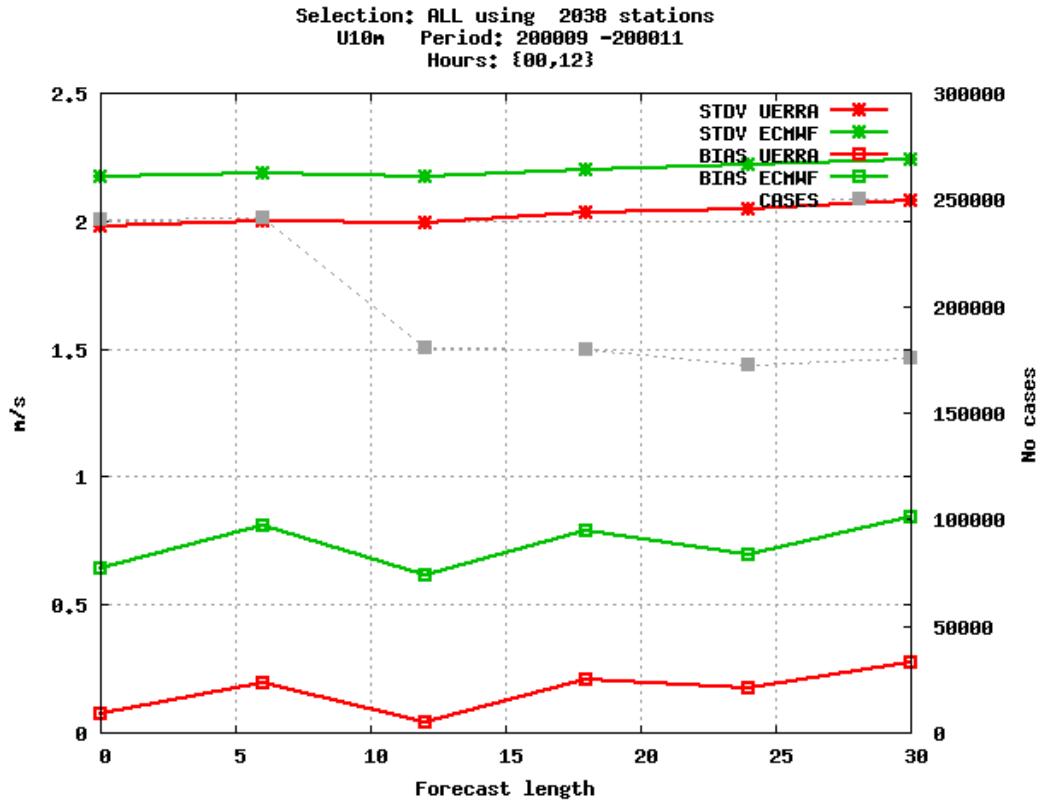

Figure 2: Bias and standard deviation for difference between reanalysis and observation for 10m-wind as a function of forecast length for the period September to November 2000.

For the mean sea-level pressure, the verification displays an advantage of UERRA-ALADIN over ERA-40 for the years 1961 to 1978, but a tie for the following years in comparison with ERA-interim (not shown).

For 2m-relative humidity, the comparison displays more mixed results with a slight advantage for the ERA-reanalyses (not shown). A subjective analysis showed that ERA performs better in 45% of the cases, while UERRA-ALADIN performs better only in 30%. Remaining cases were estimated as ties.

For the precipitation, UERRA-ALADIN shows mostly better Equitable Threat Scores, however not in summer season where the situation is more mixed (not shown).

The UERRA-ALADIN reanalysis data allows now for climatological studies. As an example, Figure 6 displays the averaged maximum 2m-temperature that occurs between 12 and 18 UTC during July. The average was done over all July days for the years 2006 to 2010.

The easy access of UERRA-ALADIN through the MARS-system and the numerous tools on ECGATE facilitates a straight forward generation of different climatological products with the European regional reanalysis.

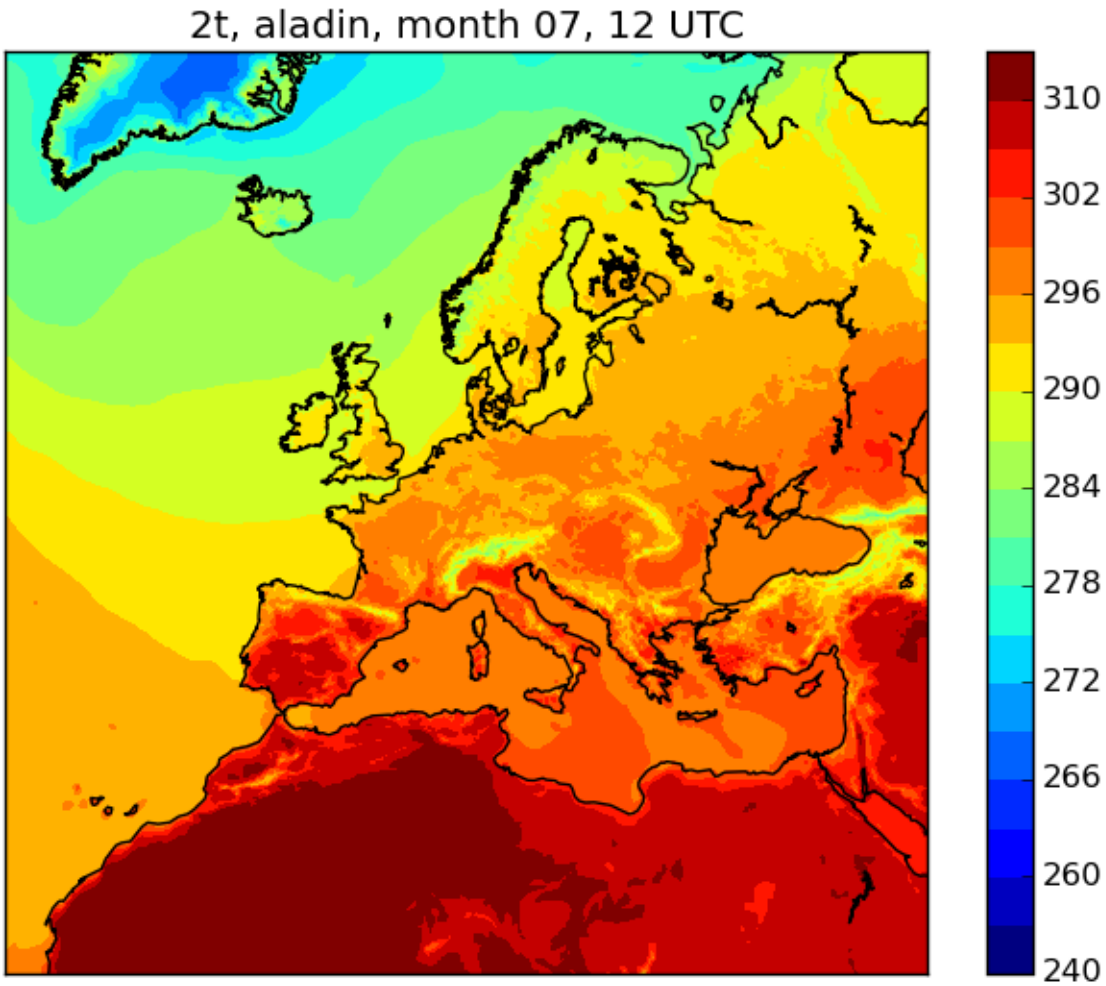

Figure 3: 5-year mean of the maximum 2m-temperature during the hours 12 to 18 UTC and the month of July. The average was done over all July days for the years 2006 to 2010.

List of publications/reports from the project with complete references

The reports of the FP7-project UERRA can be found on the following webpage:
http://www.uerra.eu/publications/deliverable-reports.html

Ridal, M., Körnich, H., E. Olsson and U. Andrae, 2015: Deliverable D2.5: Report of results and datasets of two physics HARMONIE runs for spread estimation. Report of FP7-project UERRA. Available from http://www.uerra.eu/component/dpattachments/?task=attachment.download&id=162

Ridal, M., Körnich, H., E. Olsson and U. Andrae, 2016: Deliverable D2.6: HARMONIE initial production. Preliminary report of the first period of the RA. Report of FP7-project UERRA. Available from http://www.uerra.eu/component/dpattachments/?task=attachment.download&id=186

Summary of plans for the continuation of the project

(10 lines max)

The project UERRA will finish in the end of 2017, covering the years 1961 to present-day. It is desirable that this regional reanalysis will continuously be produced, downscaling the global reanalysis of ECMWF. Therefore, we will apply for a continuation of the project during 2017 and into 2018 in order to ensure near-current date production, until a Copernicus climate service for regional reanalysis is in place.