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High-resolution modelling of the mean flow and meso-scale eddy variability around the Grand Banks of Newfoundland

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The mean flow and meso-scale eddy variability in the region around the Grand Banks of Newfoundland (GBN) are quantified by analyzing surface drifter observations, mean dynamic topography (MDT), along-track satellite altimeter observations and the solutions of two high-resolution ocean models based on NEMO. By increasing the horizontal resolution from 6.5 km (CREG12) to 2.2 km (GBN36), the modelled mean kinetic energy (MKE) decreases and the eddy kinetic energy (EKE) increases in the study area. GBN36 obtains the MKE of surface geostrophic currents and total currents similar to that derived from MDT and drifter data, whereas CREG12 overestimates these quantities by 40-53%. CREG12 and GBN36 underestimate the EKE of surface geostrophic currents by 46% and 30% respectively with respect to the EKE derived from along-track SLA data. The models do not reproduce the strong eddy activity in the Gulf Stream and its downstream region, possibly related to a northward shift of the Gulf Stream position by 0.5° in latitude. Both models obtain wavenumber spectra of sea level anomaly in close agreement with the spectrum derived from along-track altimeter data, with a slope of -5 at wavelengths near 100 km on logarithmic spectral density scales.