Magma Sources Involved in the 2002 Nyiragongo Eruption, As Inferred from an InSAR Analysis

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1. TECTONIC SETTING

2. MODELING OF INSAR DATA

a) East (km)

b) North (km)

3. ERUPTION INDUCED BY DRAINAGE

4. CONCLUSIONS

- The best fit model describing the 2002 co-eruptive deformation, comprised of two sub-vertical dikes injection. The first shallow dike, 2 km long on average, is associated with the 20 km-long effusive fissure. The modeled main surface opening is 3 km, which corresponds to the horizontal strike of this dike. The second dike is 3 km long, and it is consistent with a deep magma source outside of the southernmost effusive fissure. In addition, at about 5 km from the lake, it could have represented a considerable portion of magma that had reached the lake (via 75 km) and contains high concentrations of evolved carbon dioxide and carbonates.

- On 8 April 2002, the previous issue may be explained by the existence of a crustal fissure that had opened to a depth of at least 6 km. The absence of seismicity is the key to magma will first supply to a deep reservoir within the crust for the stress transfer. After the first dike injection, we find that the effusive fissure might have triggered the failure of a shallow crack and activated magma column beneath Nyiragongo lava. Inducing the injection of fissures from the lake, magma column and shallow reservoir into the volcano. Our analysis indicates that the deep dike is an additional 2 km-long opening on the southernmost effusive fissure, suggesting that magma from the deep dike was transported to the southern part of the effusive fissures. The fluid is further inflating the lower part of the volcano. The exception of the October 2002, the lake expands, and this fault movement may not be detectable on the interferograms, which could explain why they are occurring in the area of crater or deflection below Lake Kivu.

- Low overpressure are determined for both dikes, corresponding to crustal cracks which are closing to be filled with magma, and the horizontal direction of stress as the sub-vertical dikes. Indicate that the direction of movement is controlled by the rift extension. Because stresses are mainly due to the loss of strength inferred from the interferograms, it is probable responsible for the rift extension. The deposition of numerous zones indicates that the direction is a preferred direction. The opening of the rift flank is on the side of the lake, indicating that the rift flank is on the side of the lake. This effect could have been the result of the effervescent dikes injection. If the rift flank is a shear zone, it should be magma driven (see a construction paper from Cayol et al. for further data).