Project:
Project title: **Decadal Variability of the Tropical Pacific and El Niño Events**.
Principal investigator: **Dmitry Sein**
Allocation period: **2020-01-01 to 2020-12-31**

Abstract

The occurrence of extreme rainfall on the northern coast of Peru is mostly associated with warm anomalies in Sea Surface Temperature (SST) in the tropical Pacific (Cai et al., 2020), and in the Niño 1 + 2 region. The latest global El Niño 2015-2016 has caused only two days of extreme precipitation (SENAMHI, 2017), while in 2017, when the SST anomalies were seen mainly in the Niño 1 + 2 region, extended extreme rainfall during the austral summer and autumn were seen. This event is known in the popular culture with the name "coastal El Niño" (Martinez & Takahashi, 2017). It had strong impacts, causing damage in the life and health of 1,782,316 people and damaged to 413,983 households (INDECI, 2017). By its impacts, this coastal El Niño can be considered the third most intense “El Niño Phenomenon” in at least the last hundred years in Peru (ENFEN, 2017).

Regional climatic models (Gutowski et al., 2020) are the best tool to provide high resolution information on long-term Variability in the Niño 1 + 2 region and its effects on the climate, its seasonal prediction and projections for the interested stakeholders.

A realistic representation of this variability requires a correct simulation of ocean-atmosphere interactions as well as oceanic and atmospheric dynamics in the region, which are still not correctly represented by the latest generation of GCMs.

We carried out preliminary analysis of two simulations of the present climate, one with the coupled regional ocean-atmosphere model ROM (Sein et al. 2015) and the atmospheric component of ROM (REMO). Our analysis indicates that coupling introduces significant improvements in the representation of the long-term climate of the area of study and the representation of the Coastal Niño event. We expected that a better tuned version of the ROM setup used in the will further improve the simulation of the coastal Niño and out understanding of the climate in the high plateau and the rest of Peruvian’s territory.

We propose to study systematically the impact of increasing ocean and atmospheric resolution on the representation of climate conditions on the west coast of South America and its variability in the Niño 1 + 2 region. As 25 km does not resolve adequately the orography of the Andean Cordillera, the ROM setup will have a 12 km resolution in the atmosphere and the same, 7 – 12 km variable resolution in the ocean (Fig. 1).

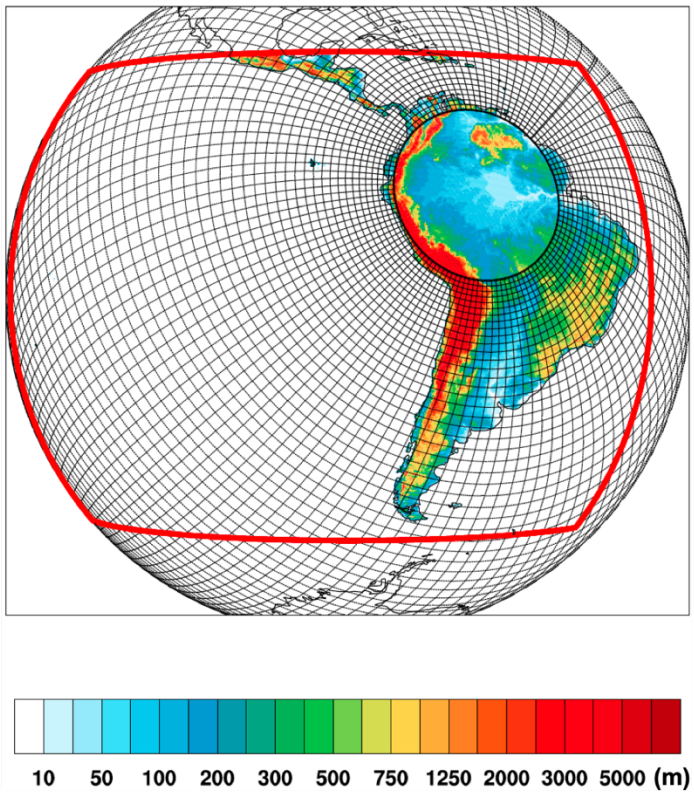

Figure 1. Model configuration. Red "rectangle" – coupled atmosphere – ocean area. Solid black lines – MPIOM grid (every 12th grid line is shown). Colour scale – model orography

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