Observations of Inertial and Low Frequency Variability in the Northern Arabian Sea Associated with Tropical Cyclone Gonu

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Tropical Storm Gonu crossed the Northern Arabian Sea in June of 2007. Tropical Storm passage in the western Indian Ocean is more rare than in the east; only three cyclone tracks have passed through the Gulf of Oman since 1891. The observed response to this storm was captured by two ocean observing systems deployed off Oman in 2005 by Lighthouse R&D Enterprises, Inc. One array is a sustained, real-time, operational, cabled system of profiling current meters located off Abu Bakara off the northern Oman coast. The other was a conventional, four-mooring array of single point current meters located off Cape Ras Al Hadd and at Murray Ridge with data recovered approximately annually. Times series of current, temperature, salinity, and dissolved oxygen were examined for the period 15 May through 30 June 2007. Inertial oscillations were observed at all depths at all locations and persisted for weeks after the storm. Amplitude and duration of inertial oscillations were dependent upon depth and proximity to the storm. Analysis of time-series observations of temperature and salinity relationships reveal strong along-isopycnal cycling with temperature and salinity ranges (0.5C and 0.5 salinity at deep locations to 5C and 2 salinity at shallow locations) indicating strong cross shelf gradients of hydrographic properties associated with water mass generation and transport in the region. Wavelet analysis of the observed times series shows that two distinctly different low-frequency periods were generated by the storm. The period of oscillations were dependent upon water depth, proximity to bathymetric gradients, and distance from the storm. The response is characterized by a high-frequency (3 to 4 day period) shelf oscillation associated with a shallow Kelvin wave and a lower frequency (16 day period) deep slope topographic Rossby wave. The presence of the Murray Ridge in the northern Arabian basin played a unique role in creating and controlling this response. Much of the deep energy generated beneath Gonu was diverted eastward as the storm crossed the Murray Ridge resulting in the cyclonic propagation of the shallow Kelvin and deep topographic Rossby waves. This cyclonic path for storm generated energy is seen in the data as phase lags in the arrival of energy at the Abu Bakara location and is corroborated with numerical simulations of Gonu presented in a companion poster.

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