Abstract View

Volume 18, Issue 8 (August 1988)

Journal of Physical Oceanography
Article: pp. 1167–1177 | Abstract | PDF (962K)

Bottom Stress Estimates from Vertical Dissipation Rate Profiles on the Continental Shelf

Richard K. Dewey

College of Oceanography, Oregon State University. Corvallis, Oregon

William R. Crawford

Institute of Ocean Sciences, Department of Fisheries and Oceans, Sidney, British Columbia, Canada

(Manuscript received February 3, 1987, in final form February 25, 1988)

DOI: 10.1175/1520-0485(1988)018<1167:BSEFVD>2.0.CO;2

ABSTRACT

Measurements of the near-bottom distribution of the turbulent dissipation rate on the continental shelf west of Vancouver Island are used to calculate bottom stress. A free-failing vertical profiler with microstructure shear probes was used to measure the dissipation rate, from near the surface to within 0.15 m of the bottom. The shear probes measure velocity gradients at scales within the viscous subrange of the turbulence and therefore directly measure the rate at which kinetic energy is dissipated by viscosity. Friction velocities are computed from the formula $u_{ast;} = (\epsilon\kappa z/\rho)^{1/3}$, where the dissipation rate ϵ is measured in the constant stress layer. The technique is more reliable than estimates of the dissipation rate obtained by fitting spectral slopes to velocity spectra at scales in the inertial subrange. Near-bottom current measurements indicate that the bottom stress values obtained from the turbulent measurements are well correlated with the current magnitude. An estimate of the drag coefficient indicates that the bottom is hydrodynamically smooth and that bottom stress estimates from current data alone would overestimate the stress by four times, possibly due to the influence of form drag.