Surface deformation and tectonic setting of Taiwan inferred from a GPS velocity field

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1. Introduction

[2] The island of Taiwan is a zone of active continental deformation located in an exceptional tectonic setting within the plate boundary zone between the Eurasian Plate (EUP) and the Philippine Sea Plate (PSP) (Figure 1). At Taiwan the PSP is moving toward the EUP at a rate of 70–80 mm yr$^{-1}$ in the direction N306°E [Seno et al., 1993] (inset of Figure 1). The complexity of Taiwan’s tectonic setting arises from the fact that at the Ryukyu Trench the PSP subducts north-northwestward underneath the EUP, whereas at the Manila Trench the PSP overrides the EUP in a westward direction. Taiwan is located at the transfer zone between subduction and overriding of the PSP. The 150 km long, NNE trending Longitudinal Valley Fault (LVF) on the island of Taiwan is generally considered as the suture zone between the two plates [Barrier and Angelier, 1986; Big, 1972] accounting for 25–30% of the total plate convergence [Angelier et al., 2000].

[3] The still ongoing collision between the Luzon volcanic arc and the Chinese continental margin started at least 8 Myr ago [Ho, 1988; Kao et al., 1998; Lallemand et al., 2001; Teng, 1990] thereby creating and building the Taiwan orogen. Because of the oblique orientation of the strike of the arc relative to the strike of the passive margin, the collision at Taiwan has migrated southward, incorporating ever new portions of the Luzon arc [Lewis and Hayes, 1983; Suppe, 1981]. Details of the geodynamic evolution and present-day tectonic setting of Taiwan are by no means resolved. This becomes evident from the variety of contradicting models proposed in the literature [Angelier et al., 1990; Chemenda et al., 1997; Lu and Malavieille, 1994; Suppe, 1981; Teng, 1990; Wu et al., 1997].

[4] These models focus on two closely related processes: the geometry and dynamics of the transition between the...