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Tidal and near-inertial energy density and energy fluxes over the Reykjanes Ridge

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The Reykjanes Ridge is a key topographic structure stretching south of Iceland and located at the crossroad of the Atlantic Meridional Overturning Circulation upper and lower limbs. It has been inferred to host significant mixing and water mass transformation, yet the mechanisms at play remain obscure. Using data from an array of 7 moorings deployed for two years over the Reykjanes Ridge in a cross-ridge direction, we computed internal waves' energy density and energy fluxes in the dominating wavebands, i.e., near-inertial and semi-diurnal (tidal) bands to assess the contribution of several mechanisms at fuelling a route to energy dissipation and mixing. Internal tide fluxes are dominating the energy fluxes by an order of magnitude right on top of the ridge and follow a clear spring-neap cycle; but rapidly fade away and become decoherent O(100) km away from the ridge, suggesting a strong scattering by mesoscale turbulence and seafloor topography. Near-inertial energy fluxes and density are surface-intensified and follow a seasonal cycle, with a winter intensification due to storms and intense low-pressure weather systems. The level of near-inertial energy density is roughly explained by the local wind power input, and rapid decay of energy with depth suggests that most of the dissipation occurs in the surface layers, thus is not important for deep water mass transformation.

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