

Characteristics of the wedge-top depozone of the southern Taiwan foreland basin system

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ABSTRACT

The wedge-top depozone in the southern Taiwan foreland basin system is confined by the topographic front of the Chaochou Fault to the east and by a submarine deformation front to the west. The Pingtung Plain, Kaoping Shelf and Kaoping Slope constitute the main body of the wedge-top depozone. In a subaerial setting, the alluvial and fluvial sediments accumulate on top of the frontal parts of the Taiwan orogenic wedge to form the Pingtung Plain proximal to high topographic relief. In a submarine setting, fine-grained sediments accumulate on the Kaoping Shelf and dominant mass-wasting sediment forms the Kaoping Slope. Wedge-top sediments are deformed into a series of west-vergent imbricated thrusts and folds and associated piggyback basins. A major piggyback basin occurs in the Pingtung Plain. Four smaller piggyback basins appear in the shelf–slope region. Many small-sized piggyback basins developed over ramp folds in the lower slope region. Pliocene–Quaternary deep marine to fluvial sediments about 5000 m thick have been deposited on top of the frontal orogenic wedge in southern Taiwan. Sedimentary facies shows lateral variations from extremely coarse fluvial conglomerates proximal to the topographic front (Chaochou Fault) to fine-grained deep marine mud close to the deformation front near the base of the slope. The stratigraphic column indicates that offshore deep-water mud is gradationally overlain by shallow marine sands and then fluvial deposits. The transverse cross-section of the wedge-top depozone in the southern Taiwan is a doubly tapered prism. The northern boundary of the wedge-top depozone in southern Taiwan is placed along the southern limit of the Western Foothills where the frontal orogenic wedge progressively changes southward to a wedge-top depozone (Pingtung Plain), reflecting ongoing southward oblique collision between the Luzon Arc and the Chinese margin. The wedge-top depozone is bounded to the south by the continent–ocean crust boundary. The deep slope west of the Hengchun Ridge can be viewed as an infant wedge-top depozone, showing initial mountain building and the beginning of wedge-top depozone.

INTRODUCTION

Basin setting and previous studies

Taiwan is located at the junction between the Ryukyu and Luzon Arcs in the northwest Pacific (Fig. 1). The mountain belt of Taiwan was formed by collision between the Luzon Arc and the Chinese margin beginning in Late Miocene–Early Pliocene (Suppe, 1981, 1984; Ho, 1988). The resultant development of the Taiwan Orogen flexed down the foreland region on the eastern edge of Chinese margin to form an east dipping wedge-shaped foreland basin (Fig. 1). More than 5000-m thick Pliocene–Quaternary sediments derived from the Taiwan Orogen have been deposited in the adjacent foreland basin (Covey, 1984, 1986).

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The western Taiwan foreland basin can be classified as a peripheral foreland basin in terms of the classification of Dickinson (1974) or a collisional foredeep (Bradley & Kidd, 1991; Johnson & Beaumont, 1995; Galewsky & Silver, 1997; Sinclair, 1997; Chen *et al.*, 2001; Chou & Yu, 2002). On the basis of lithofacies and depositional environments of the western Taiwan foreland basin, Covey (1984) distinguished a mature foredeep in the north from a youthful one in the south. The former consists mainly of deep marine facies or flysch facies but the latter comprises mainly fluvial–shallow marine facies or molasse facies (Fig. 2). Covey (1986) suggested that the northern mature foredeep in Taiwan has reached a steady state in the evolution of a foreland basin with a balance between sedimentation and subsidence. These two papers about the foreland basin west of Taiwan (Covey, 1984, 1986) have been commonly cited and compared with other foreland basins. For example, Karig *et al.*, (1987) and Galewsky & Silver (1997) compared