Abstract View

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Wind Stress on the Ocean over the Eastern Continental Shelf of North America

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ABSTRACT

Employing one million ship reports gathered in the years 1941–72 seasonal averages of the wind stress and its standard deviation have been computed for the shelf region of the eastern North American continent (out to a depth of 200 m). A drag coefficient is assumed which increases with wind speed, from 1.0×10^{-3} at 5 m s^{-1} to 2.3×10^{-3} at 25 m s^{-1}. Atmospheric stratification is taken into account but its effect is shown to be small.

In the summer season the 32-year climatological wind stress is toward the northeast, having a magnitude close to 0.25 dyn cm^{-2} throughout the entire shelf region. In the three other seasons the stress is directed toward the south and east being strongest in winter (1–1.5 dyn cm^{-2}) and weakest in fall (0.25–0.5 dyn cm^{-2}). In addition to the expected increase in magnitude with increasing latitude remarkable small-scale variability occurs. An offshore increase in stress is widespread and dominates the mid-Atlantic Bight; in winter the stress there increases from 0.5 to 1.0 dyn cm^{-2} in going 200 km offshore. In the Gulf of Maine and especially in the Gulf of St. Lawrence local maxima occur; the tall of the Grand Banks 500 km from shore shows a minimum. Probably much of this variation is associated with the intensity (and frequency) of cyclonic activity rather than directly with changes in friction at the underlying surface. Some oceanographic consequences are commented on but the computations are principally intended as a data source for further research.