SailBuoy Ocean Currents: Low-Cost Upper-Layer Ocean Current Measurements in Coastal and Open sea

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Abstract

This study introduces an alternative to the existing methods for measuring ocean currents based on a recently developed technology. The SailBuoy is an unmanned surface vehicle powered by wind and solar panels that can navigate autonomously to predefined waypoints and record velocity profiles using an integrated downward-looking acoustic Doppler current profiler (ADCP). Data collected on two validation campaigns show a satisfactory correlation between the SailBuoy current records and traditional observation techniques such as bottom-mounted and moored current profilers and moored single-point current meter. While the highest correlations were found in tidal signals, strong current, and calm weather conditions, low current speeds and varying high wave and wind conditions reduced correlation considerably. Filtering out some events with the high sea surface roughness associated with high wind and wave conditions may increase the SailBuoy ADCP listening quality and lead to better correlations. Not yet resolved is a systematic offset between the measurements obtained by the SailBuoy and the reference instruments of ± 0.03 m/s. Possible reasons are discussed to be the differences between instruments (various products) as well as changes in background noise levels due to environmental conditions.