

Session report D3

Theme: Climate projections for islands

Day and time: Thursday (2:30pm Trieste)

Conveners: Jason Evans (CCRC), Tannecia Stephenson (UWI), Marcus Thatcher (CSIRO), Christophe Menkes (ENTROPIE, IRD, CNRS), Matthieu Lengaigne (MARBEC, Univ. Montpellier, CNRS, Ifremer, IRD, Sète, France), Ali Belmadani (ENM & CNRM, Université de Toulouse, Météo-France, CNRS, Toulouse, France)

Top Highlights

1. Climate Change projection information is missing for many island nations, due to being absent in General Circulation Models (GCMs) and not always well represented in Regional Climate Models (RCMs). This should be addressed in future climate change projections for these regions.
2. There are some pioneering projects that are working to provide Island-scale climate projection data for various regions including the Tropical Atlantic, Pacific and Indian Ocean.
3. We propose building collaboration between the existing modelling efforts by establishing a Coordinated Regional Climate Downscaling Experiment (CORDEX) Island Flagship Pilot Study (FPS). This will help build enhanced capacity to better support the climate change data needs of island nations.

Additional Notes and Takeaways

Speaker 1: Marie Leroux (online) Producing climate services in the Southwest Indian Ocean from CMIP6 Downscaled Data

- *Building Resilience in the Indian Ocean (BRIO) project to provide high-resolution climate information for islands in SW Indian ocean. Most islands <50km*
- *Project has provided climate services (e.g., health, water, agriculture, biodiversity)*
- *Using Aire Limitée Adaptation dynamique Développement InterNational (ALADIN) RCM 12km nested in the host GCM CNRM-ESM2-1 (1981-2100) and*

Statistical downscaling to 3km from 22 Climate Model Intercomparison Project phase 6 (CMIP6) GCMs with the Shared Socioeconomic Pathways (SSP) SSP1-2.6 and SSP3-7.0 for greenhouse gas emissions.

- *Projections include significant increases in the number of hot days >31C, a large consensus in Oct-Nov-Dec decline in rainfall. Leeward side is impacted more by the decrease in precipitation.*
- *Decrease in frequency of tropical cyclones, but higher intensities, greater proportion of more intense Category 4-5 cyclones. Also, a poleward migration of cyclone tracks.*
- *Analysis of vegetation changes due to projection. Increasing arid areas at higher altitudes.*

Speaker 2: Abhnil Prasad (online) Future Precipitation Extremes in the Small Pacific Islands

- *Precipitation over islands can be intense. Flash floods, landslides, etc*
- *Model studies are too coarse to resolve islands. Intergovernmental Panel on Climate Change 6th Assessment Report called for higher resolution. How does extreme precipitation change under climate change?*
- *25km statistical downscaling using Bias Corrected Statistical Downscaling with daily temporal resolution, 35 GCMs*
- *Fiji projections drier in SSP2-4.5 compared to historical, but drier north and wetter south in SSP5-8.5*
- *Micronesia is wetter in SSP2-4.5 compared to historical and drier in SSP5-8.5 (but some disagreement with projections based on different models with the same SSP)*
- *Guam showing wetter for both SSP2-4.5 and SSP5-8.5 (but increase is greater for SSP5-8.5)*
- *Vanuatu showing drier in SSP2-4.5, whereas north drier and south wetter for SSP5-8.5*
- *High resolution data is critical for impact studies. Intensity of extreme wet days generally increases for all islands under SSP5-8.5.*

Speaker 3: Almoustapha Amadou Malam Lacho Impacts of ocean-atmosphere coupling on precipitation in small islands: a case study of the Cape Verde archipelago.

- *Reduction of bias in South East Atlantic with regional ocean model (improved Benguela upwelling region). Improvement from atmosphere-ocean coupled RCM.*
- *Inter Tropical Convergence Zone (ITCZ) in June-July-August is less intense and wider in the atmosphere-ocean coupled model compared to an atmosphere-only model. Also, the ITCZ is further south in September-October-November (SON) compared to atmosphere-only model.*

- *Coupled atmosphere-ocean model improved rainfall for the peak of the rainy season, compared to atmosphere-only model.*
- *Positive added value due to the coupled model during SON in precipitation.*
- *Recommendations to use coupled regional models and higher resolution to resolve topography (<3km).*

Speaker 4: Ali Bel Madani Downscaling climate projections over small islands and territories: The cases of French West Indies and French Guiana

- *Stretched grid GCM + Bias corrected SST with Action de Recherche Petite Echelle Grande Echelle (ARPEGE-Climat) variable resolution climate model.*
- *Resolves sharp gradients in temperature and precipitation for Guadeloupe archipelago. Seasonal cycles are well represented by the model.*
- *Also implemented quantile-quantile correction for bias.*
- *Careful GCM selection to avoid biases was used to improve the seasonal climatology over French Guiana.*
- *Final subset with stronger warming, weaker warming and stronger drying within the distribution of CMIP6 GCMs.*
- *Additional statistical downscaling also employed.*

Speaker 5: Misnawati Misnawati Assessing Rice Yield Change based on CORDEX-Southeast Asia simulations in Sumatra

- *Need to understand how rice production may change under global warming due to its importance for feeding the Indonesian population.*
- *Based on field work using 2 provinces (South Sumatra and Lampung)*
- *Used the Agricultural Production Systems sIMulator (APSIM) model to simulate crops. Required observed data for soil, crops, management practices and weather. CORDEX-South East Asia data used for climate change projections.*
- *1 GCM predicted increasing rice yields, while the other 2GCMs predicted decreasing rice yields.*

Speaker 6: Vishnu Sasidharan Nair CLIPSSA: High-Resolution Island Scale Climate Simulation for Improved Adaptation Strategies in the Southwest Pacific Region

- *Providing high resolution 20km and 2.5km resolution simulations for island scales using ALADIN and Application of Research to Operations at Mesoscale (AROME).*
- *ALADIN simulates cyclones better than fifth generation European Centre for Medium-range Weather Forecasts atmospheric reanalysis of the global climate (ERA5) when compared to observations (i.e., International Best Track Archive for Climate Stewardship). Currently working to improve cyclone genesis.*
- *ALADIN also better captured the spatial distribution of rainfall for islands that was not well represented in ERA-5.*

- *Selection of CMIP6 models was based on South Pacific Convergence Zone (northward movement, southward movement, or displacement).*