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Numerical modeling of environmental flows using DAM: Some preliminary results

Roy A. WALTERS and David R. PLEW

National Institute for Water and Atmospheric Research,
Christchurch, New Zealand
e-mails: rawalters@shaw.ca (corresponding author); d.plew@niwa.co.nz

Abstract

Development of closures and parameterizations for subgrid scale effects is a significant and longstanding problem in the numerical simulation of environmental flows. The model described herein uses a rigorous approach for developing double-averaged governing equations – first a traditional Reynolds averaging to derive the Reynolds averaged Navier-Stokes equation (RANS), then a volume average to derive a set of double-averaged equations (DANS). An existing finite element flow model is then modified to accommodate these equations. This process gives rise to several new terms that require closures, as well as a new equation for free surface elevation. This paper is directed toward model development and uses several existing closure schemes as test cases.

Key words: hydrodynamics, numerical model, double-averaging, closures, form drag.