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Evolution of the Blue Nile Gorge, Ethiopia, from Optical and Radar Remote Sensing and Digital Elevation Models Data Integration

Optical and radar remote sensing and digital elevation models (DEM) data integration is a powerful technique for the analysis and visualization of morphologically – defined structures such as those formed in extensional tectonic regime. The Blue Nile in the Ethiopian Plateau, carved a 1500 m deep canyon with an elevation of 1000 m at the Blue Nile bed and 2500 m at the plateau crest forming the fascinating Blue Nile Gorge. The canyon exposes Mesozoic sandstone and limestone that underlie the Quaternary basalt of the plateau. Geological control on the evolution of the Blue Nile Gorge is still not fully understood. We integrated the Advanced Spaceborne Thermal Emission and Reflectance Radiometer (ASTER) with Standard and Wide Beam RADARSAT images and DEM's extracted from the Global Topographic data (GTOPO30) in order to study the evolution of the Blue Nile Gorge. Band and band-ratio Red – Green – Blue (RGB) color combinations of ASTER data are used to extract spatial distribution of lithological units whereas RADARSAT data are used to map the morphologically-defined structures. The relationship between lithological and structural features are displayed by the fusion of ASTER and RADARSAT data using RGB - Intensity – Hue – Saturation (HIS) - RGB and Color Normalization Transformation (CNT) techniques. The three dimensional geometry of geological features are extracted from draping the ASTER/RADARSAT fused image over the DEM. Many regional faults probably related to the East African Rift System are identified as possibly have played a significant role in controlling the evolution of the Blue Nile Gorge.