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The origin and variability of major cold water events observed off Sydney, Australia

J.E. Wood (1) and M. Roughan (1,2)

(1) The University of New South Wales, School of Mathematics and Statistics, Australia (julie.wood@student.unsw.edu.au),
(2) Sydney Institute of Marine Sciences, Mosman, Australia

Western boundary current regions do not tend to experience prolonged upwelling seasons compared with eastern boundary current regions. None the less, sporadic event-driven uplift of the isotherms can occur. The continental shelf off Sydney, Australia, occasionally experiences such events. The continental shelf in this region is influenced by intrusions of the East Australia Current, it's eddies and wind stress. These physical processes can force isotherms to uplift leading to the observation of lower temperature for a period of time. Water column temperature data from a near shore mooring off Bondi, Sydney, collected between May 2006 and June 2011 shows that, while a seasonal cycle in temperature is observed, there can be large fluctuation from the average for a given month. These anomalies occur more often in summer (where there can be dramatic shifts in the temperature) than in winter. Some of these anomalies in temperature may be attributed to events driven by the presence of offshore eddies and/or the influence of the wind. Using high passed filtered temperature data, we have identified twenty-nine such events between May 2006 and June 2011 where cold water anomalies have occurred. Using current data from the mooring, wind data from an onshore site at Kurnell, Sydney and satellite sea surface temperature and current data, we visually assessed each event to determine the dominate forcing mechanism; either an eddy/East Australia Current intrusion and/or wind stress. The major forcing mechanism was the interaction of a strong southward flowing current with the sea floor causing onshore movement of subsurface cooler water. During these events some observations of onshore flows in the bottom boundary layer exceeded 0.07 m s-1. Forcing events caused by an upwelling favourable wind tended to be weaker and of a shorter duration. The isotherms were uplifted the greatest during periods where there was a strong southward flowing alongshore current combined with upwelling favourable wind stress. Results showed that each event is unique and dependent on the strength and duration of the forcing mechanism.