Project: 1207
Project title: Decadal Variability of the Tropical Pacific – El Niño Events
Principal researcher: Dmitry Sein
Report period: 2026-01-01 to 2026-10-30

Over the course of the year, the following activities were carried out in the frame of this project:

1) Execution of climate change scenario simulations.

During 2026, activities were carried out to prepare and preprocess data from the global climate model CNRM-CM6-1, part of the Coupled Model Intercomparison Project Phase 6 (CMIP6), with the aim of generating the initial and boundary conditions required to run regional climate change simulations using the Weather Research and Forecasting (WRF) model over the CORDEX South America domain under the SSP5-8.5 emissions scenario. These activities included processing, organizing, and adapting surface meteorological variables and atmospheric variables at different vertical levels, taking into account the input requirements of the WRF model. This work contributed to advancing the preparation of the climate data required for subsequent stages of dynamical downscaling of climate change scenarios over South America.

2) Propagation of the Madden–Julian Oscillation (MJO)

During 2026, progress was made in preparing and adapting the initial and boundary conditions for the WRF regional model using NOAA's Final Operational Global Analysis (FNL) data. Data corresponding to the months of November through April for the 2010–2023 period were prepared for the simulations over the larger domain.

Data processing and preliminary simulations were carried out on Levante. These simulations, covering the period from March 1 to March 24, 2023, and configured with two domains, were aimed at identifying the most suitable convective parameterization.

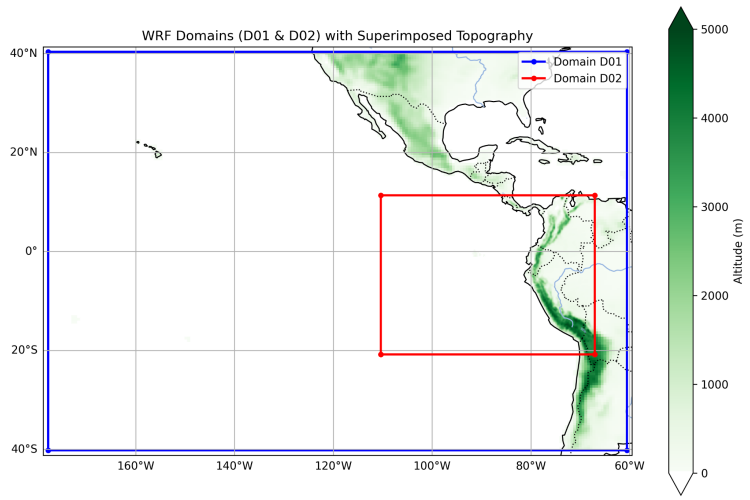


Figure 1. The two simulation domains for active Madden–Julian Oscillation (MJO) events using the WRF model.

3) High-resolution simulation of Cyclone Yaku (2023)

During 2026, progress was made in preparing and adapting the initial and boundary conditions for the WRF simulations of Cyclone Yaku, using NOAA FNL data for February and March 2023.

Data processing and preliminary simulations were carried out on Levante, with the aim of identifying the most suitable convective parameterization for representing Cyclone Yaku within a domain covering the eastern Pacific.

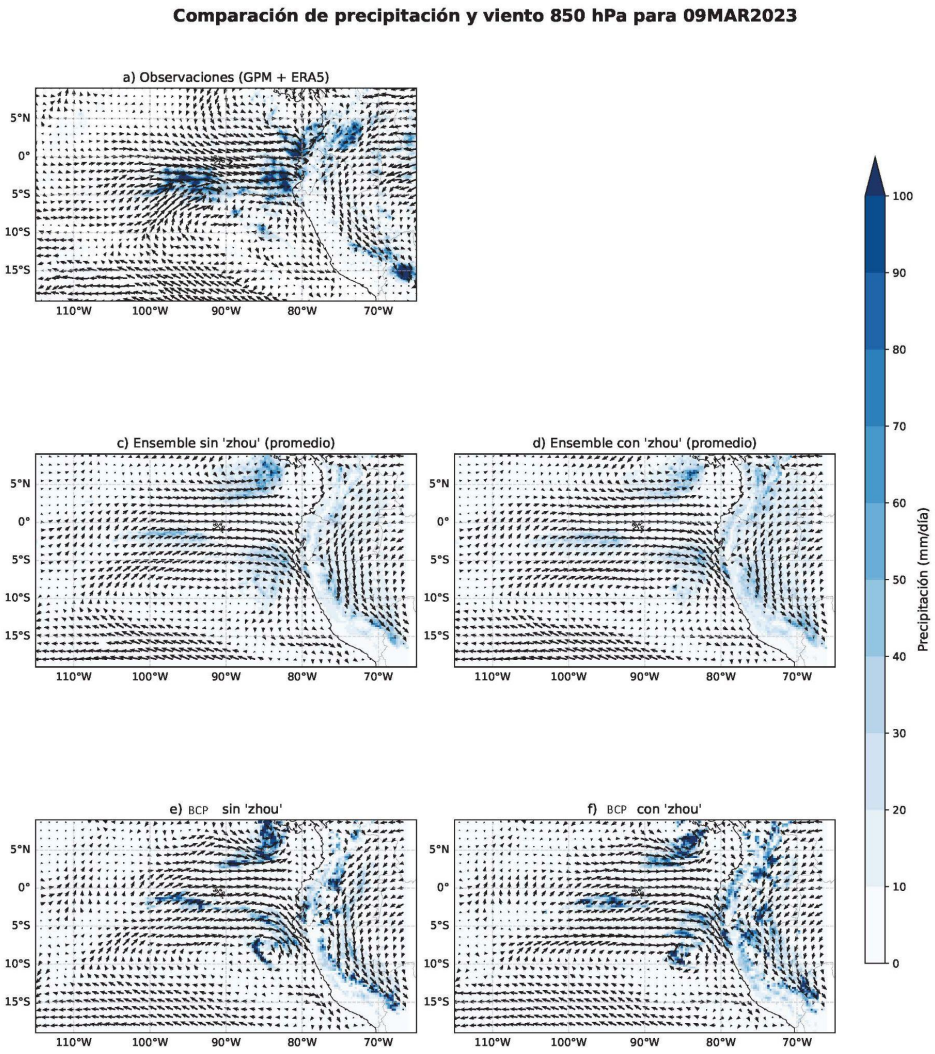


Figure 2. (a) 850-hPa wind fields and total precipitation on March 9, 2023. (b) Ensemble of simulated 850-hPa wind fields and total precipitation on March 9, 2023, using different convective parameterizations without the Zhou configuration in the WRF regional model. (c) Ensemble of simulated 850-hPa wind fields and total precipitation on March 9, 2023, using different convective parameterizations with the Zhou configuration in the WRF regional model. (d) Simulated 850-hPa wind fields and total precipitation on March 9, 2023, using the best convection scheme without the Zhou configuration in the WRF regional model. (e) Simulated 850-hPa wind fields and total precipitation on March 9, 2023, using the best convection scheme with the Zhou configuration in the WRF regional model. Sulca et al. (in preparation).