

# ZONAL INFLUENCES IN A MODIFIED STOMMEL–ARONS MODEL OF THE ABYSSAL OCEAN CIRCULATION

By P.F. HODNETT\* R. MCNAMARA

Department of Mathematics and Statistics, University of Limerick

[Received 8 May 2000. Read 13 November 2000. Published 30 August 2002.]

## ABSTRACT

The Stommel–Arons model of the circulation in the abyssal ocean is modified by allowing the temperature (homogeneous in Stommel–Arons) to vary with depth and latitude and weakly with longitude. The temperature and vertical velocity are specified at the top of the abyss as functions of latitude and weakly of longitude. The resulting distributions of temperature for the North Atlantic show agreement with climatological data when the vertical coefficient of thermal diffusion is  $1.25 \times 10^{-4} \text{ m}^2 \text{ s}^{-1}$ . The vertical, meridional and zonal components of velocity show significant change in structure from the Stommel–Arons expressions. Also the resulting streamline pictures are significantly different from the Stommel–Arons solution. The simple model of the abyssal ocean presented here yields results consistent with some specific observations and with some aspects of three-dimensional numerical models of the North Atlantic circulation which more fully represent the physical reality.