THE EQUATORIAL SUBTHERMOCLINE CIRCULATION IN OCEAN GENERAL CIRCULATION MODELS

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Chapter 1

Introduction

The most active part of the oceans is generally concentrated near physical boundaries, such as the surface, the coasts, or near "dynamical" boundaries, such as the equator where the Coriolis parameter is zero. In these regions, strong along-boundary currents are observed, and play an important role in the basin circulation.

In the upper part of the Atlantic and Pacific oceans, the surface equatorial currents, the Equatorial Undercurrent (EUC), and the pair of South and North Subsurface Countercurrents (SSCC and NSCC individually; SCCs collectively), have been widely observed, and it is fair to say that most of these features and their dynamics are either well-known, or the topic of intense research. The subthermocline part has been, however, much less documented, but the observations show a complex set of east-west currents constituting the Equatorial Subthermocline Circulation (ESC).

The SCCs, located at the bottom edge of the thermocline, are formally part of the upper ESC. Many recent works exist on the subject (Johnson and Moore 1997; Marin *et al.* 2000, 2003; McCreary *et al.* 2002; Rowe *et al.* 2000; Donohue *et al.* 2002; Jochum and Rizzoli 2004). But our focus here is the deeper part of the ESC (400 m depth and below), and the SCCs will not be considered hereafter.

Why the ESC exists, and what its dynamics are, are puzzling questions. The lack of understanding of the ESC means that an important part of the equatorial dynamics is missing. The main goal of this study is to build a basis for future studies, by synthesizing the existing observations and theories (Secs. 1.1 and 1.2), and by comparing and evaluating recent ouputs from high-resolution ocean models (Sec. 3).