

# Inferring the movements of marine animals from satellite telemetry, Lagrangian drifters and ocean circulation models

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The movement of an animal in the ocean is the combination of swimming velocity and the velocity of the water. With information on two of these vectors you can calculate the third (Fig. a). For many marine animals, we often have information on the track velocity based on satellite telemetry data (Fig. b). By subtracting the ocean current vector (as estimated, for instance, from ocean circulation models) from the track vector, you are left with the swimming velocity of the animal. With estimates of ocean velocity along the track of an animal you could derive the extent that drift and swimming have on net movement. These estimates can then be used to better parameterize models of animal movement which, when combined with output from ocean circulation models, can predict spatiotemporal variation in species' distributions and its influence on important biological processes including population connectivity, growth, survival and interactions with anthropogenic stressors. The sensitivity of these quantitative methods for estimating swim behavior can be tested using the AOML drifter dataset (Fig. c). Differences between predictions of ocean currents by models and drifters reveal the precision with which swimming behavior can be inferred (Fig. 1). Studies with sea turtles in the Gulf of Mexico, Mediterranean Sea, and South Atlantic are currently underway. The combined use of animal tracking and physical ocean data presents an important opportunity for collaboration between the SEFSC and AOML.

