EMS Annual Meeting Abstracts
Vol. 14, EMS2017-609, 2017

The South America CORDEX Flagship Pilot Study: Extreme precipitation events in Southeastern South America: a proposal for a better understanding and modeling

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The South America Flagship Pilot Study endorsed by CORDEX seeks to promote inter-institutional collaboration and further networking in the South America CORDEX domain. With focus on extreme precipitation events, the main aims of this initiative are to study multi-scale processes and interactions (convection, local, regional and remote processes, including the co-behaviour of processes) that result in extreme events; and to develop actionable climate information from multiple sources (statistical and dynamical downscaling products) based on co-production with the impact and user community. A strengthened cooperation and integration of dynamical modeling, statistical downscaling and VIA communities is one of the expected outcomes of this project, integrating not only South American research communities but also European communities.
Regional processes, regional circulation patterns and forcings associated with selected extreme precipitation events over the region, triggered by both convective systems and extratropical cyclones, will be studied from a suite of downscaling approaches, including high resolution regional climate models (RCM) and empirical statistical downscaling (ESD) models. Different RCM (RegCM4, Eta and WRF) with resolutions ranging from 25 to 1 km and a suite of ESD methods (MLR, CCA, Analogs, ANN) will be used to explore the added value of downscaling. The influence of large SST gradients over the Brazil-Malvinas confluence region in the development and intensification of extratropical cyclones will also be explored using the RegCM-MITogcm coupled model. The proposed suite of downscaling tools will allow an intercomparison of approaches and mutual validation between RCMs and ESD methods. The skill of downscaling as well as the physical consistency will be evaluated following recommendations and the validation framework developed within former international initiatives such as VALUE-COST Action and STARDEX.
In order to explore the impact of extreme precipitation events the water balance model CLASS (Catchment scale multiple-Landuse Atmosphere Soil water and Solute transport model) will be used to estimate soil moisture and to quantify flooding events. The DSSAT (Decision Support System for Agrotechnology Transfer) cropping system model will be used to simulate maize and soybean yield in multiple locations of the region. The model will be driven by the climate outputs produced, initial soil water contents simulated by hydrological models and a set of realistic agronomic managements.