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Internal Tidal Waves on the Continental Shelf of the Northwestern Arabian Gulf

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The fluxes and turbulence mixing supported by internal waves (IWs) play a major role in transporting nutrient-rich waters in coastal ecosystems, affecting biological productivity as well as sediment transport. A better understanding of the effects of these waves in numerical models is required to reproduce the crucial links between large scales into which most energy is injected and small scales in which dissipation occurs. To address some of these issues, we examined the characteristics of IWs, and the associated multi-scale energy cascade from IWs to turbulence, on the continental shelf of the northwestern Arabian Gulf, off the coast of Kuwait. The study, conducted during midsummer (15 to 27 July, 2017), collected spatial transects and time-series measurements at five moorings and five-days of continuous turbulence profiles at four locations in the vicinity of the moorings. Measurements of temperature, salinity, currents, turbidity, dissolved oxygen, chlorophyll-a and turbulence reveal that IW activity was consistent with a semidiurnal tidal cycle suggesting that these waves were generated by tides. Using cross-shore tracking of the IWs, we found that these waves propagated towards the coast at an average speed of 0.31 m/s, with an amplitude ranging from 7 to 9 m. The results presented here shed new light on IW characteristics in the Arabian Gulf, and offer the first detailed study of these waves in this region.