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Sea ice and iceberg drift and their relationship to altimetry-derived ocean currents in the Labrador Sea

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Sea ice drift variability and its oceanic and atmospheric forcing are investigated for the Labrador Sea over the period 1979-2002. The two forcing components can be approximately separated by comparing the time series resulting from an Empirical Orthogonal Function (EOF) analysis of the sea ice motion with local sea level pressure gradients, altimetry-derived oceanic velocities and the number of icebergs crossing the 48o N parallel. We find that the first ice motion EOF is closely associated, as expected, with sea level pressure gradient changes, i.e. wind driven ice drift. The time series of the second ice motion mode appears to be associated with oceanic forcing, because it is remarkably similar in its fluctuations to both the iceberg count and the oceanic velocities derived from altimetry. The ice motion data thus provides the longest record complementing the subpolar oceanic velocity variability inferred from the altimetry data. The oceanic component of the ice drift also suggests that large fluctuations of the subpolar ocean gyre have likely been missed during the gaps in the altimetry record.