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Wind driven eddies and plankton blooms in the North Atlantic Ocean

C. Eden (1) and T. Jung (2)

(1) IFM-GEOMAR, Kiel, Germany (2) ECMWF, Reading, UK (contact: ceden@ifm-geomar.de)

Recent high-resolution satellite missions have revealed persistent small-scale features in near surface winds over the global oceans. We report that such features also show up in the current weather prediction model of the ECMWF at horizontal resolution of ca. 50km. We exploit this finding by forcing a high-resolution general circulation model of the North Atlantic Ocean (1/12deg FLAME) with surface wind stress and heat fluxes taken from the ECMWF model (for the first time, to our knowledge, at such high resolution).

Driven by the small-scales features in the wind forcing, meso-scale oceanic eddies develop in lee of Islands located in prevailing trade winds, providing a substantial, previously overlooked source of oceanic eddy kinetic energy in subtropical regions. Furthermore, anticlockwise circulating eddies are related to upwelling of nutrient rich water from below leading to large plankton blooms in the simulations. It is speculated that similar eddies also show up at comparable other locations in the world oceans, e.g. the Hawaiian Archipelago, with far-reaching implications for local and basin-wide ecosystem dynamics.