Geophysical Research Abstracts
Vol. 18, EGU2016-10856-1, 2016
EGU General Assembly 2016

Hydrographic climatology in the Gulf of St. Lawrence: its recent trends and an estuarine regime of interannual variability

Alexander Yankovsky (1), Igor Yashayaev (2), and Alejandro Frank (3)

(1) University of South Carolina, Columbia, SC, United States (ayankovsky@geol.sc.edu), (2) Bedford Institute of Oceanography, Dartmouth, NS, Canada (Igor.Yashayaev@dfo-mpo.gc.ca), (3) University of South Carolina, Columbia, SC, United States (afrank@geol.sc.edu)

Combining hydrographic data from the NOAA NODC World Ocean Database and the archive of the Bedford Institute of Oceanography we construct a hydrographic climatology of the Gulf of St. Lawrence (GSL) and analyze interannual to multidecadal variability of its principal water masses. Our analysis is based on the assumption that buoyancy is a primary forcing mechanism defining thermohaline fields and driving circulation in GSL, which in turn dictates the selection of representative transects. We analyze ensembles of hydrographic conditions, parameters of seasonal cycle, seasonal-to-interannual anomalies and long-term trends in each distance-depth bin of several transects orthogonal or tangential to the principal pathways of buoyancy-driven flows in GSL. In the Cabot Strait, the surface layer exhibits freshening while the bottom layer (affected by the Atlantic water influx) becomes warmer and saltier. The latter tendency can be traced along the axis of the entire Laurentian Channel and becomes even stronger further inland (e.g., off Anticosti Isl.). This enhancement in two-layer estuarine exchange flow is likely related to the freshening effect of the melting ice further north advected into the Gulf, or to the stronger freshwater discharge mixing in the Gulf. Indeed, the near-surface coastal bin off Nova Scotia occupied by the coastal buoyancy current originating from the St. Lawrence estuary does not reveal similar freshening. Interannual variability of temperature and salinity also exhibits patterns of estuarine exchange: near-bottom temperature and salinity indicative of the return flow from the Atlantic into GSL correlate with the St. Lawrence River discharge. The coastal buoyancy current responds to variations in the freshwater discharge by its expansion offshore while the salinity variations near the coast do not show a significant relationship with the discharge. Accelerating departure of hydrographic anomalies from their record-mean trends is observed over the last 10 years.