



Observations of a negatively buoyant river plume in a large lake

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ABSTRACT: Although seldom studied, negatively buoyant river plumes may be common within large lakes, especially during spring when lake and river waters are near the temperature of maximum fresh water density (4° C) and relatively warm river discharge can be denser than the receiving lake water. Here we examine a negatively buoyant plume entering Lake Superior from the Ontonagon River during late March 2000. Because of small temperature related density differences, the sediment load carried by the river made an appreciable contribution to the plume-edge density field and significantly impacted plume-edge dynamics. Particle-related density gradients were responsible for roughly one-third of the geostrophic velocity shear at the plume edge. As a result of the small width (50 m) of the Ontonagon River mouth, the emerging river water was not deflected by rotational effects. Its movement appeared to have been primarily controlled by the wind-driven coastal current. Our analysis indicates that the frequent reversals of this current should effectively limit the plume's alongshore extent and may result in a continuous coastal band of turbid water extending alongshore in either direction from the river mouth.

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