

Structural Analysis of Swat and the Surrounding Peshawar Basin, North Pakistan: Application of GIS and Remote Sensing

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Remote sensing technology has gained credibility for analyzing the structural and geologic evolution of an area or region. In this regard an attempt has been made to bring out the structural trends in Swat and surrounding of Peshawar basin through satellite imagery. The structural information derived from the satellite imagery was integrated with field observations and existing geologic maps (Ahmad and Jehan, 2005; DiPietro and others, 2008) using GIS software. The integration has given a clear picture of structural trends in Swat and the surrounding Peshawar basin (Fig. 1).

Three major faults, the Kohistan, Kishora and the Khairabad-Panjtal thrusts, dominate the structure of the study area. The Kohistan and the Kishora thrusts are the extension of the MMT in the Swat area (Kazmi and others, 1984). The Kohistan thrust dip angle varies from 55° to more than 60° to the northwest and strikes approximately WSW. The map trace of the Kohistan thrust is mostly straight with a few deflections due to topography. The Kishora and the Khairabad-Panjtal thrusts are also northwest dipping and strike WSW. These dip less steeply than the Kohistan thrust. Beside the major thrusts, high-angle dip-slip and strike-slip faults oriented north-south dominate the eastern part of the study area. The Swat area and the surrounding Peshawar basin have undergone multiple deformations with at least four periods of folding (DiPietro and Lawrence, 1991; Ahmad and Lawrence, 1992; Ahmad and Jehan, 2005). The northern part of the study area preserves four superposed small-scale folds (F₁ through F₄) whereas in the south only the last two phases are preserved. F₁ and F₂ are primarily small-scale folds that can not be distinguished on the image. These are coaxial and coplanar with isoclinal, recumbent axial surfaces and fold axis that plunge gently toward the NNW. F₃ and F₄ folds describe the map pattern. Large scale F₃ folds are upright folds. Small scale F₃ folds are closed to tight with variably dipping axial surfaces, whereas large scale F₃ axes plunge gently but variably towards the north or less commonly the south or southeast (Fig. 1). F₄ folds are open, E-W trending and asymmetric. These are mostly south vergent but are verging north near Rustam (Fig. 1). The superposition of the east-west trending F₄ folds on the generally north-south trending earlier F₃ folds has created dome and basin structures in the Kot, Kotah and Loe Sar area (Fig. 1).

The fold sequence implies an early period of E-W compression prior to the development of south verging structures. The small scale F₁ and F₂ folds represent a progressive F₁ / F₂ deformation that was associated with a single set of west-southwest vergent large-scale folds (F₂). The large-scale F₃ folds may have developed in intense localized shear strain related to ophiolite emplacement south of the Kohistan fault. F₄ folds may correlate with early doming of the lower Swat sequence and with strike-slip displacement along the Kohistan fault or in the northern part of the MMT.

References

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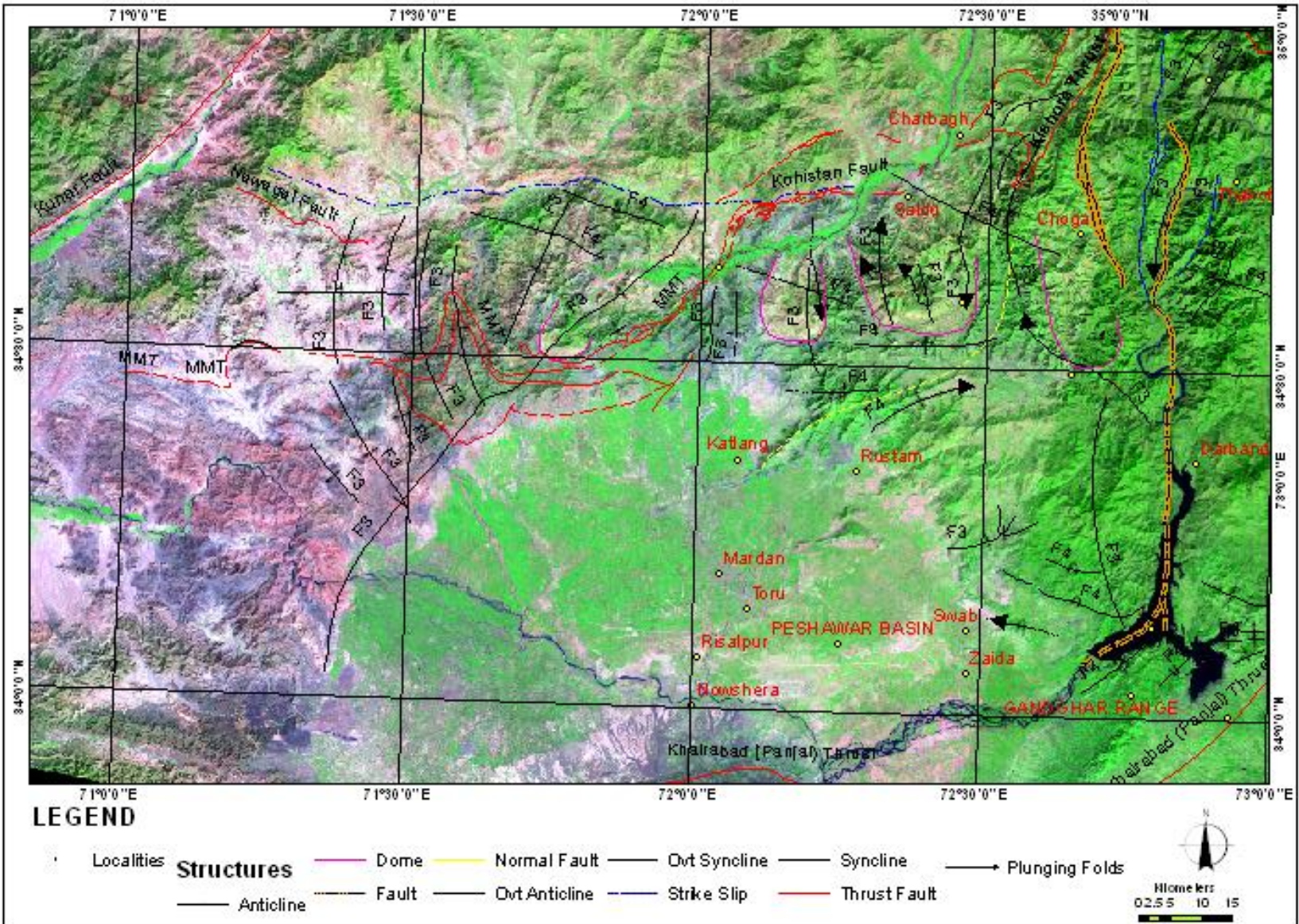


Figure 1. Landsat ETM image showing the structural trends of the Swat and surrounding of Peshawar Basin