

HIGH-RESOLUTION INTERFEROMETRIC MONITORING OF PITON DE LA FOURNAISE WITH TERRASAR-X DATA

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Abstract

We present preliminary results of a TerraSAR-X interferometric survey of Piton de la Fournaise volcano (Reunion Island, Indian Ocean) for the period between September 2009 and October 2010. The TerraSAR-X data used for this survey were provided to us in the framework of the CNES Kalideos programme.

In a first part of our study, we analyze in detail the benefits of using jointly X-band data with a recent Lidar DEM, in term of interferometric coherence. These benefits are compared with those of C-band data, provided by a set of 340 Envisat-ASAR interferograms previously produced on Piton de la Fournaise. As a result, we demonstrate that X-band coherence is significantly better in areas without vegetation than that of C-band and that it declines quickly as expected in areas covered with vegetation. Moreover, we show that TerraSAR-X coherence can be used to map, with a good accuracy, lava flows emplaced during the time spanned by the interferogram. Our study also reveals the importance of using an up-to-date high-resolution DEM in the interferometric processing, in order to take full advantage of the TerraSAR-X data capabilities.

In a second part of the study, we show how TerraSAR-X interferograms provide new insight on displacements associated with an intrusion which happened on 18-19 October 2009 and with four eruptions which happened on 5-6 November 2009, 14 December 2009, 2-12 January 2010 and 14-31 October 2010.

Keywords: Piton de la Fournaise, Indian Ocean, Volcanology, Geodesy, Radar interferometry, InSAR, TerraSAR-X