Lithofacies associations and depositional environments of the neogene molasse succession, Pishin Belt, Northwestern Pakistan

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Abstract

The Pishin Belt is NE-SW trending flysch and molasses basin, in northwestern part of Pakistan, bordered by Eurasian Plate (Afghan Block) in the west and Indian Plate in the east. Western boundary of the belt is marked by well-known Chaman Transform Fault, whereas the Zhob Valley Thrust and Muslim Bagh-Zhob Ophiolite mark the eastern boundary. The Neogene molasse succession of the Pishin Belt comprises the newly identified Middle Miocene Dasht Murgha group, Late Miocene-Pliocene Malthanai formation and Pleistocene Bostan Formation. In the Neogene succession twelve distinct lithofacies have been recognised and grouped into four types of facies associations. Lithofacies include clast-supported massive gravel (Gcm), clast-supported crudely bedded gravel (Gh), cross-stratified conglomerate (Gt and Gp), trough cross-stratified sandstone (St) planar cross-stratified sandstone (Sp), ripple cross-laminated sandstone (Sr), horizontally stratified sandstone (Sh), low-angle cross-stratified sandstone (Sl), massive sandstones (Sm), massive mudstone and siltstone (Fm) and paleosol carbonate (P). The lithofacies associations include channel facies association (CHA), crevasse-splay facies association (CSA), natural-levee facies association (LVA) and floodplain facies association (FPA). The lithofacies associations suggest that the Dasht Murgha group was deposited by a sandy braided to mixed-load high-sinuosity fluvial system. The Malthanai formation was deposited by a mixed-load high-sinuosity fluvial system and Bostan Formation was deposited by gravelly braided channels of a coalescing alluvial fan system.

We postulate that prolonged and continued collision of western margin of the Indian Plate with Afghan Block resulted in closure of the Katawaz Remnant Ocean (southwestern extension of Neo-Tethys) in Early Miocene. Uplifted orogens of the Eocene to Oligocene marine succession of the Nisai and Khojak formations served as a source terrain for the deposition of Miocene through Holocene continental molasse succession in the south and southeast verging successive thrust-bound foreland basins at the outer most extremity of the Pishin Belt.