

CORDEX-FPS-SA: “Extreme precipitation events in Southeastern South America: a proposal for a better understanding and modeling”

2nd Report - February 2019

The main aim of the CORDEX-Flagship Pilot Study in South America (FPS-SA) is to investigate multi-scale aspects, processes and interactions that result in extreme precipitation events by using dynamical models (high resolution, convection permitting and coupled models) and statistical models. To this end, this initiative also seeks to promote inter-institutional collaboration and further networking in the South America domain.

FPS-SA Experiments Set Up

During the 2nd FPS-SA Meeting held at the University of Sao Paulo in Sao Paulo, Brazil on 6-7 November 2018, a common protocol for performing simulations at convective permitting resolution was defined. Noting the high computational cost of such simulations, it was decided first to explore the capability of different RCMs in capturing the main features of individual case studies. Considering that the warm season from October 2009 to March 2010 was one of the seasons with larger number of extreme precipitation events within the southeastern South America region, that season was selected as a starting point for convective permitting simulations and intercomparisons with ESD simulations. Three case studies within that season were chosen.

Erika Coppola, PI of the FPS on Convective Phenomena over Europe and the Mediterranean, also attended the FPS-SA Meeting and gave a presentation summarizing the experiments run in the European FPS. The experience gained at the European FPS discussions and her contribution served as input for the FPS-South America and allowed for making various decisions on how to move forward to achieve the FPS-SA objectives.

It was then agreed to run two types of experiments: one type of experiment, referred to as Weather Mode (RCMs are initialized 1 day before each selected case study) and the other is referred to as Climate Mode (RCMs are initialized one month in advance of the selected case study). The experiment protocol and details can be found at the following link: <https://drive.google.com/open?id=13tSIPJbhDgCDrWkQObYufvn7epcRcMCI>. This articulation with the European FPS will allow for future comparisons of simulations between both CORDEX domains.

In order to produce ESD simulations to compare results with the RCM simulations, it was agreed to perform simulations with several ESD methods in the same domain chosen for the RCM simulations. The calibration and validation of the ESD methods were performed for the long period of 1979-2009 and the independent warm season of 2009/2010, chosen for the RCM convection permitting simulations, was selected for intercomparisons. Some simulations of the ESD phase 1 experiment was performed at the University of Cantabria-IFCA in collaboration with the University of Buenos Aires. The experiment protocol and details can be found at the following link: <https://drive.google.com/file/d/18W2M-DUVW1P9cmNxvWvHuVeVnD9diWDS/view?usp=sharing>

The three extreme precipitation events during the 2009/2010 warm season selected as case studies were chosen in a strategic location in order to evaluate the hydrological impact in the Uruguay River

basin with a hydrological model jointly run by the University of Buenos Aires and the Argentine Meteorological Weather Service.

Models and Participating Institutions

RCMs	Institution	Responsible
RegCM4	University of Sao Paulo - São Paulo State University	Rosmeri Porfirio da Rocha-Marta Llopart
ETA	National Institute for Space Research-Brazil	Sin Chan Chou-Daniela Carneiro Rodrigues
WRF	University of Cantabria	Jesús Fernández – Alvaro Lavin
WRF	University of Buenos Aires	Silvina Solman
ESD models	Institution	Responsible
Generalized Linear Models (4 models)	University of Cantabria – University of Buenos Aires	José Manuel Gutierrez – María Laura Bettolli
Analogs (3 models)	University of Cantabria – University of Buenos Aires	José Manuel Gutierrez – María Laura Bettolli
To be defined	Charles University in Prague	Radan Huth

Meetings

- Several teleconferences are usually carried out in order to follow up the activities envisioned in the FPS-SA.
- A small informal side meeting was carried out at the CORDEX Central America and South America Training Workshop on Downscaling Techniques in La Paz, Bolivia, during June 25-27 2018.
- The 2nd Workshop on CORDEX-FPS-South America was held at the University of Sao Paulo, Brazil during 6-7 November 2018 (see the pictures at the end of the report). The workshop was organized as a side meeting of the ‘Second ICTP Advanced School on Regional Climate Modeling and Extreme Events over South America’. Taking advantage of this ICTP training activity proposed in the framework of the FPS-SA and that many of the lecturers/trainers/organizers participate in the FPS-SA and in the FPS on Convective Phenomena over Europe and the Mediterranean, the 2nd FPS-SA Workshop gave raise to the possibility of discussions and exchange of ideas with the team of the European FPS.

Training Activity

Second ICTP Advanced School on Regional Climate Modeling and Extreme Events over South America, Sao Paulo, 5-9 November 2018.

http://www.incline.iag.usp.br/data/evento20181105-09_BRA.php

The activity was supported by the ICTP, the Sao Paulo Research Foundation (FAPESP) and the University

of Sao Paulo. The main motivation of the proposed activity was to promote the application of different dynamical (RegCM4) and statistical downscaling tools for the generation of high resolution climate experiments. In particular, some extreme precipitation events in the framework of the FPS-SA were presented (see pictures at the end of the report).

Funding Opportunities:

Some difficulties in accessing funding for supporting the entire project were found. Therefore, it was agreed to take advantage of the possibilities of national and bilateral financial agencies for funding projects that could partially cover the objectives of the proposal as well as funding for mobility. In this context:

- A proposal to provide financial support for attending the 2nd FPS-SA Workshop and the 2nd ICTP Advanced School on Regional Climate Modeling and Extreme Events over South America in Sao Paulo in November 2018 was submitted and approved by the Sao Paulo Research Foundation (FAPESP). PI: Rosmeri Porfirio da Rocha.
- A proposal for dynamical and statistical high resolution modeling of extreme precipitation in southeastern South America was submitted and financed by the University of Buenos Aires. This proposal is conducted in collaboration with the Argentine Meteorological Weather Service to evaluate the hydrological impact of extreme rainfall in the Uruguay River basin. PI: Silvina Solman
- A 21-day scientific stay in the University of Cantabria was co-financed by the Cantabria Institute of Physics/University of Cantabria and the University of Buenos Aires in the framework of the FPS-SA in order to perform the statistical downscaling experiment. The research visit was made by Maria Laura Bettolli.

Proposals under evaluation

- A proposal for dynamical and statistical high resolution modeling of extreme precipitation in Southeastern South America was submitted to the Argentine National Agency for Scientific and Technological Promotion in September 2018. PI: Silvina Solman.
- A proposal for supporting visits and mobility among Spanish and South American scientists was submitted to the Spanish National Council of Scientific Research (CSIC), Programme I-Coop+2018, in November 2018, in order to promote scientific cooperation in the FPS-SA framework.
- A conference activity was submitted to the ICTP in February 2019. The title of the activity is "Conference on Regional Climate Modeling and Extreme Events over South America: results from the CORDEX-Flagship Pilot Study" to be held at the University of Buenos Aires in 2020. The main objective of the proposed conference is to share and discuss results from FPS-SA initiative with the South American regional modeling community. Additionally, lessons learned from the experience of European scientists which are relevant to advance with the FPS-SA are also envisioned.

Publications in Scientific Conferences

- Porfírio da Rocha R, Reboita M, Llopart M, Solman S, Bettolli ML. 2018. Assessment of RegCM4.6.1 over La Plata Basin: annual cycle and extreme events of precipitation. EGU General Assembly 2018. Geophysical Research Abstracts. Vol. 20, EGU2018-9991.
- Olmo M, Bettolli ML. 2018. Daily extreme precipitation events in different datasets in Southeastern South America. EGU General Assembly 2018. Geophysical Research Abstracts. Vol. 20, EGU2018-9309.
- Huth R, Stryhal J, Poggi MM, Bettolli ML. Validation of atmospheric circulation in CMIP5 GCMS over Southern South America. AMOS-ICSHMO 2018, 5-9 February 2018, Sydney, Australia.
- Huth R, Bettolli ML, Solman S, da Rocha R, Llopart M, Sin Chan C, Machado L, Vianna Cuadra S, Doyle D, Barreiro M, Farneti R, Gutierrez JM, Bert F. The South America CORDEX Flagship Pilot Study: Extreme precipitation events in Southeastern South America: a proposal for a better understanding and modeling. EMS Annual Meeting: European Conference for Applied Meteorology and Climatology 2017 | 4–8 September 2017 | Dublin, Ireland.

Upcoming Activities

- To finalize RCM and ESD runs and perform intercomparisons according with different scientific aims: analysis of daily cycle of extreme events; sensitivity of RCMs simulations to resolution and physics; ESD methods sensitivity to dataset choice and predictors choice; ESD and RCM capability in reproducing extreme events during the 2009/2010 season; representation of the synoptic environment associated with the case studies selected.
- Abstract submission to the ICRC-CORDEX 2019.
- 3rd FPS-SA Workshop to be held at the University of Buenos Aires in June 2019 (conditioned on the availability of financial support).
- To build a website and repository for data and simulations.

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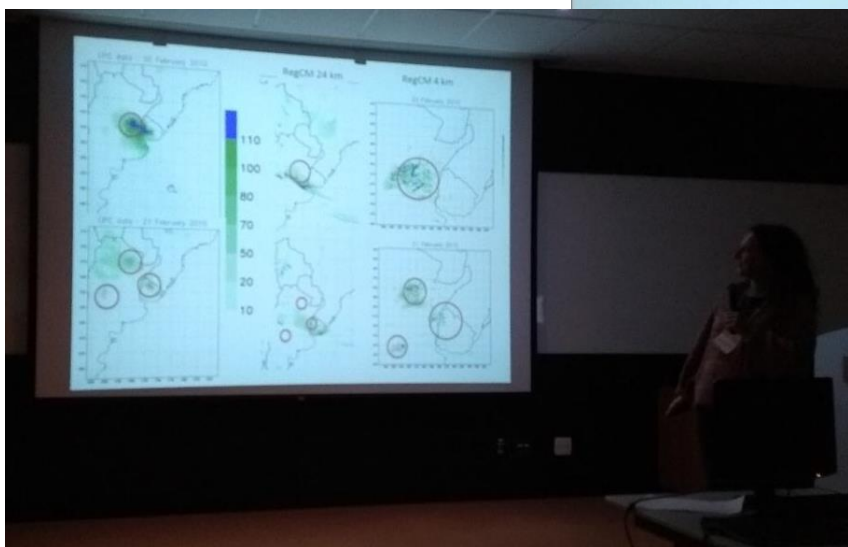
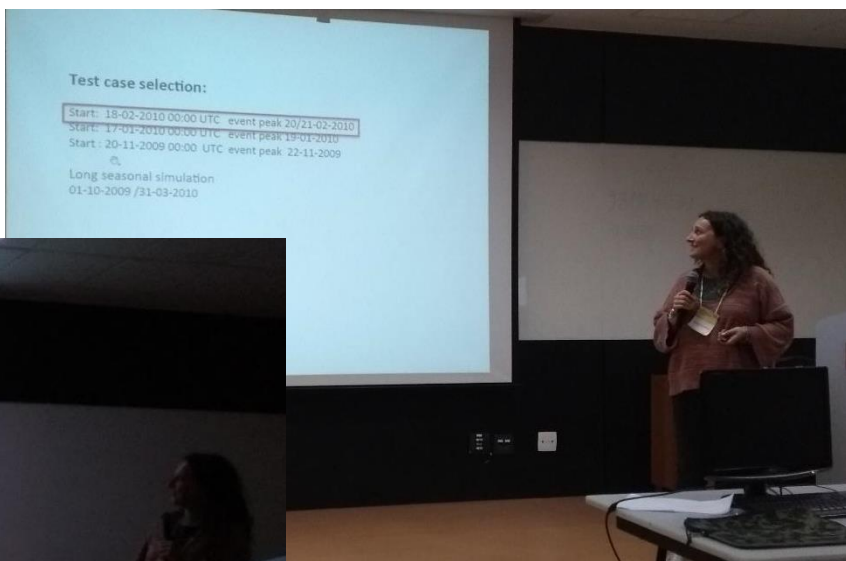


2nd Workshop on CORDEX-FPS-SA held at the University of Sao Paulo, Brazil, 6-7 November 2018.



Upper picture (left-right): Marcelo Barreiro, Sin Chan Chou, Moria Doyle, Rosmeri Porfirio da Rocha, Erika Coppola, Silvina Solman, Marta Llopart, Radan Huth, Jan Stryhal. Right picture (left-right): Michelle Reboita, Francesca Raffaele, Marta Llopart, Erika Coppola, Silvina Solman, Maria Laura Bettolli, Marcelo Barreiro, Graziano Giuliani, Rosmeri Porfirio da Rocha.

2nd ICTP Advanced School on Regional Climate Modeling and Extreme Events over South America, Sao Paulo, 5-9 November 2018.



First case study selected in the FPS-SA as simulated by the RegCM4 at convection permitting resolution presented at the ICTP School.