



## Dynamical Downscaling of Storm Surges in South-China Sea and Singapore Strait

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A projection of sea level extremes is an important part of global climate change studies. In Singapore Strait the extreme sea level anomalies occur during Asian Northeast (NE) and Southwest (SW) monsoons blowing over the South-China Sea (SCS). The extremes are believed to be associated mainly with storm surges exceeding magnitude 50 cm relative mean sea level in the Singapore Strait due to the strong persistent monsoon winds off coast of Vietnam (Tkalich et al., 2009a, 2009b). The paper uses past wind and storm surge data to validate the shallow-water COASTOX-UN model (Kolomiets et al. 2008), and then dynamically downscale future extreme storm surges using projected wind and atmospheric pressure from ECHAM5 global climate model (GCM).

Past records from Singapore tide gauges and regional TOPEX/POSEIDON altimetry are analysed together with wind and pressure from NCEP data to identify most prominent storm surge cases. A criterion was found linking extreme storm surges in Singapore Strait to wind parameters at certain areas of SCS; and then the criterion is used on future wind and atmospheric pressure data to identify probable dates of storm surges. Two 100-years-long wind data sets are used, one is the direct output from ECHAM5 GCM for SRES scenario A2, and another is dynamically downscaled using WRF regional climate model RCM.

The wind data are fed into 2D shallow-water unstructured finite-volume model COASTOX-UN covering region from  $-10^{\circ}\text{S}$  to  $30^{\circ}\text{N}$  and from  $90^{\circ}\text{E}$  to  $130^{\circ}\text{E}$ . The mesh comprises of 184,000 elements, having cell sizes ranging from 100km at the domain boundaries, to 7km at the shoreline, and with refinement up to 1km near the Singapore Strait. For past cases the computations showed a good agreement with measurements, with a little or no calibration required. For future wind, projected storm surges show distribution consistent with natural variability rather than certain trend. For extreme cases the maximum sea surface may reach height up to 1m in Singapore Strait.

### References

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