Toward an internal tide climatological atlas for Northern Australia

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Internal waves dominate the internal ocean temperature and velocity variability over much of Northern Australia in the frequency band spanning 1 - 200 cycles per day due to the combination of the large surface tides and steep shelf and island topography. Much of their energy is located in the semi-diurnal tidal frequency band so these waves are often referred to as internal tides. Unlike surface tides, internal tides lose coherence with their forcing frequency over time scales of days to weeks, making their prediction more challenging. We attempt to overcome this challenge by integrating a shelf-scale hydrodynamic model with IMOS mooring observations to extract the internal tide amplitude for different seasons, creating a regional climatology. For the model, we used the unstructured mesh SUNTANS code that importantly allows for variable grid resolution around complex geometrical regions, such as the Indonesian Archipelago, which is an important internal wave generation region. For the observations, we incorporated the short-lived (2012 to 2014) IMOS Pilbara, Kimberley and Timor Sea mooring lines to both assess the model performance and to build up a spatio-temporal database of the regional internal wave amplitude. A climatological atlas will be useful in identifying likely regions and time periods for nonlinear wave formation and enhanced ocean mixing. Importantly, it will also help communicate the role of internal tides in driving ocean variability to audiences without a specialist background in physical oceanography.