

Predictability of Seasonal to Interannual Coastal Flood Risk

Sea level rise is increasingly threatening the coastal zone under a continuously warming climate, with many coastal and island communities already feeling its impacts. While sea level rise due to anthropogenically forced thermal expansion and land-ice melt increases flood risk overall, flood risk on seasonal to annual timescales is more directly connected to natural climate variability such as ENSO, NAO and MJO. For example, during El Niño winter months, there is higher-than-average sea level along the Mid-Atlantic coast due to changes in regional sea level pressure, leading to enhanced coastal flood risk. Along the Southeast coast, the ENSO signal is weak, but the connection to the prevailing atmospheric conditions (sea level pressure and winds) remains strong, further indicating the potential for sub-seasonal to seasonal predictability. Also, ENSO-related sea surface height anomalies, along with shifts in the prevailing winds, increase the coastal flood risk in California. Along the east coast of the US Gulf Stream variability is known to affect coastal flood risk on seasonal and longer timescales with a weakened Gulf Stream associated with increased flood risk. Clearly, there is substantial evidence supporting the development of an early warning system for coastal flood risk on seasonal to annual timescales, although this has not yet been done. Our research efforts will primarily focus on the pragmatic sources of predictability for coastal flood risk in the US, leveraging the output from existing NMME retrospective and real-time predictions. The research efforts will also lead to the development of a prototype real-time seasonal-to-seasonal coastal flood risk prediction system for the US coastline that will capture the flood risk from timescales of one month out to several seasons.

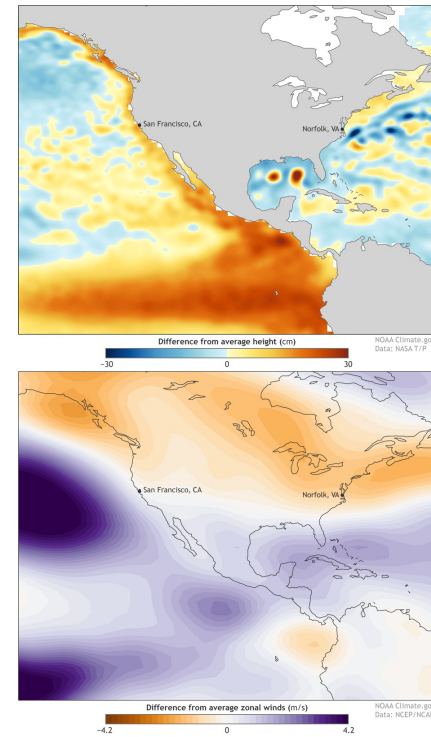


Figure 2: (a) Sea surface height anomalies during the peak phase (December 1997-February 1998) of the 1997-98 El Niño. The sea surface height (in centimeters) is estimated from TOPEX-POSEIDON altimeter data. (b) Surface zonal wind anomalies (in meters per second) during the peak phase (December 1997-February 1998) of the 1997-98 El Niño.