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Circulation and transport during Episodic Events in La ke Michigan

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The Episodic Events Great Lakes Experiment (EEGLE) program initiated by the National Oceanic and Atmospheric Administration (NOAA) and the U.S. National Science Foundation (NSF) in Lake Michigan was designed to create an integrated observational program and numerical modeling effort to identify, quantify and develop prediction tools for winter-spring resuspension events, and assess the impact of these events on the transport and transformation of bio-geochemically important materials and on lake ecology. This paper presents an overview of moored physical oceanographic observations during three field years (1998-2000). We analyze the moored current and meteorological observations to study the variability of coastal circulation and the physical mechanisms resulting in the alongshore and cross-shore transport in the lake. Three northerly storms in each field year have been further analyzed to study the generation of two-gyre circulation and the offshore transport due to topographic steering. The observed currents show the signature of a forced two-gyre circulation in the southeastern basin. The interannual variability of mean and fluctuating currents is mainly due to the variability of prevailing wind forcing. The intermittent episodic circulation influenced by northerly storms cause significant asymmetry to the mean circulation. During northerly storm episodes, the mean xurrent speeds increased significantly, and the currents within 10 km of shore followed the surface wind stress while further offshore the circulation was oppositely directed. During these episodes it is also observed that the combination of directly wind forced currents and northward propagating vorticity wave generates significant offshore transport in this region.