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Study and Monitoring of Virunga Volcanoes using Tandem-X interferometry

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The Tandem-X mission offers new perspectives and allows new development in remote sensing methods such as high-resolution SAR interferometry (InSAR) related techniques or split band interferometry (SBI). Thanks to the processing and analysis of a set of Tandem-X data (bistatic mode), we pursue our effort for monitoring and studying the Virunga Volcanic Province (VVP) located in Central Africa. VVP hosts two active volcanoes, Nyiragongo and Nyamulagira, which are both situated in the Democratic Republic of Congo (DRC). Last eruption of Nyiragongo occurred in 2002, but the volcano remains very active, with a permanent lava lake at the summit (the largest in the world). Nyamulagira erupts more frequently (every 1-4 years) generally producing monogenic vents with emplacement of major lava flows. The most recent volcanic activity occurred from November 2011 to April 2012. Using Tandem-X data set, we aimed at two main objectives: 1) From InSAR processing, we produce high resolution DEMs of VVP, which allows detailed geomorphological studies and assist realistic lava flow simulations. The obtained DEMs time series also provides essential information about the characteristics of the last eruption, such as the thickness of the emplaced lava flows. In addition, high resolution Tandem-X data are used for computing differential interferograms and contribute to the monitoring of the volcano-tectonic ground deformation in the study area. 2) The SBI technique (under development at CSL) will allow monitoring the Nyiragongo lava lake level and measuring its rapid level rise. This lava lake monitoring is a key point in term of risk assessment. In the past, the city of Goma, situated few km south of Nyiragongo, was partially destroyed in 1997 and 2002 when the lava lake was drained during catastrophic but very short living eruptions. Because the difficult political context affecting the VVP often prevents the installation of permanent ground-based instruments, remote sensing offers a major contribution to the study of the Virunga volcanoes. These preliminary results show that Tandem-x mission has a great potential for contributing to that task and to mitigate hazard.