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The distribution of age in a coastal river plume ALEXANDER HORNER-DEVINE, MELYSSA NAGAMINE, SHAUN BEVAN, YEPING YUAN, University of Washington — Fluid age and residence time are arguably the most important variables for predicting changes in water quality in aquatic systems; however, no existing experimental technique can directly resolve them, and our understanding of the relationship between the distribution of age and fluid mechanical principals is incomplete. We present a novel experimental technique for determining the spatial distribution of the age of fluid parcels in laboratory flows. We use the technique to investigate the retention of fluid in a coastal river plume using a series of experiments on a 2m diameter rotating table. In this system, an anticyclonic eddy, or bulge, sets up near the river mouth and accumulates approximately half of the water discharged from the river. Initially, fluid collects continually in the core of the bulge such that the maximum age in the eddy after 10 rotation periods is approximately 6 rotation periods. Subsequently, the bulge becomes baroclinically unstable and the aged core is distorted by smaller coherent eddies. The instability breaks down the retention process and transports fluid from the aged core into the coastal current. The instability also appears to periodically modulate the partitioning of new fluid between the bulge and the coastal current, resulting an coherent pulses of fluid in discreet age classes in the age distribution.

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