

Remote sensing of ocean surface currents: a review of what is being observed and what is being assimilated

Ocean currents play a key role in Earth's climate – they impact almost any process taking place in the ocean and are of major importance for navigation and human activities at sea. Nevertheless, their observation and forecasting are still difficult. First, no observing system is able to provide direct measurements of global ocean currents on synoptic scales. Consequently, it has been necessary to use sea surface height and sea surface temperature measurements and refer to dynamical frameworks to derive the velocity field. Second, the assimilation of the velocity field into numerical models of ocean circulation is difficult mainly due to lack of data. Recent experiments that assimilate coastal-based radar data have shown that ocean currents will contribute to increasing the forecast skill of surface currents, but require application in multidata assimilation approaches to better identify the thermohaline structure of the ocean. In this paper we review the current knowledge in these fields and provide a global and systematic view of the technologies to retrieve ocean velocities in the upper ocean and the available approaches to assimilate this information into ocean models.

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Sea surface temperature from AVHRR. Upper left: absolute dynamic topography from AVISO (black lines) and the associated geostrophic velocities (arrows). Top right: velocities derived from a sequence of thermal images

using the MCC method (arrows). Bottom: velocities derived from the thermal image using a Butterworth filter (arrows)