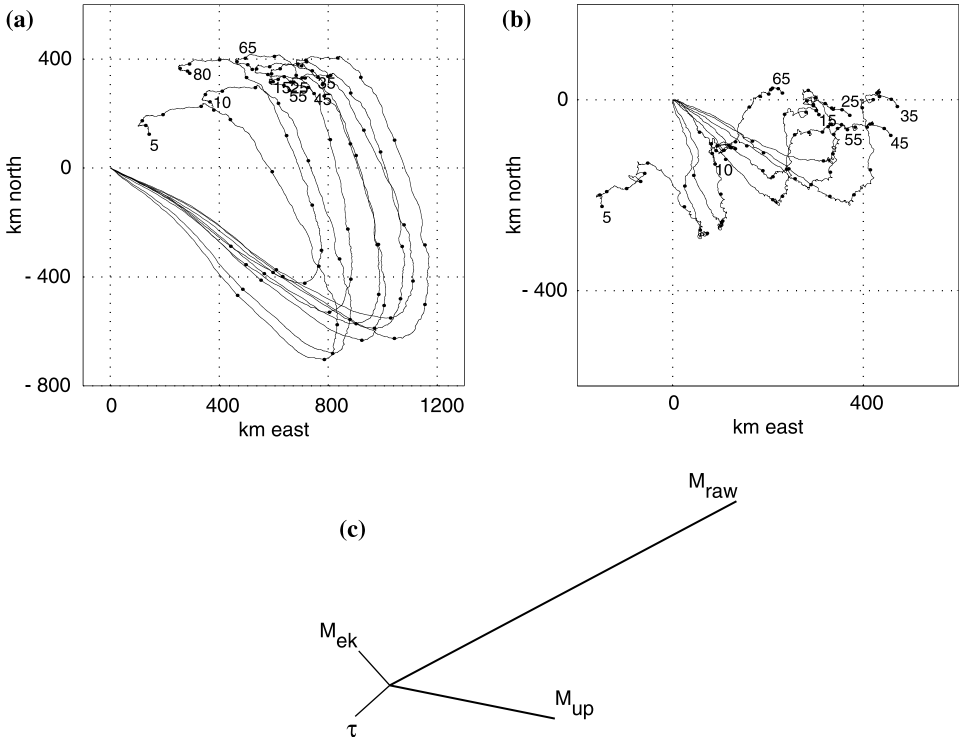

Fig. 18. Progressive vector diagrams and integrated transports. (a) Progressive vector diagrams for flow in the upper 80 m during the NE Monsoon (dots are separated by 6 days) and (b) for the flow relative to 80 m, both at the WHOI mooring. (c) The average wind stress, observed (raw) transport in the upper 80 m, observed transport relative to 80 m (up), and theoretical Ekman transport (ek) computed from the mean wind stress, showing that much of the response was not due to the local winds.

ERS-1 altimetry for October 30, 1994, just at the beginning of the NE Monsoon, is shown in Fig. 19. There is a dipole feature extending for several hundred kilometers to the north and south of the moored array, with a positive sea-surface height anomaly to the south and a trough to the north. The strong eastward velocities seen at the mooring site are consistent with this. Over the course of the next two months, these features move generally westward, and the moored array alternately samples areas of anomalous highs and lows, corresponding to the regions of depressed and raised thermocline seen in the temperature record.

6.4. Deepening mechanism

The local surface forcing during the NE Monsoon, moderate winds and strong surface cooling suggest that the primary mechanism driving deepening of the mixed layer from the surface was convective cooling. A scale analysis of the surface forcing and its contribution towards the generation of turbulence bears this out. The Obukhov length represents the height below the surface (adapted for the oceanic case) at which the buoyant production of turbulence becomes larger than the shear production of turbulence, and is defined (with the von Karmann constant taken to be 0.5) as

$$L = \frac{2u_*^3}{B_0}, \tag{4}$$

where u_* is the friction velocity, derived from the surface wind stress and density as $(\tau/\rho_0)^{1/2}$, and B_0 is the surface-buoyancy flux derived from the surface heat flux, evaporation, and precipitation. The surface-buoyancy flux is defined as positive in