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Bottom Pressure Variability in the Red Sea

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We deployed an array of three bottom pressure/temperature/conductivity (PTC) instruments at Jeddah, Thuwal and Rabigh along the Saudi Arabian coast of the eastern Red Sea for a period of 3 years. This PTC array accurately measured the regional tidal variability of the bottom pressure field and characterized the low frequency along-shore pressure, temperature and salinity gradients and their variability. Surface sea level/height was calculated from the bottom pressure measurements using the hydrostatic equation. On time scales of order 1 day the most energetic component of sea level variability was the semidiurnal and diurnal tides dominated by the M2, N2, K1 and O1 tidal constituents. On time scales of order 10 days the sea level variability was wind driven with setup and set down up to 40 cm due to the local wind stress. On yearly time scales the sea level varied approximately 50 cm and was highest in winter (January-February) and lowest in summer (July-August). Barometric pressure also had an annual cycle of approximately 10 mb and was highest in January thus attenuating the amplitude of the annual sea level variability. Higher sea level in winter months may be due to a convergence in the large-scale Red Sea wind stress. The amplitude of the principal tidal and subtidal sea level variability was coherent at the three sites, but the direction of phase propagation could not be resolved with confidence.