Advanced Monitoring of Mining Assets with Satellite InSAR

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ABSTRACT

Mining assets such as tailings storage facilities and waste piles have recently been under increasing scrutiny and subject to a global effort by the mining community to establish more rigorous standards. In order to have a more comprehensive understanding of the structural integrity of these structures, mine operators are incorporating satellite InSAR as part of their risk management and surface deformation monitoring programs. Without the need for any on-site equipment, InSAR can provide systematic coverage over an entire site every few days, depending on the revisit frequency of the satellite. With new and improved satellites being established in orbit, InSAR technology is becoming increasingly effective and reliable as a monitoring tool with the flexibility to adapt to different mine-life phases of operation as well as changing risk levels. The increasing number of SAR satellites in orbit is expected to reduce the revisit time to daily acquisitions. InSAR has been proven to provide millimetric precision of surface deformation, and new developments in processing algorithms are exploiting the data further with acceleration profiles, trend variation detection, surface change detection, and tailings water position detection. InSAR is not only apt at detecting early warnings of changing surface behavior over an entire mine site but captures the actual extent on the unstable area. This vantage point allows for effective decision making and deployment of other monitoring instrumentation for an optimal use of available resources in support of risk management. As a digital product, InSAR monitoring products can be distributed or accessed securely such that site engineers, managers, headquarters, and consultants may collaborate on multiple company assets. This paper looks at the new and improved methods of using InSAR as a technology for monitoring mining assets with case studies relevant to tailings storage facilities and waste piles.