



**Figure 4.6a.** Winter (November through February) near-surface mean flow and low-frequency current ellipses observed in Massachusetts Bay during various experiments conducted between 1986 and 2005. The observed mean flow (blue arrows) and the variability (shown as an ellipse centered around the tip of the mean flow arrow) are shown for near surface currents (measured 2-8 m below sea surface). Typically, the daily-averaged current originates at the station symbol (colored squares) and flows toward any location within the ellipse. In general, the daily fluctuations are larger than the mean. These data were obtained from the Massachusetts Bays Circulation Experiment (winter 1990-1991) (Geyer and others, 1992), USGS-MWRA long-term observations (winter 1990-2002 at LT-A and winter 1997-2002 at LT-B; Butman and others, 2004a), Gulf of Maine Observing System (GoMOOS) (winter 2001-2005), Stellwagen Bank (winter 1994, USGS data archives), western Massachusetts Bay (winter 1987, USGS data archives), and Cape Cod Bay (winter 1986, USGS data archives). The 40-m isobath is shown as a gray line.