



Bias-corrected CMIP6 projections of sea surface temperature over the west coast of India with inputs from satellite observations

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Regional ocean – atmospheric process plays key role in the magnitude of sea level rise and associated storm surges. Coastal areas that may submerge due to the individual or combined effect of oceanographic variations need to be identified and ranked for effective disaster risk reduction. The coupled model intercomparison project 6 (CMIP6) based region specific projections along with coastal maps can facilitate coastal resilience and climate action plans for the region.

Climate projections of Indian coasts are significant to anticipate the severe weather events and further to plan for the disaster mitigation efforts. In order to improve the accuracy of coast specific projections, the discrepancies among the projected values of various global models over a region need to be negated. This paper focusses on the historic trends and projections of sea surface temperature (SST) over the west coast (5° N -22° N, 68° E -78° E) region of India. Validation of the model historical output values with remotely sensed data of sea surface temperature is performed to identify the model biases. Satellite data of SST with a spatial resolution of 1° × 1° from the Met Office Hadley Centre were utilized for the duration of 1980-2014. The historical and projected data of CMIP6 were obtained for the duration of 1980 - 2014 and 2015 - 2099 respectively. The CMIP6 data were acquired from 3 best performing models namely CESM, NorESM, MPI-ESM. Historic ensemble mean of the three models were calculated and compared with the satellite data. The estimated biases among model and satellite values were corrected by quantile mapping method. The bias-corrected SST projections for the time slices of near (2015–2039), mid (2040–2069) and far (2070–2099) future were accomplished for the four shared socio-economic pathways (SSPs) such as SSP 1.26, SSP 2.45, SSP 3.70, SSP 5.85. The SST shows increasing trend in all scenarios across the west coast of India. An increase of 0.07°C per decade was observed for the CMIP6 historical models, while the trend was 0.08°C for the satellite data. Decadal increase of SST for the selected four SSP scenarios were found to be 0.08°C, 0.18°C, 0.27°C and 0.31°C, respectively. The use of satellite data help in model bias correction in addition to high spatial and temporal coverages. The significant warming trend can influence the sea surface height leading to increased coastal vulnerability and risks. The study finds application in generating CMIP6 based projections along with vulnerability and risk mapping for the west coast.