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Estimating Mixed Layer Depth with the use of a coastal High-Frequency radar

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Abstract

This work introduces a method that enables the production of mixed-layer depth estimates from concurrent measurements of surface current velocities and surface wind stress. The method's basic assumption is that the mixed layer responds to wind forcing as a slab-layer. Here, the surface current velocities are provided by a High Frequency (HF) radar installed at the east coast of Lemnos island, monitoring the Dardanelles outflow of modified Black Sea waters into the Aegean Sea, and the wind stress is provided via the ERA-interim data set. The surface mixed layer is assumed to respond to wind-forcing as a slab. The method is applied both using the full EOF-reconstructed surface velocity field as well as only its wind-forced part. In the current implementation, the former method appears to produce better results than the latter. The method is evaluated using mixed-layer depth values estimated via local CTD profiles as reference.

Keywords: Mixed Layer Depth, HF radar, Dardanelles, Aegean Sea

1. Introduction

The atmospheric and oceanic boundary layers are regions characterized by relatively strong mixing and large eddy diffusivities and viscosities (Thorpe, 2005), and thus can be identified by more or less homogeneous vertical distribution of properties. The thickness of the homogeneous surface layer of the ocean is referred to as surface mixed layer depth, and, for brevity within

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