

## Abstract

This report presents the findings of the Server-Based Unified Thematic Geological Mapping of Makran (SUTGMM) project, a groundbreaking geospatial study conducted at a 1:50,000 scale in southeastern Iran. The Makran region, positioned along the northern margin of the Oman Sea, is a key geological area shaped by the complex collision of the Arabian and Eurasian plates. The project offers a detailed analysis of the region's diverse geological formations, including volcanic sequences, sedimentary basins, and Quaternary deposits, which reveal the area's dynamic geologic history. Utilizing state-of-the-art technologies such as cloud computing, machine learning, and object-based image analysis (OBIA), the SUTGMM project integrates data from Sentinel-1, Sentinel-2, Landsat-8, and ASTER, alongside digital elevation models (DEMs). Processed via *Google Earth Engine*, this innovative approach enabled the production of a unified geological map with 85% accuracy, providing new insights into the region's stratigraphy and tectonic processes. The final output includes geological maps, covering key areas of Makran, supported by the GeoNexus geodatabase. This geodatabase consolidates multi-source data, field surveys, and advanced algorithms to produce highly detailed and accurate geological interpretations. The GeoNexus/SUTGMM project represents a cost reduction of 80% compared to traditional methods and achieves a more than 90% reduction in time and personnel, making it a highly efficient and cost-effective, yet precise and comprehensive solution for large-scale geological mapping. The SUTGMM project represents a significant advancement in cost-effective geological mapping, reducing both time and resources traditionally required for such large-scale studies, while improving precision and comprehensiveness.

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