

The collision and subduction between the Luzon and Ryukyu arcs in the Taiwan region

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Taiwan is a typical collision zone. In the south of Taiwan, the South China Sea subducts beneath the Philippine Sea plate (PH) from the Manila Trench, forming the Luzon arc. On the other hand, the Philippine Sea plate subducts beneath the Eurasian plate (EU) from the Ryukyu Trench. It has been considered that, between them, Taiwan has resulted from the collision of the Eurasian continental margin with the Luzon arc (e.g., Suppe, 1981, 1984; Lallemand et al., 2001). However, it is difficult to explain the form of the collisional mountain belt or the connection with the Ryukyu arc based on this idea. In this study, we propose a model which can explain these well. The proposed scenario is as follows. Before the collision of the Luzon arc with the continental margin, a transform fault extended from the northern end of the Manila Trench to the continental margin in the direction of the PH-EU motion. The Luzon arc migrated in this direction along the transform fault, and was contacted with the Ryukyu arc a few m.y. ago. In the north of the transform fault, however, the Philippine Sea plate subducted obliquely from the Ryukyu Trench, and the Ryukyu forearc sliver was migrating to the SW relative to EU. The northernmost part of the Luzon arc, therefore, moved with respect to the Ryukyu forearc in the NNW direction after the contact. This direction regulated the structure and form of the collision belt. Moreover, the part of the Luzon forearc west of the line extending SSE from the northern end of the Manila trench was obducted above the Ryukyu arc and caused the uplift of the Central Range and the high pressure Yuli metamorphic belt. In contrast, the part east of the line subducted beneath the Ryukyu arc, forming the slab extending NNW beneath the westernmost Ryukyu arc. The eroded and/or offscraped sediments were also accumulated in the east of the line and formed the thrust and fold belts extending to Taipei. The reason why the subduction of the east side of the Luzon arc occurred is because the Luzon forearc mantle was serpentinized and dehydrated (See Seno, 2005 for general discussion), which is supported by the double seismic zone in the westernmost Ryukyu slab (Kao et al., 1999). The model proposed here is consistent with the view by Hsu and Sibuet (1995) that the Ryukyu arc is buried beneath the collision zone of Taiwan.