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Tidal Conversion and associated mixing in the Arctic Ocean

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The Arctic Ocean is unique globally for the low levels of mixing found at intermediate depths. This situation has long been attributed to (i) the presence of sea ice isolating the ocean from surface wind stress, and (ii) the geographical location of much of the ocean basin poleward of the critical latitude (74.5 deg for the principle semi-diurnal M2 tide) and so precluding the formation of a freely propagating linear internal tide. Here we present Arctic wide measurements of the rate of dissipation of tubulent kinetic energy and show that the intermediate depth dissipation is corrlated to the rate of tidal conversion. We then demonstrate, through a non-hydrostatic GCM modelling study and field data focused on the Spitsbergan Bank (76 deg N) that the formation of tidally generated lee-waves, and the subsequent disintergration into high frquency internal waves, is a key mechanism for the transfer of tidal energy to turbulence at these latitudes.