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Earth and Planetary Science Letters 203 (2002) 277–293

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Late amagmatic extension along the central and eastern segments of the West Philippine Basin fossil spreading axis

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Received 25 February 2002; received in revised form 2 July 2002; accepted 23 July 2002

Abstract

The spreading processes within the West Philippine Basin (WPB) remain partly unknown. This study presents an analysis of the tectono-magmatic processes that happened along its spreading axis during the conclusion of the last spreading phase at 33/30 Ma. We demonstrate that the late episode of N–S opening from an E–W-trending spreading system has been followed by a late tectonic event occurring in the central and eastern parts of the basin. This event was responsible for transtensional strain accommodated along the NW–SE faults cutting through the former E–W rift valley in the central part of the basin. In its eastern part, the same event occurred at a larger extent and led to the creation of a new NW–SE axis, obliquely cutting the older E–W spreading segments and their associated spreading fabrics. At this location, several tens of kilometers of slightly oblique amagmatic extension occurred following a $\sim 60°$ direction. We propose that this late event is associated with the onset of E–W opening of the Parece-Vela Basin located along the eastern border of the WPB at 30 Ma. Extensive stresses within this basin were probably transmitted to the hot and easily deformable rift zone of the WPB. The newly-created NW–SE axis most likely propagated from east to west, being responsible for scissors opening within the WPB. NE–SW extension ceased when well-organized spreading started at 26 Ma in Parece-Vela Basin, accommodating entirely the global extensive stress pattern.

Keywords: West Philippine Basin; Philippine Sea Plate; spreading centers; seafloor spreading; segmentation; transform faults; discontinuities

1. Introduction

The West Philippine Basin (WPB) is a currently inactive marginal basin belonging to the Philippine Sea Plate. The most recent model proposed for the spreading processes within the basin is from Hilde and Lee [1]. These authors analyzed magnetic anomalies and seafloor structures to propose a formation of the basin during two phases of spreading (Fig. 1). The first one probably occurred following a NE–SW direction between 58 and 45 Ma, and was followed by a second N–S episode along E–W-oriented spreading segments between 45 and 33 Ma, date of cessation

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0012-821X/02/$ – see front matter
PII: S0012-821X(02)00855-5