Numerical Study of Tidal Upwelling Over The Sill
In The Lombok Strait (Indonesia)

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ABSTRACT

Strong tidal currents have been observed across the Badung Strait and over the Lombok Sill. The vertical profile of horizontal and vertical velocity signatures appeared strong around the Lombok Sill, especially near the sea bed. The vertical profile signature has the same tendency for upwelling and downwelling phenomena in the vicinity of the sill. A numerical model has clearly shown the role of the stepped bottom topography and vicinity of the Lombok Sill leading to tidally induced tidal upwelling.

KEY WORDS: The Lombok Strait; Lombok Sill; tidal upwelling; 3-dimensional numerical model; FVCOM.

INTRODUCTION

Many researchers have investigated the dynamics of seawater flows in Indonesian Seas (Field and Gordon, 1991; Hatayama et al, 1996; Field and Gordon, 1996; Robertson and Field, 2005). Seawater flow in the Indonesian basin is complicated due to the complex coastline geometry and the rough sea bottom topography (Gordon and McClean, 1998; Gordon, 2005). The tidal currents in the Indonesian Seas, which have an important role in connecting the Pacific Ocean and the Indian Ocean, enhance vertical mixing and transport (Hatayama et al 1996; Field and Gordon, 1996).

Lombok Strait is separated by Bali Island and Lombok Island as shown in Fig.1, and is an important pathway for the Indonesia Throughflow (ITF) (Gordon and McClean, 1998; Susanto et al, 2005). In the south part of the Lombok Strait there are small islands namely, Nusa Penida Island, Ceningan Island and Lembongan Island. These and Bali Island form another water pathway in the Lombok Strait called the Badung Strait. In the northeastern channel too there are small islands called Gili Terawangan.