PSINSAR AS A NEW TOOL TO MONITOR SUBSIDENCE OF RAMGARH CRATER. J. Aswathi[1]*, Saranya R. Chandran[1], S. James[1], Devika Padmakumar[1], K.S. Sajinkumar[1, 1] Department of Geology, University of Kerala, Thiruvananthapuram 695 581, Kerala, India, [2] Department of Geological & Mining Engineering & Sciences, Michigan Technological University, Houghton, MI 49931, USA
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Introduction: Permanent Scatterers Synthetic Aperture Radar Interferometry (PSInSAR) is a powerful remote sensing technique that uses radar signals from a satellite to monitor and measure the displacement of the Earth's surface on a millimeter-scale [1]. PSI is used to detect and analyse Persistent Scatterer (PS) points based on time series analysis of multitemporal Synthetic Aperture Radar (SAR) images acquired at different times and views using differences in the wave phase returning to the satellite.

Ramgarh is a well-known nearly circular-shaped topographic high structure(Fig.1), that has captivated Indian geologists since the nineteenth century. Ramgarh crater lies in a flat sedimentary terrain within the vast soil-covered plains of the NeoProterozoic Vindhyan Supergroup of Ramgarh village, Baran district, Rajasthan of India [2].

In this study, we evaluated a PSInSAR derived approach for detecting and monitoring ground displacements and subsidence in and around Ramgarh crater.

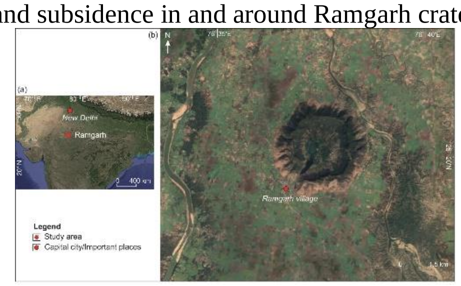

Fig. 1 Ramgarh Crater

Materials and Methods: A total of 65 Sentinel-1A Single Look Complex (SLC) descending images between April, 2016 and October, 2022 were used for the process. ENVI sarscape analytics of ENVI software has been used for the analysis. The PSI technique can produce a large number of points depending on the choice of a coherence threshold. Although all the points convey the same amount of information, they are affected differently by random noise and the strength of the signal being measured. To identify and isolate only the points that convey the maximum amount of information and avoid potential noise and artifact (especially the influence of vegetation), we did a selection process looking for points with a high signal-to-noise ratio and signal quality utilizing the coherence value. For the filtering, we selected only PSI points that have low coherence (<0.7) [3].

Results and Discussion: A large number of PSI points were obtained through this technique. These PSI points yield average velocity values (mm/y), incremental displacement values (mm), total displacement values (mm), and coherence. PSI velocity values range from -27.97 mm/y to +27.18 mm/y. Negative PSI velocity values indicate downward ground movement and positive velocities indicate upward movement. The rate of subsidence is indicated by the negative velocities. Also, displacement time-series implies the regional stability of the study area. Therefore, PSInSAR technique is a new tool to monitor the subsidence and displacement of meteorite impact crater and can used as a cost-effective method for long-term monitoring of regional stability.

Acknowledgments: https://search.asf.alaska.edu/

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