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Coupling submesoscale physics to seabirds behaviour at the ocean-atmosphere interface

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During their journeys, seabirds are faced to environmental heterogeneity of the scale of tens of Kms in extension and of days in duration, that are induced in the open ocean by mesoscale and submesoscale turbulence. We combine tracking of frigatebirds in the Mozambique channel - available for the first time with 3-D resolution - and multisatellite-based nonlinear diagnostics to inquire how birds respond to the coupled ocean-atmosphere physics. Birds behaviour along their flight trajectory are categorized in 5 classes of vertical displacement, e.g. slow or fast descents, and are superimposed with the submesoscale structures obtained by a Lagrangian reanalysis or remote-sensing measures. We show that frigatebirds modify their behaviour at such scale over and outside transport and thermal fronts. We suggest that birds colocalization with structures generated by horizontal transport is a consequence of their quest for food (preferentially located on thermal fronts) but also for upward vertical wind. Our multidisciplinary method can be applied to forthcoming high-resolution animal tracking data and contribute to elucidate the response of marine ecosystems to environmental change.