Project: **763**
Project title: **MiKlip II Module E – Evaluation of the MiKlip Decadal Prediction System**
Project lead: **Marc Schröder**

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Reporter: Thomas Spangehl, Marc Schröder

Description of Work and Summary of Results

The PROVESIMAC project focuses on the evaluation of the decadal climate prediction system developed within the second phase of MiKlip (research programme funded by Federal Ministry of Education and Research in Germany, BMBF, http://www.fona-miklip.de/) utilizing satellite data. Satellite simulators for usage with MPI-ESM are developed for the Special Sensor Microwave Imager (SSM/I) and for the Special Sensor Microwave Imager and Sounder (SSMIS) utilizing the CFMIP Observation Simulator Package (COSP, Bodas-Salcedo et al., 2011).
An extended model output comprising additional variables projected onto the satellite orbit tracks (hereafter referred to as 'curtain data') is required to run the satellite simulator. The software components of the MPI-ESM model which are used to generate the curtain data have been updated for usage on the new Mistral compute server. Moreover, in order to minimize the extra amount of computing time required to generate the curtain data online during model integration, a 3-hourly output stream containing 3-d fields which can be run in a parallel i/o mode has been implemented. A workflow has been established to generate the required curtain data by subsequent projection of the 3-d data onto satellite orbits (hereafter referred to as 'pseudo curtain data'). Test simulations were performed with MPI-ESM in LR and HR configuration in order to assess the performance of the extended software components. Moreover, comparison of satellite simulator results deduced from the 'pseudo curtain data' (obtained from 3 hourly fields) against satellite simulator results obtained from 'regular curtain data' (model time step, generated online) shows only minor differences for statistical evaluation results. The software was handed over to MiKlip II Module D. A first test simulation to generate the extended model output using these updated software components was successfully performed by MiKlip II Module D.

The COSP SSM/I satellite simulator has been tested using data from the MiKlip baseline 1 system. First results show that the simulator captures the general structure and the order of magnitude of the observations for different channels (Fig. 1).

References

Bodas-Salcedo, A., and Co-authors, 2011: COSP: Satellite simulation software for model assessment. Bull. Amer. Meteor. Soc., 92, 1023-1043, doi: http://dx.doi.org/10.1175/2011BAMS2856.1.

Related own Publications and Contributions to Conferences

Marotzke, J., W. A. Müller, F. S. E. Vamborg, P. Becker, U. Cubasch, H. Feldmann, F. Kaspar, C. Kottmeier, C. Marini, I. Polkova, K. Prömmel, H. W. Rust, D. Stammer, U. Ulbrich, C. Kadow, A. Köhl, J. Kröger, T. Kruschke, J. G. Pinto, H. Pohlmann, M. Reyers, M. Schröder, F. Sienz, C. Timmreck, and M. Ziese, 2016: MiKlip - a National Research Project on Decadal Climate Prediction. Bulletin of the American Meteorological Society, early online release, DOI: http://dx.doi.org/10.1175/BAMS-D-15-00184.1.

Contributions to Conferences:

Spangehl, T., M. Schröder, K. Graw, A. Bodas-Salcedo, R. Glowienka-Hense, S. Stolzenberger, A. Hense, and R. Hollmann, 2016: Evaluation of decadal predictions using satellite simulators and Fundamental Climate Data Records (FCDRs). 16th EMS Annual Meeting & 11th European Conference on Applied Climatology (ECAC), Trieste, Italy, September 12 – 16 2016, EMS Annual Meeting Abstracts, Vol. 13, EMS2016-402, 2016.
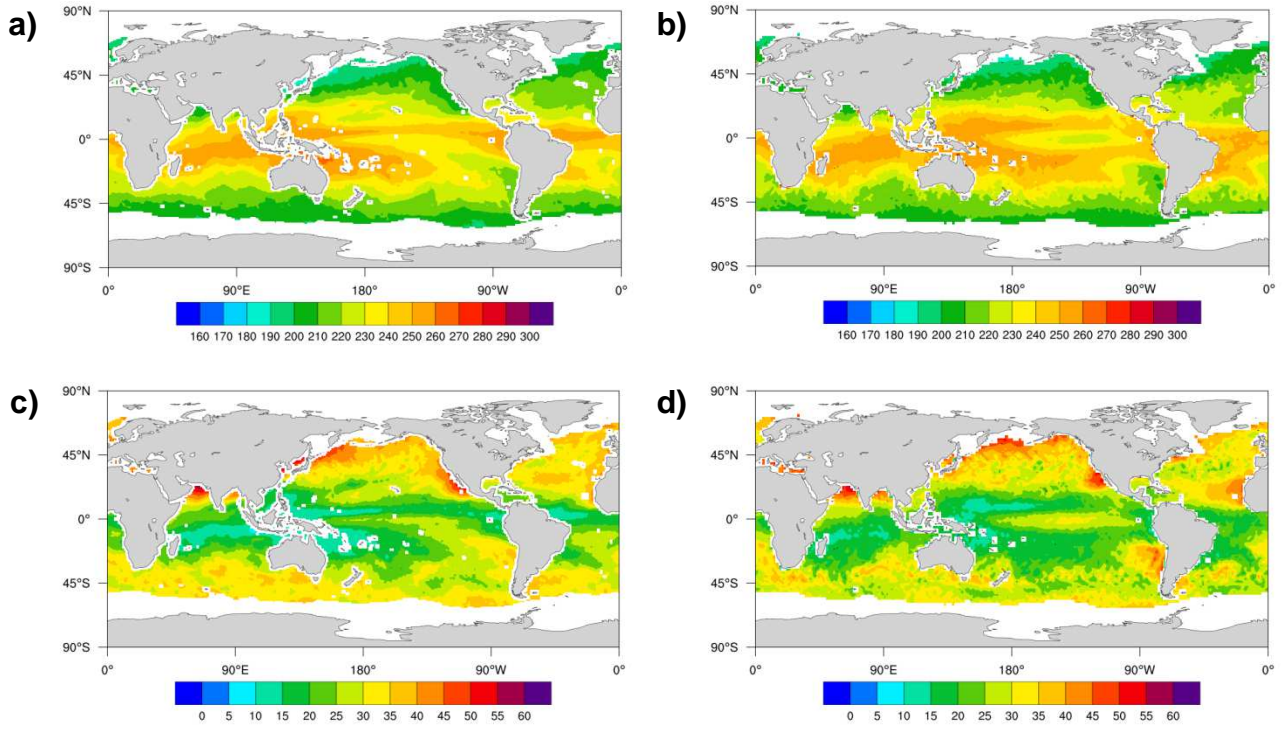
Figure 1: SSM/I brightness temperature [K] for February 2008. Upper maps show results of the 22 GHz vertical polarization channel for **a)** observations and **b)** COSP SSM/I simulator. Lower maps show results of the 85 GHz vertical minus horizontal polarization channel for **c)** observations and **d)** COSP SSM/I simulator. Results for COSP SSM/I simulator are based on MiKlip baseline-1 hindcast data. Data over land and sea ice are masked due to lack of mandatory input to radiative transfer model.