Abstract View

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Sea-Surface Drift Currents Induced by Wind and Waves

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ABSTRACT

Wind-induced shell currents and wave-induced mass transports at various fetches of both clean and slick sea surfaces are separately estimated. At the clean surface, the ratio between wind-induced current and wind velocity decreases, while the ratio between wave-induced current and wind velocity increases, with increasing fetch. The total surface drift current, the sum of wind- and wave-induced components, decreases gradually with increasing fetch and approaches 3.1% of wind velocity at long fetches, comparing very favorably with measured values. At a slick surface, the wind-induced drift current is reduced due to a decrease of the wind-stress coefficient, and the wave-induced mass transport is increased due to an additional wave damping. As a result of these opposite effects, the total surface drift current at a slick surface differs much less significantly than individual components from that at a clean surface. It is also suggested that the surface mass transport can be calculated simply from characteristics of dominant waves and that discrepancy between earlier measured currents of clean and slick surfaces is due to a direct momentum flux from wind to waves. Finally, linear superposition of wind- and wave-induced components and effects of water depth on surface drift currants are discussed.