Frontal maintenance

Rob Hetland, PNNL

Fronts in the coastal ocean are associated with strong geostrophic along-front flows and a secondary ageostrophic circulation that creates a convergence at the front. The intensification of a front can be characterized by the frontogenesis function that relates the change in the magnitude of a tracer gradient to derivatives of the velocity field. Considering only the 2D surface flow field, there are two modes of deformation that can cause a front to intensify: divergence and strain. A recent study by Barkan et al. (JPO, 2019) demonstrated that at small frontal scales convergence of the secondary circulation dominates strain in frontal intensification. In this study, analysis of frontal eddies associated with the Mississippi-Atchafalaya river plume in summer extends and confirms Barkan et al.'s findings, demonstrating that the frontogenesis function is only proportional to the divergence, and is independent of the strain; this is true even at horizontal spatial scales much larger than the frontal width.