Geophysical Research Abstracts
Vol. 20, EGU2018-5501, 2018
EGU General Assembly 2018

Turbulent controls on the onset and development of seasonal stratification on the NW European shelf

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We present data from a series of ocean glider deployments on the European continental shelf to investigate the mechanistic control seasonal stratification in on the continental shelf. Central to this presentation is a nine-month, 120 km long repeat transect between mid-shelf and the shelf break that shows how variable controls by surface forcing, internal waves and topography drives spatial and temporal variability in temperature, salinity and density structure. We include coincident hydrography and turbulence results from Ocean Microstructure Gliders (OMG), combined with measurements from a nearby buoy fitted with meteorological and ocean surface sensors to explicitly resolve the influence of the different forcing mechanisms across the continental shelf.

Intuitively, our results show that tidal forcing provides the dominant source of bottom mixed layer control, with the spring-neap cycle and changes in topography causing the majority of observed variability. The ocean surface boundary layer depth is controlled by buoyancy input from solar heating and atmospheric cooling balanced predominantly by wind driven mixing, with only occasional instances where surface waves contribute significantly. While an active internal wave field is observed throughout stratified periods we find only weak levels of internal mixing, except in regions close to extreme topography such as at the shelf break and in close proximity to submarine banks.

Results from a state-of-the-art regional scale model (NEMO) are compared with these observations to test the success of chosen turbulence closures in replicating mixing within boundary layers and the thermocline and to test the connectivity between each layer.