Wave-current Interactions in the Aghulas current: Impact on ship behavior

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Ocean waves interacting with large scale ocean currents is a frequent cause of sea-state variability [Ardhuin et al 2017, Quilfen et al 2018, Quilfen and Chapron 2019]. Such situations can lead to sea-state hazards, crucial for shipping security. The Great Agulhas current system is an area of very intensive maritime traffic, where dangerous localized sea-state amplification by the current has quite regularly been reported.

In absence of wind and wave-induced motions, the heading and drift of every ship along its trajectory can be estimated from the near-surface oceanic current map. This first guess can then be compared with real ship parameters obtained from satellite-collected ship Automatic Identification System (AIS) messages. During Southwestern storm-swell wave conditions, with wind and waves aligned against the current, some ships experience pronounced navigation difficulties, slowing down up to 2 m/s, and frequently maneuvering to keep their heading perpendicular to dominant waves. Superposed multiple individual ship trajectories can then help map anomalous areas, and to relate them to localized strong wave-current effects such as large refraction of waves by the oceanic current.

