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INTRODUCTION

CLARIS-La Plata Basin: regional hydroclimate variability, uncertainties and climate change scenarios

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ABSTRACT: The CLARIS-LPB project, funded from 2008 to 2012 by the 7th Framework Programme of the European Commission, aimed at projecting regional climate change impacts in the La Plata Basin (LPB) in southeastern South America focusing on the periods 2010–2040 and 2070–2100. Such a coordinated projection of regional climate change scenarios was key in successfully designing adaptation strategies for land-use, agriculture, rural development, hydropower production, river transportation, water resources and wetland ecosystems. Topics covered in this special include characteristics of climate variability over the region, together with trends, extreme events and uncertainties for modelled regional climate projections.

KEY WORDS: Modelling · Regional climate change · South America · Extremes

The CLARIS-LPB project brought together around 200 scientists from various disciplines, whose research objectives included: (1) to improve the description and understanding of decadal climate variability for short-term regional climate change projections (2010–2040); (2) to improve the capacity to predict climate change and its impacts in the region, through an ensemble of coordinated regional climate scenarios. This ensemble would allow quantification of the amplitude and sources of uncertainties in the La Plata Basin (LPB) future climate for 2 time periods: 2010–2040 (near future) and 2070–2100 (far future). The near-future period would be key for adaptation strategies, and the far future for assessment of long-term impacts; (3) to design adaptation strategies for regional scenarios of climate change impacts through multi-disciplinary research; (4) to involve stakeholders in the design of adaptation strategies through an interactive and communicative process, ensuring dissemination of information to public, private and governmental policy-makers; (5) to foster long-term collaborations between European and South American partners; and (6) to train young scientists in relevant disciplines at South American and European institutes.

The research groups involved in CLARIS-LPB — and more specifically in this Special — collaborated to estimate the robustness of the ensemble of regional climate change projections, with special focus on the most important scientific issues over the region, that is: decadal and interdecadal variability, the effects of such variability on climatic extremes over the LPB, and trends and uncertainties in global climate model (GCM) projections, in particular from the CLARIS-LPB regional model ensemble, since it is the first coordinated regional ensemble of climate change projections over South America.

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An overview of the main features, uncertainties and trends obtained from the ensemble of regional climate models (RCMs) and their projections can be seen in Carril et al. (2016) and Solman (2016). Carril et al. (2016) relate the RCM data to several indices of extremes, while Solman (2016) analyzes systematic biases that were obtained from both ERA-Interim- and GCM-forced RCM ensembles by comparing both against the Climate Research Unit observational database. Gallardo et al. (2016) describe an overall picture of the main climatic characteristics of the South American continent using the ERA-Interim-forced RCM ensemble, showing how these are projected (using the GCM-forced RCM ensemble) to change during the 21st century. López-Franca et al. (2016) inspect changes in temperature extremes, while Cavalcanti & Silveira (2016) study changes in mean and extreme precipitation. A combination of extreme temperature and precipitation events and the associated atmospheric circulation as predicted by the ensemble of RCMs is studied by Tencer et al. (2016). Marengo et al. (2016) use the Eta regional climate model to study the change in hydrometeorological conditions for the end of the 21st century over the Brazilian Pantanal area.

A better understanding of the main physical atmospheric processes at regional scales relevant to the LPB region is also a crucial issue. One of the more important processes is related to the land surface and atmospheric feedbacks. These mechanisms are studied using observations (Penalba et al. 2016) and an ensemble of RCMs (Menéndez et al. 2016). Cold front structures, analyzed from the RCM simulations, are studied by de Jesus et al. (2016).

Climate variability over the region is another very important topic included in this Special, which is covered in 3 contributions: Cazes-Boezio & Talento (2016) analyze the impact of La Niña events over the southeastern region of South America during the austral summer; Grimm et al. (2016) study the interdecadal variability related to extreme precipitation events in the monsoon season; and the ENSO influence simulated by a GCM is described in Tedeschi et al. (2016).

This Special shows the potential of the first coordinated RCM ensemble for South America to be used to better understand the climate of the region. It also offers opportunities for further studies (e.g. pure climate studies) and provides a foundation for impact and adaptation strategies in the La Plata Basin region for the 21st century.

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