

Numerical simulations of Low Frequency Variability in the Northern Arabian Sea Associated with Tropical Cyclone Gonu

D. Smith¹, X. Zhang¹, S. F. DiMarco¹, R. Hetland¹

¹ Department of Oceanography, Texas A & M University, College Station, TX

Tropical Storm Gonu crossed the Northern Arabian Sea in June of 2007. Cyclone passage in the Gulf of Oman is exceedingly rare having occurred only twice previously since 1891. The ocean response to this storm is considered in numerical simulations of Gonu in the northwestern Indian Ocean using the ROMS model. The realistic model domain is driven using idealized wind fields following a realistic storm track. The results illustrate that the response exhibits two distinct time scales: a high frequency (3-4 day period) shelf oscillation associated with a shallow Kelvin wave and a lower frequency (16 day period) deep slope topographic Rossby wave. The shallow Kelvin wave is initiated relatively early in the storm's lifetime along the Pakistan coast and propagates to the west along coastal Iran, then cyclonically around the Gulf of Oman and southward along the Oman coast. A distinct east-west gradient of response period is seen along vertical transects between the Indian and Oman coasts. Investigation of the Rossby wave response shows considerably slower phase speeds resulting in longer phase lags between time of initiation and arrival at various location around the basin. The simulations reveal that residual effects in water column properties may last for months after the storm's passage. The geography of the Gulf of Oman basin and the presence of the Murray Ridge in the northern Arabian basin play a unique role in creating this response. Comparing numerical simulations with and without the Murray Ridge shows that neither of these wave modes is generated without this topographic feature; much of the deep energy that is generated beneath Gonu is diverted eastward as the storm crosses the Murray Ridge resulting in the shallow Kelvin and deep topographic Rossby waves propagating cyclonically around the basins. The ocean response to Gonu was also captured in observations taken at moored arrays in the Gulf of Oman and Northern Arabian Sea. Those results are presented in a companion poster.

D. Smith, X. Zhang, S. F. DiMarco, R. Hetland. 2010. Numerical Simulations of Low Frequency Variability in the Northern Arabian Sea Associated with Tropical Cyclone Gonu. EOS Transactions of AGU. Vol. 91 (26), Ocean Sciences Meeting Supplement, Abstract IT45H-07.