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Benguela Niños and Benguela Niñas in forced ocean simulation from 1958 to 2015

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A systematic study of all the Benguela Niño and Benguela Niña events including those that developed before the satellite era (1982) is carried out using an ocean general circulation model (OGCM) in combination with a linear equatorial model. From 1958 to 2015, 21 strong anomalous coastal events are identified among which 6 undocumented extreme coastal events are reported. Results suggest that most of these extreme coastal warm and cold events including the newly identified ones are linked to remote equatorial forcing. Equatorial Kelvin waves of second baroclinic mode propagate after approaching the African coast poleward as coastally trapped waves leading surface temperature anomalies along the Angola Benguela current system by 1 month. 1-2 months before the peak of Benguela Niños or Niñas usually occurring in March-April, a large-scale wind stress forcing is observed with both local (variations of alongshore coastal wind stress) and remote forcing developing simultaneously. Results further suggest that surface temperature anomalies in Southern Angola and the Angola Benguela Front domains are associated with equatorial dynamics and meridional wind stress fluctuations off the southwestern African coast north of 15°S. Similar processes are observed for Northern Namibia in combination with local meridional wind stress variations.