Barren Island volcano: a multi-source analysis of two decades of volcanic activity

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Barren Island volcano is the only active stratovolcano within Indian territory. Following the 2004 Indian Ocean earthquake, which had a magnitude of 9.3 M_w, the volcano gained global attention due to its sudden unrest and violent behaviour. It has been intermittently active since then, between 2005 and 2022. Due to the remote location and inaccessibility of the volcano, Earth Observation technology is the only feasible approach for regular monitoring. The present study utilizes satellite images and their derived products, such as volcanic radiative power, fire information for resource management system, and SO_2 data, to understand various volcanic features and assess the volcanic characteristics and patterns during the active phases over the last two decades. The results demonstrated the effectiveness of the multi-source satellite datasets in monitoring India's lone active volcano.

Keywords: Andaman Sea, Barren Island volcano, FIRMS, SO_2, satellite observations, volcanic radiative power.

in-depth examination of associated environmental impacts[6,7]. A key advantage of remote sensing lies in its capacity to offer a broad area perspective of large and complex volcanic systems, providing valuable information for monitoring purposes.

Various satellite-based remote sensing technologies, such as the advanced spaceborne thermal emission and reflectance radiometer (ASTER) and Landsat series datasets, have been instrumental in estimating silicic lava vesicularity, volcanic mapping, and monitoring activities[8–11]. Additionally, synthetic aperture radar (SAR)[12] and thermal infrared (TIR) imaging[2,13–15] have proven effective tools in detecting changes in the shape, size and temperature of volcanoes. These technologies not only provide valuable insights into the dynamics of magma chambers but also serve as reliable tools for monitoring gas emissions from volcanoes[16]. Therefore, to effectively identify and predict forthcoming eruptions while improving long-term forecasting accuracy, ongoing monitoring and a compreher