

Mianwali and Tredian formations; An example of the Triassic progradational deltaic system in the western Salt Range, Pakistan

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The Nammal Gorge in the Western Salt Range, Pakistan, nicely preserves a record of the interacting Triassic progradational deltaic system and fluctuating relative sea level. The lithofacies analyses show carbonate accumulation at the bottom, followed by shale/mud that grades upward into mixed-carbonates, and clastics of the Mianwali Formation and concludes in fluvial-continental sandstones of the Tredian Formation. Bioturbation, ripple marks and mudcracks are observed in Mianwali Formation, while cross bedding is dominant in the overlying Tredian Formation. Soft sediment deformation (internal contortion) are observed and large scale slumps are visible in the Lower part of the Tredian Formation. The petrographic analyses show that the carbonates have shallow marine fauna and have wacke- to packestone texture, while the sandstones are quartz rich with moderate textural and compositional maturities. The two units show deposition in a progradational deltaic setting. An open marine setting, marked by limestone beds, established subsequent to the Permo-Triassic paraconformity that gradually built up into a progradational deltaic system. The thick shales of the Mianwali Formation represent the prodelta shale/muds that were deposited on top of the open marine carbonates. The interbedded sandstones, and shale of Mianwali Formation might represent the prograding clinoforms and/or topsets. The associated carbonates might have been deposited in the less siliciclastic input times in the lagoons or abandon delta lobes. The lower part of the Tredian Formation was deposited in the channel bar, mouth bar and delta lobe setting. The thick sandstone of the Tredian Formation was deposited in a delta plain/fluvial setting with dominant fluvial character.