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Evidence for submesoscale barriers to horizontal mixing in the ocean from current measurements and aerial-photographs

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Ocean submesoscale (2̃-20 km) mixing processes play a major role in ocean dynamics, in physical-biological interactions (e.g. in the dispersion of larvae), and in the dispersion of pollutants. We investigate horizontal mixing on a scale of a few km, from observations of surface currents, using highly resolved (300 m) high-frequency radar. Our results show the complexity of ocean mixing on scales of a few km and the existence of temporary barriers to mixing that can affect the dispersion of biological materials and pollutants. These barriers are narrow (O(100m)) and can survive for a few days. The existence of these barriers is verified in simultaneous aerial-photographs. The barriers observed here may require a new approach to the way horizontal mixing is parameterized in ocean and climate models.