ABSTRACT

It appears that the gold potential of peninsular India has not been adequately evaluated. The Sonakhan greenstone belt (SGB) in the Bastar Craton, Central India, is underexplored as yet with indications of gold mineralization and thus makes a case for knowledge-driven approach for prospectivity mapping and favorability analysis. The Hutt-Maski greenstone belt (HMGB) in the eastern Dharwar Craton, south India has a few important localities that produced gold in the past and a presently producing deposit. The HMGB is considered as a terrane of moderate exploration maturity with known localities and prospects of gold and is amenable to a data-driven approach for prospectivity mapping. The present work is on information synthesis using state-of-the-art methodology of spatial data modelling using multidisciplinary geoscience data generated over the past two decades by various Indian and international agencies.

Concentration-Area (C-A) fractals in combination with Fuzzy Analytic Hierarchy Process (FAHP) has been used to map regional-scale significant geochemical anomaly in SGB. This study used the stream sediment geochemical data from the National Geochemical Mapping Program (NGCM) of the Geological Survey of India (GSI). The concentration of gold (Au) and other pathfinder elements (Ag, Sb, As, Hg and Se) of close chemical affinity were used as indicators of gold mineralization to determine geochemical anomalies in the study area. The C-A fractal was applied to decompose anomaly and background components of the spatial dispersion patterns of each element and FAHP was used to determine the weight for each anomaly map. The reliability of the outcome was assured by the coincidence of known gold mineralization with the high potential regions delineated in the integrated multi-element geochemical anomaly map. A knowledge-driven guide was developed for exploration target delineation in parts of SGB. The obtained geochemical anomalies of selected pathfinder elements were further combined with the available geological data such as key lithological units and their contacts, geophysical data (aeromagnetic anomaly and K/Th ratio map) and satellite digital image data (ASTER and Landsat 7 ETM+) to map gold prospectivity. A total of seventeen evidential layers were generated and integrated using four knowledge-driven prospectivity models such as binary and multiclass index