



Inertial oscillations and related internal beat pulsations and surges in Lakes Michigan and Ontario

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ABSTRACT: Records of water temperature, current, and wind, made during campaigns on Lakes Michigan 1963 and Ontario 1972, are searched for inertial responses to wind action: (i) circle-tracking currents; and (ii) isotherm depth undulations, i.e., long internal wave manifestations of forcing by wind. With stratification absent in winter, only response (i) is seen (and then only rarely) with periods very close to the local inertial period, T_m . After whole basin stratification is complete, both responses (i) and (ii) occur frequently, as internal Kelvin waves (shore trapped and not further treated here) and cross-basin Poincaré internal seiche modes. Mode periods range between 1% and 15% less than T_m , depending on which of the here-modeled modes have responded and on differences between modes in their partitioning of kinetic and potential energy. When, in both lakes, short duration wind impulses were followed by a week or more of relative calm, Poincaré mode combinations produced beat pulsations in both responses (i) and (ii), diagnostic features of which sometimes permitted participating modes to be identified. At a nearshore downwelled front in Lake Ontario, another type of poststorm adjustment was seen. Periodically released from the front, internal surges migrated across the basin through fields of inertially rotating, response (i) currents.

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