Quasi-planktonic behavior of foraging top marine predators

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Monitoring marine top predators is fundamental for assessing the health and functioning of open ocean ecosystems. Although recently tracking observations have substantially increased, factors determining the horizontal exploration of the ocean by marine predators are still largely unknown, especially at the scale of behavioral switches (1–100 km, days-weeks). It is commonly assumed that the influence of water movement can be neglected for animals capable of swimming faster than the current. Here, we challenge this assumption by combining the use of biologging (GPS and accelerometry), satellite altimetry and in-situ oceanographic data (ADCP and drifting buoys) to investigate the effect of the mesoscale ocean dynamics on a marine predator, the southern elephant seal. A Lagrangian approach reveals that trajectories of elephant seals are characterized by quasi-planktonic bouts where the animals are horizontally drifting: the horizontal projections of their trajectories are remarkably similar to the ones of Lagrangian drifters. These bouts correspond to periods of increased foraging effort, indicating that in the quasi-planktonic conditions energy is allocated to diving and chasing, rather than in horizontal search of favorable grounds. A similar result was found for Macaroni penguins, whose trajectories were remarkably similar to the ones of passive tracers simulated by ocean currents when in the proximity of the Sub-Antarctic front, a known foraging area for this species. These results suggest that mesoscale features like eddies and fronts may act as focal points for trophic interactions not only by bottom-up modulation of nutrient injection but also by directly entraining horizontal displacements of the upper trophic levels and emphasize the value of an accurate description of fine-scale oceanic currents for ecological monitoring.