EDDY EVOLUTION GENERATED BY OSCILLATORY WATER FLOW OVER ROUGH BOTTOMS

A THESIS SUBMITTED TO
THE GLOBAL ENVIRONMENTAL SCIENCE
UNDERGRADUATE DIVISION IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

BACHELOR OF SCIENCE

IN

GLOBAL ENVIRONMENTAL SCIENCE

DECEMBER 2004

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ABSTRACT

The evolution and lifespan of eddies generated by flow separation around a headland is studied using laboratory, analytical, and numerical methods. Here, the importance of these oceanographic features will be demonstrated by analyzing the vorticity scales associated with the generated eddies as well as the potential for mass and energy transfer through the water. The role of tidal flow history is investigated as well as its relationship to the generation and tracks of the vortices. Laboratory experiments were conducted to reinforce understanding of data collected from field observations and numerical modeling. Field observations were then analyzed and compared. It was established that oscillatory flow from tidal cycles enables interactions between eddies of long life spans (relative to the tidal excursion) of opposite signs. These interactions create secondary circulations in the form of a dipole pair, which provide a transport mechanism for the interior waters to be carried out towards the boundary. Decay in the form of drag and turbulence is found to impede the longevity of the eddies and is examined here. The fate of an eddy generated at a headland is determined by longevity, flow history, and successive tidal periods.