Characterizing EOS-4 imagery for regional geological observations

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The Earth Observation Satellite, EOS-4, launched by the Indian Space Research Organisation, operates in the microwave C-band (5.6 GHz), offering high-quality backscatter images for various thematic applications. In this study, we demonstrate applicability of EOS-4 data in visualizing and identifying geological features, i.e. landforms, structures and rock type variations. Through test cases, we have suggested optimization of parameters like viewing node, geometry, look angle and polarization for geological applications. In analysis of geological structures, SAR look direction and node variation are crucial, whereas for shallow and moist subsurface features, multiple polarizations may be investigated for optimum results. FRS data analysis is essential for mesoscale features like landslides and glaciers, to bring out the subtle granularities. Finally for lithological contrast identification, RGB composites and band ratios derived from the available polarization channels provides the optimum outcomes. Thus, EOS-4 are aptly complementary to any optical datasets for geological feature identification and mapping.

Keywords: C-band, geology, mapping, synthetic aperture radar.

Organisation is designed to provide high-quality SAR images under all weather conditions for applications such as agriculture, forestry plantations, soil moisture hydrology and flood mapping.

The C-band SAR data is used to image near-surface structures and rock contacts, categorize lithological units based on roughness and moisture content. SAR can penetrate shallow depths into the subsurface under certain conditions, i.e. no vegetation and very high dryness. As a result, SAR can locate near-surface geological features or help in lithological mapping[8]. SAR's ability to penetrate the surface is instrumental in desert environments where sand forms temporary structures on the surface. Mapping of the underlying permanent structures is critical in understanding local geological processes[9]. SAR can be used to map subsurface fluvial channels, basins[10] and paleochannels[11,12], i.e. remnants of streams covered by younger sediments. Imaging radar has discovered many previously unknown palaeochannels buried beneath the sand sheets in the eastern Sahara Desert[13]. Guha *et al.*[14] demonstrated the applicability of Envisat ASAR C-band data in geological mapping or rock types in the Kurnool region of India. Similar works on lithology and ore body mapping using SAR data have been attempted by several workers across varied [15–17]