

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 2015

Project Title: Tailor-made seasonal forecasts for sub-Saharan Africa

Computer Project Account: SPDELAUX (user: de4l)

Principal Investigator(s): Dr. Patrick Laux

Affiliation: Karlsruhe Institute of Technology
Institute of Meteorology and Climate Research
(KIT/IMK-IFU)

Name of ECMWF scientist(s) collaborating to the project (if applicable)

Start date of the project: 01/01/2014

Expected end date: 31/12/2016

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)	1 Mio	*	1 Mio	
Data storage capacity	(Gbytes)	1,500	*	1,500	

* I couldn't find the command in the user manual of how to display the used resources

Summary of project objectives

(10 lines max)

The goal of the special project “Tailor-made seasonal forecasts for sub-Saharan Africa” consists in the development of improved and regionally adapted and optimized seasonal drought forecast products that integrate technical and climatic limitations. This goal is expected to be achieved by:

- i) Statistical Analysis of the raw (uncorrected) global seasonal forecasting system of ECMWF (S4) and NCEP (CFSv2) data in terms of precipitation amounts and its intra-(seasonal) rainfall distribution such as onset, cessation of the rainy season (Laux et al., 2008,2009), and various drought indices (SPI, EDI, etc.). The performance will be assessed for all ensemble members using different lead times and verification techniques.
- ii) Bias correction of the global seasonal forecasting system of ECMWF using different bias correction methods such as histogram matching or a Copula-based approach (Laux et al., 2011; Vogl et al., 2012).
- iii) Spatiotemporal refinement applying dynamical downscaling of selected ensemble members based on ECMWF and NCEP data. The results of the dynamical downscaling will be validated using gridded precipitation observations such as GPCC.

Summary of problems encountered (if any)

(20 lines max)

Problems with data transfer via scp from Reading to Garmisch-Partenkirchen

Summary of results of the current year (from July of previous year to June of current year)

This section should comprise 1 to 8 pages and can be replaced by a short summary plus an existing scientific report on the project

The following tasks for preparing the downscaling activities using data from ECMWF were performed:

- S4 reforecast data are downloaded from the MARS archive and pre-processed to be used for regional downscaling;
- WRF pre-processing tools and wrf successfully compiled and setup on the CRAY system;

Furthermore, a statistical analysis of CFSv2 precipitation product as prediction system for the Volta Basin of West Africa has been performed and published (Siegmund et al, 2015). This work can be summarized as follows (abstract of Siegmund et al., 2015):

“Seasonal precipitation forecasts are important sources of information for early drought and famine warnings in West Africa. This study presents an assessment of the monthly precipitation forecast of the Climate Forecast System version 2 (CFSv2) for three agroecological zones (Sudan-Sahel, Sudan, and Guinean zone) of the Volta Basin. The CFSv2 performance is evaluated for the Sahel drought 1983 and for all August months of the reforecast period (1982–2009) with lead times up to 8 months using a quantile-quantile transformation for bias correction. In addition, an operational experiment is performed for the rainy season 2013 to analyze the performance of a dynamical downscaling approach for this region. Twenty-two CFSv2 ensemble members initialized in February 2013 are transferred to a resolution of 10 km × 10 km using the Weather and Research Forecasting (WRF) model. Since the uncorrected CFSv2 precipitation forecasts are characterized by a high uncertainty (up to 175% of the observed variability), the quantile-quantile transformation can clearly reduce this overestimation with the potential to provide skillful and valuable early warnings of precipitation deficits and excess up to six months in ahead, particularly for the Sudan-Sahel zone. The operational experiment illustrates that CFSv2-WRF can reduce the CFSv2 uncertainty (up to 69%) for monthly precipitation and the onset of the rainy season but has still strong deficits regarding the northward progression of the rain belt. Further studies are necessary for a more robust assessment of the techniques applied in this study to confirm these promising outcomes.”

More information can be found in Siegmund et al. (2015).

List of publications/reports from the project with complete references

Tan Phan Van, Hiep Van Nguyen, Long Trinh Tuan, Trung Nguyen Quang, Thanh Ngo-Duc, Patrick Laux, and Thanh Nguyen Xuan, “Seasonal Prediction of Surface Air Temperature across Vietnam Using the Regional Climate Model Version 4.2 (RegCM4.2),” *Advances in Meteorology*, vol. 2014, Article ID 245104, 13 pages, 2014. doi:10.1155/2014/245104.

Siegmund, J., J. Bliedernicht, P. Laux, and H. Kunstmann (2015), Towards a Seasonal Precipitation Prediction System for West Africa: Performance of CFSv2 and High Resolution Dynamical Downscaling, *J. Geophys. Res. Atmos.*, 120, doi:10.1002/2014JD022692.

Summary of plans for the continuation of the project

(10 lines max)

During the following reporting period the ECMWF reforecast product S4 will be analyzed systematically in terms of the performance of intraseasonal precipitation characteristics. This will be done for the raw, the bias corrected but also for the dynamically downscaled data for selected years. Different statistical downscaling methodologies will be applied and evaluated according to their skills. For the dynamical downscaling, the HPC environment of ECMWF (CRAY) will be used. The performances of the S4 and the CFSv2 reforecast products will be compared for different regions across SSA.