

SEG 2024 Conference: Sustainable Mineral Exploration and Development

Using InSAR to Detect Soil Expansion: A New Way to Explore for Kimberlites

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Kimberlites are the most important sources of diamonds in the world; however, they may easily be buried, weathered or simply inaccessible, and accordingly hard to explore for. This creates the need for innovative exploration methods that can at least be used to narrow down the probable hidden occurrences of kimberlites. Hamilton and Webb noticed a seasonal variation in the surface elevation over a known kimberlite pipe. They related the elevation increase to an increase in the moisture being stored in weathered kimberlite clays during the rainy seasons; and the elevation decrease to the clays drying out during the dry seasons.

InSAR techniques can be used to detect these variations during green-field exploration. The technique involves the transmission of electromagnetic waves onto the earth's surface by an orbiting satellite. These waves are reflected to the satellite and the distance they travel is calculated as wavelength phases that are a function of the two-way travel time of the wave back to the satellite. If applied correctly in this project, InSAR should highlight areas of seasonal surface deformation resembling that in Hamilton and Webb's 2003 paper. These areas can then be studied further to determine their quality and feasibility status. This will lead to significant and frequent future discoveries of diamonds, often in inaccessible areas and at limited cost, using available data and resources.