

# MUZUBI

## Project presentation

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# MUZUBI: Project summary

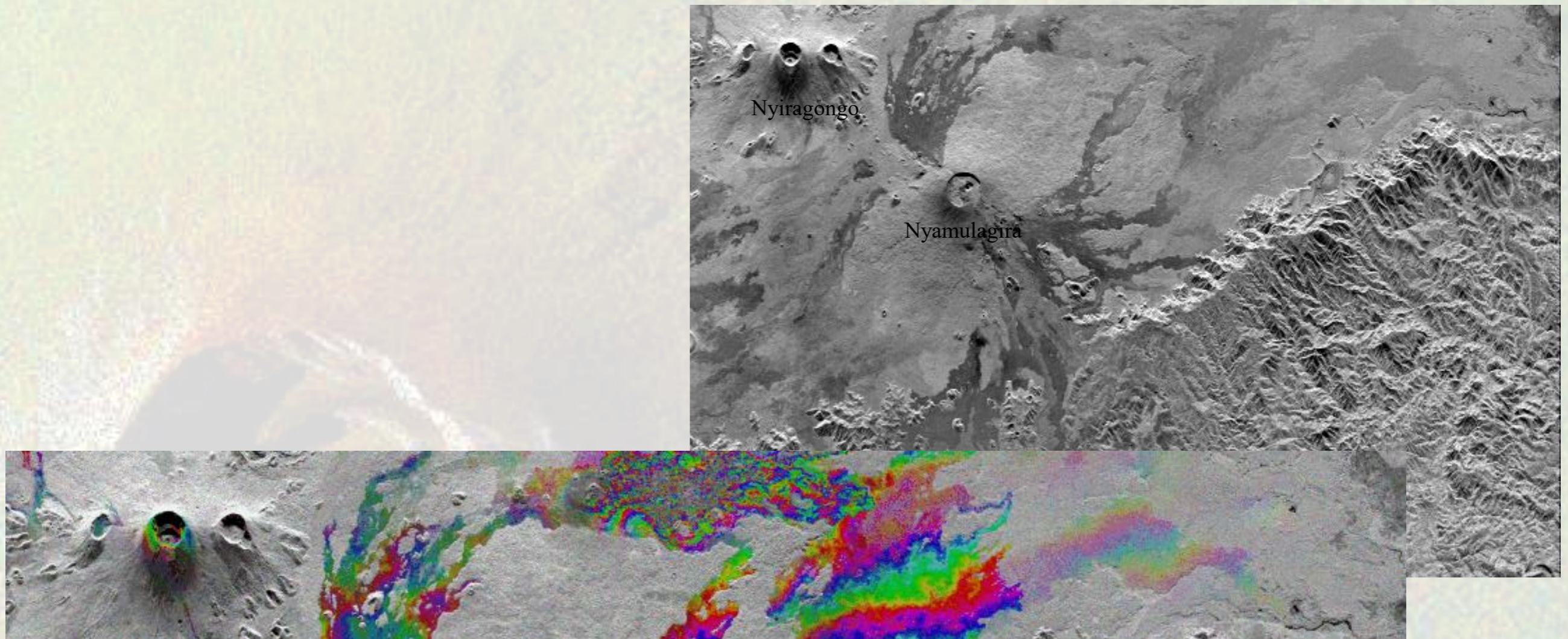
- **M**ulti-**Z**one phase **U**nwrapping using advanced Split **B**and Interferometry
  - ✓ MUZUBI is a Spin-Off project of the Vi-X project.
  - ✓ MUZUBI is a technical and application oriented project:
    - Technical/methodological core:
      - *Absolute* phase unwrapping.
    - Application core:
      - Contribution to volcanological risk assessment and early warning.





# MUZUBI

- Main question from mother project
  - ✓ How to connect independent phase zones to get continuous measurements?

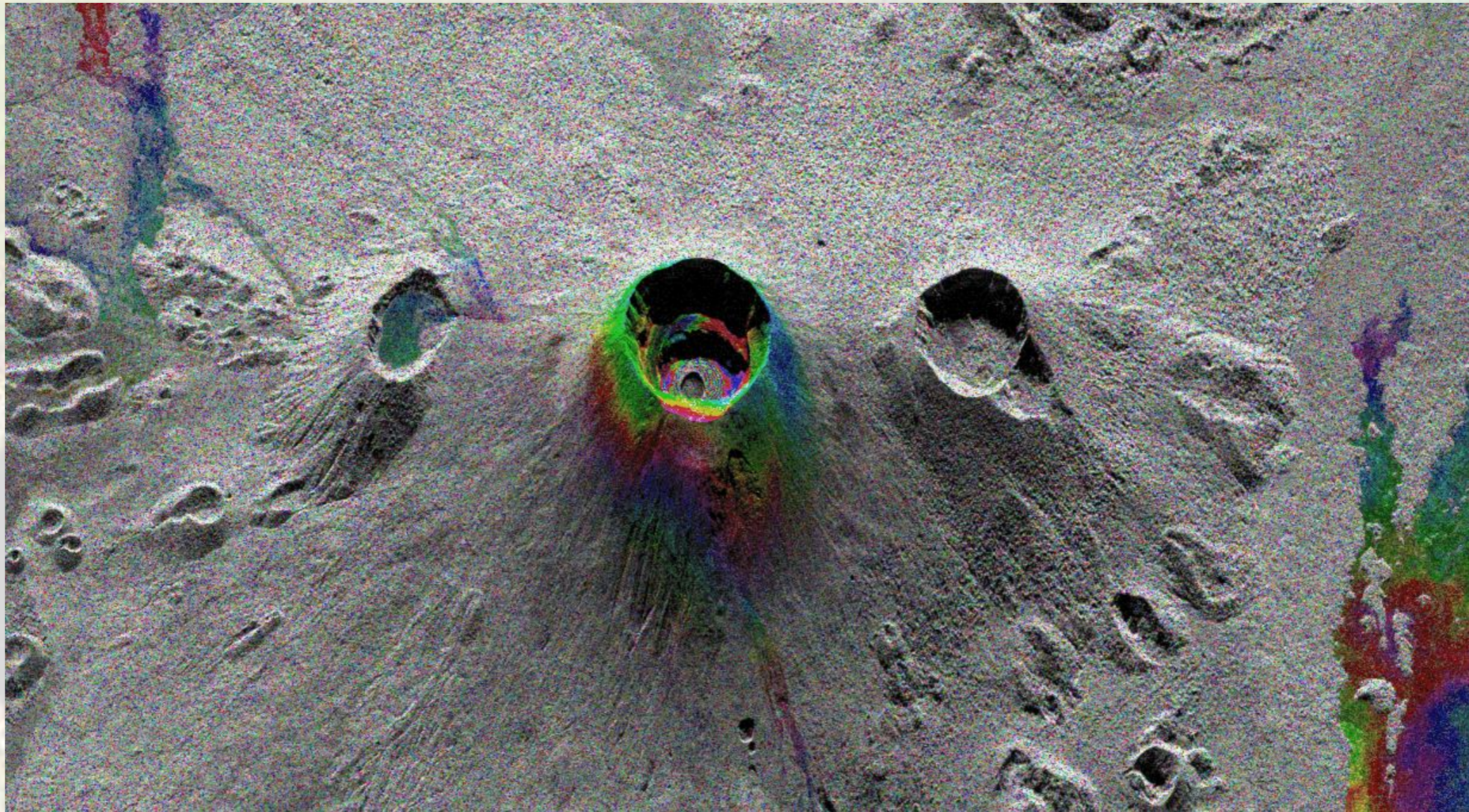


Differential interferogram of the Nyiragongo - Nyamulagira volcanoes area (June - July 2012)



# MUZUBI

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  - ✓ How to connect independent phase zones to get continuous measurements?

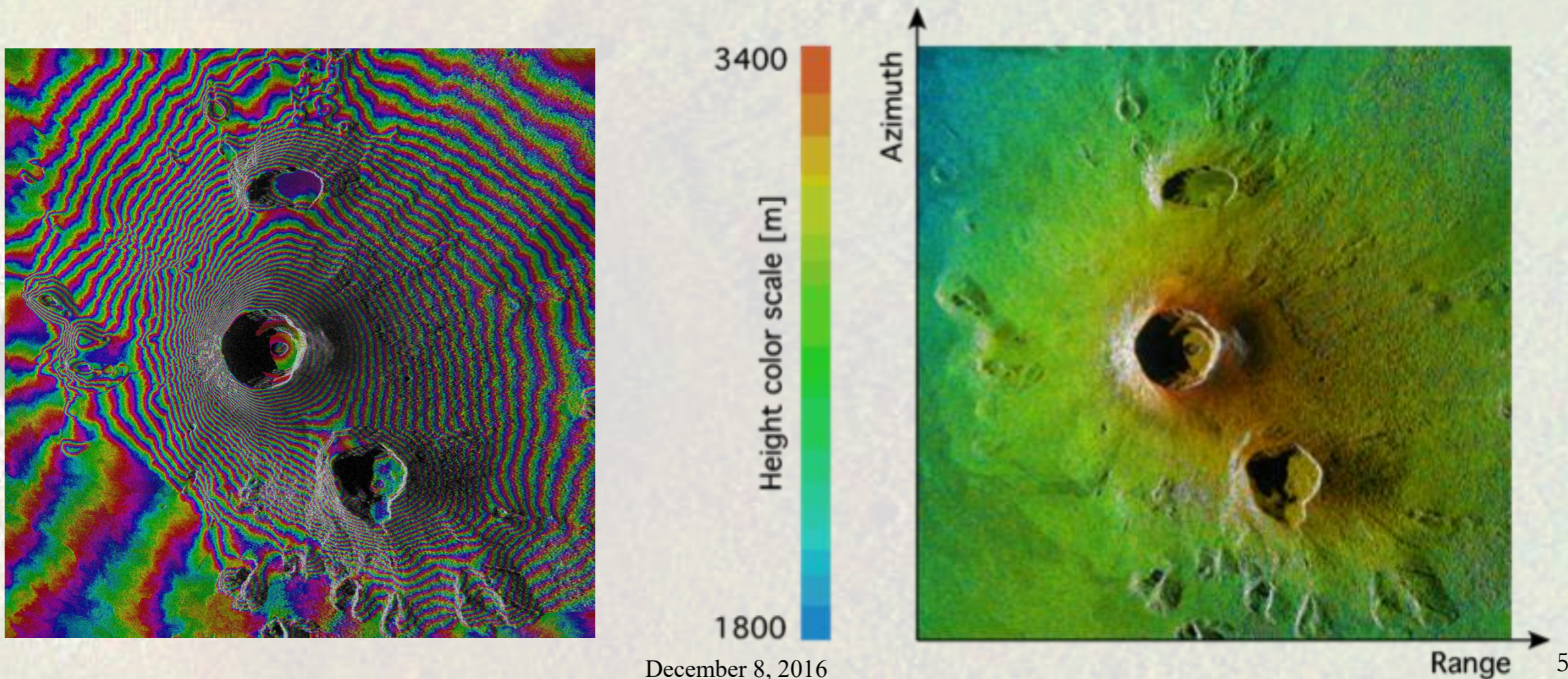


Differential interferogram of the Nyiragongo



# Mother project

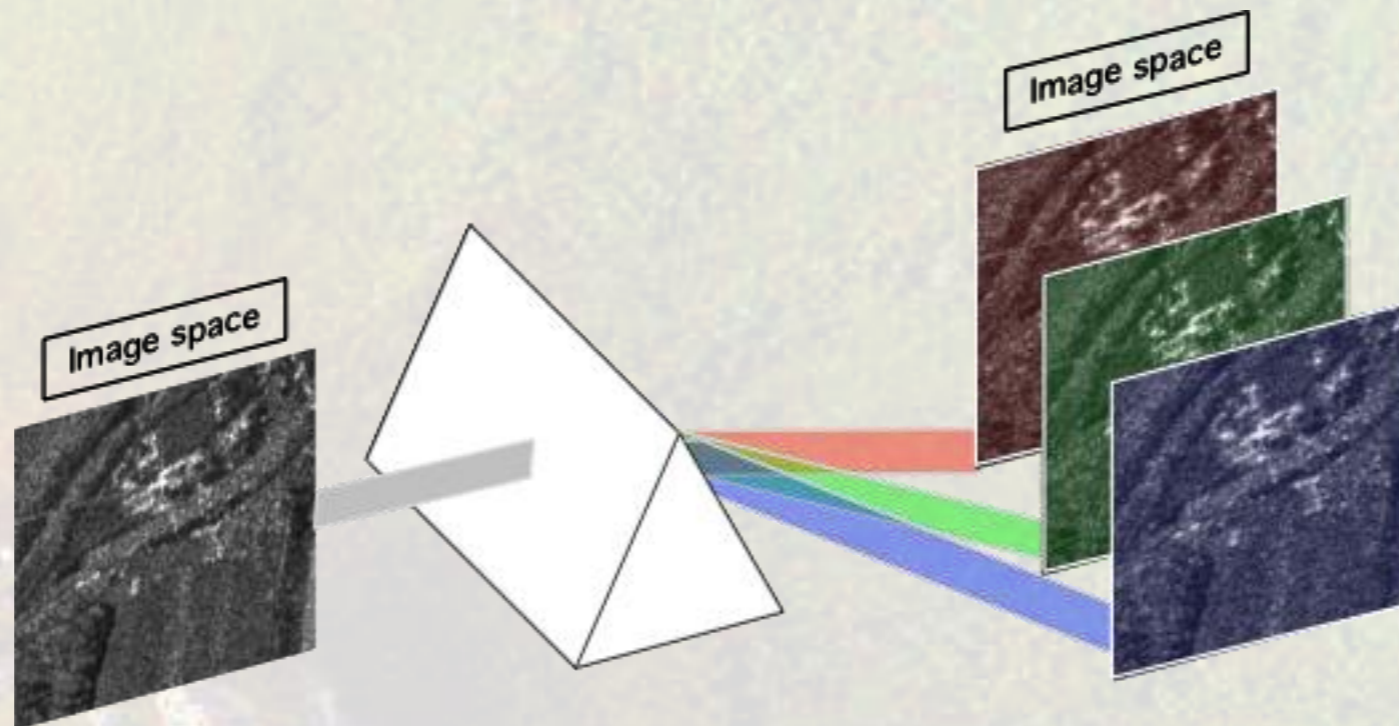
- Vi-X: Study and monitoring of **Virunga** volcanoes using TanDEM-X - BelSPo contract N° SR/00/150 (2012 - 2014):
  - ✓ Allowed demonstrating potentiality of the Split Band Interferometry (SBIInSAR) for absolute phase unwrapping
    - Revealing limitations (available bandwidth with respect to coherence).





# Methodological core: Split-Band SAR

- The process is similar to light decomposition into spectral bands by a prism. Split-band process of SAR images is also known as Multi-Chromatic Analysis (MCA):



- ✓ Each sub-image or sub-view so generated is centered on its own central frequency (or wavelength) and has a lower range resolution. Range resolution loss is equal to sub-band bandwidth to full bandwidth ratio.



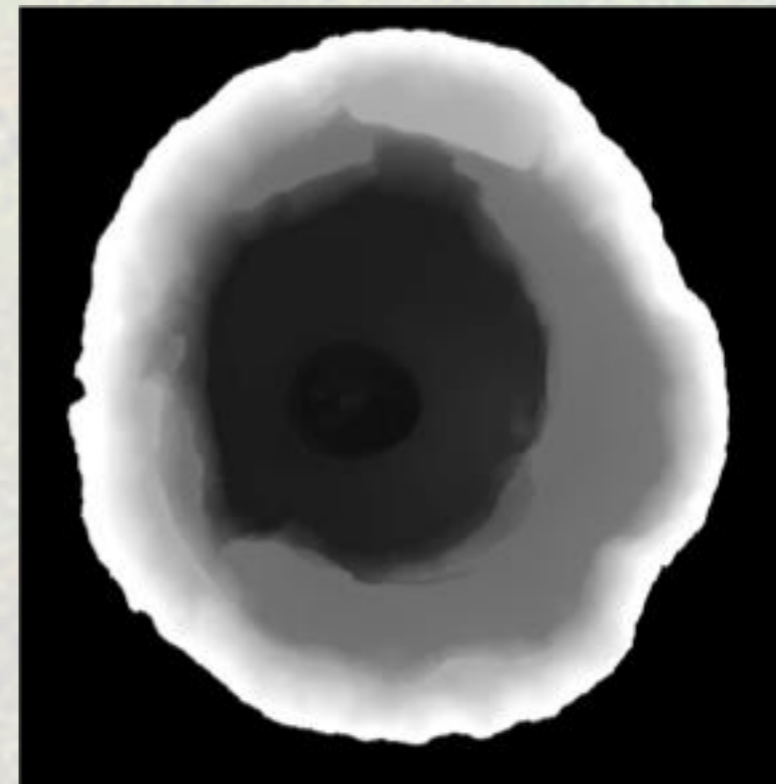
# First results

- Data set:
  - ✓ Data set obtained through the DLR TanDEM-X Science Phase AO
    - Wide band data sets (100 - 150 - 300MHz) in Pursuite and Spotlight mode.
    - Covering the Nyiragongo and the Nyamulagira volcanoes
      - High resolution data set (300MHz) still not delivered due to clearance procedure
    - Covering the Copahue volcano



# First results

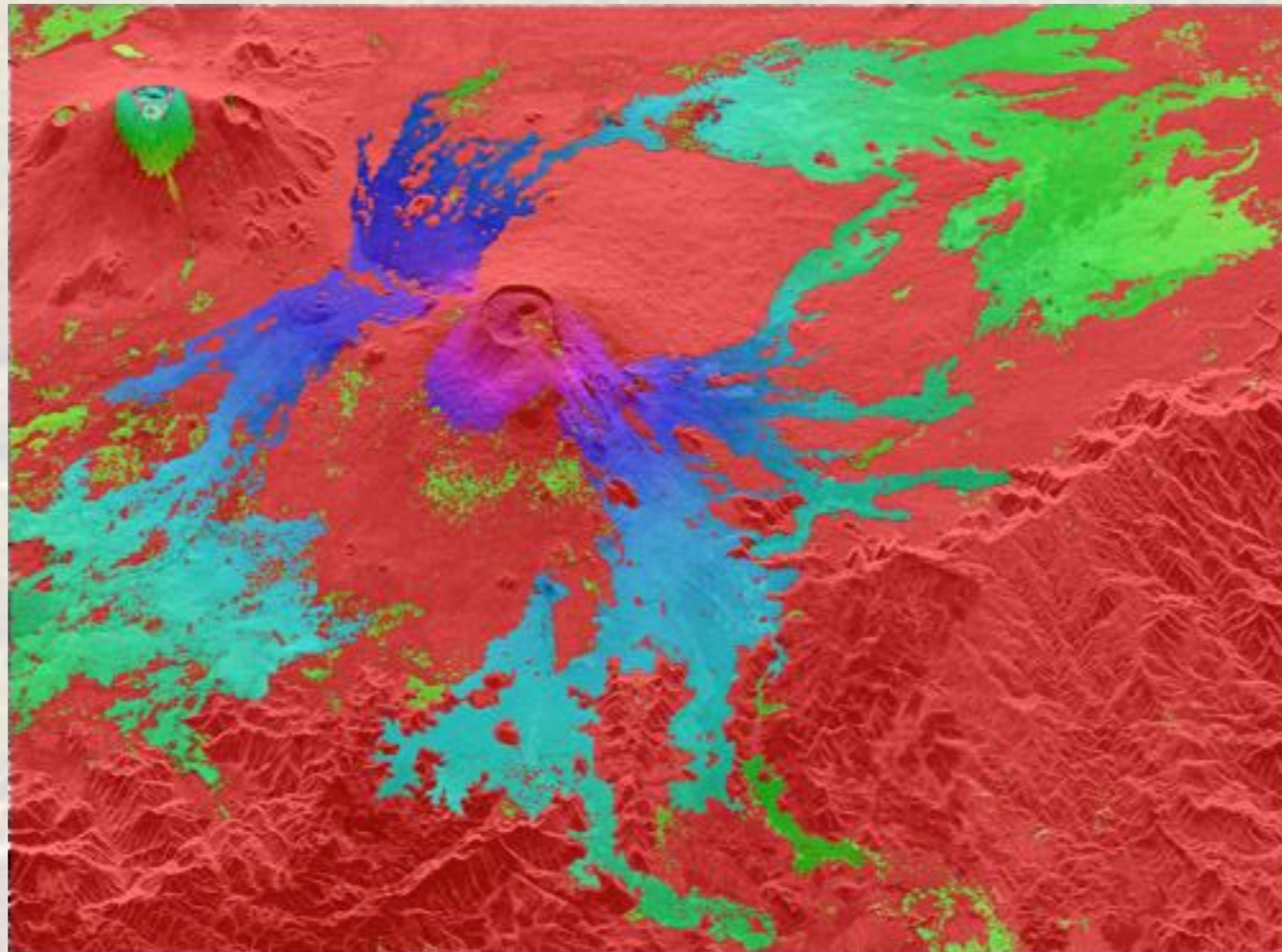
- Realisation of a full 3D model of the Nyiragongo crater to serve as reference (RMCA)





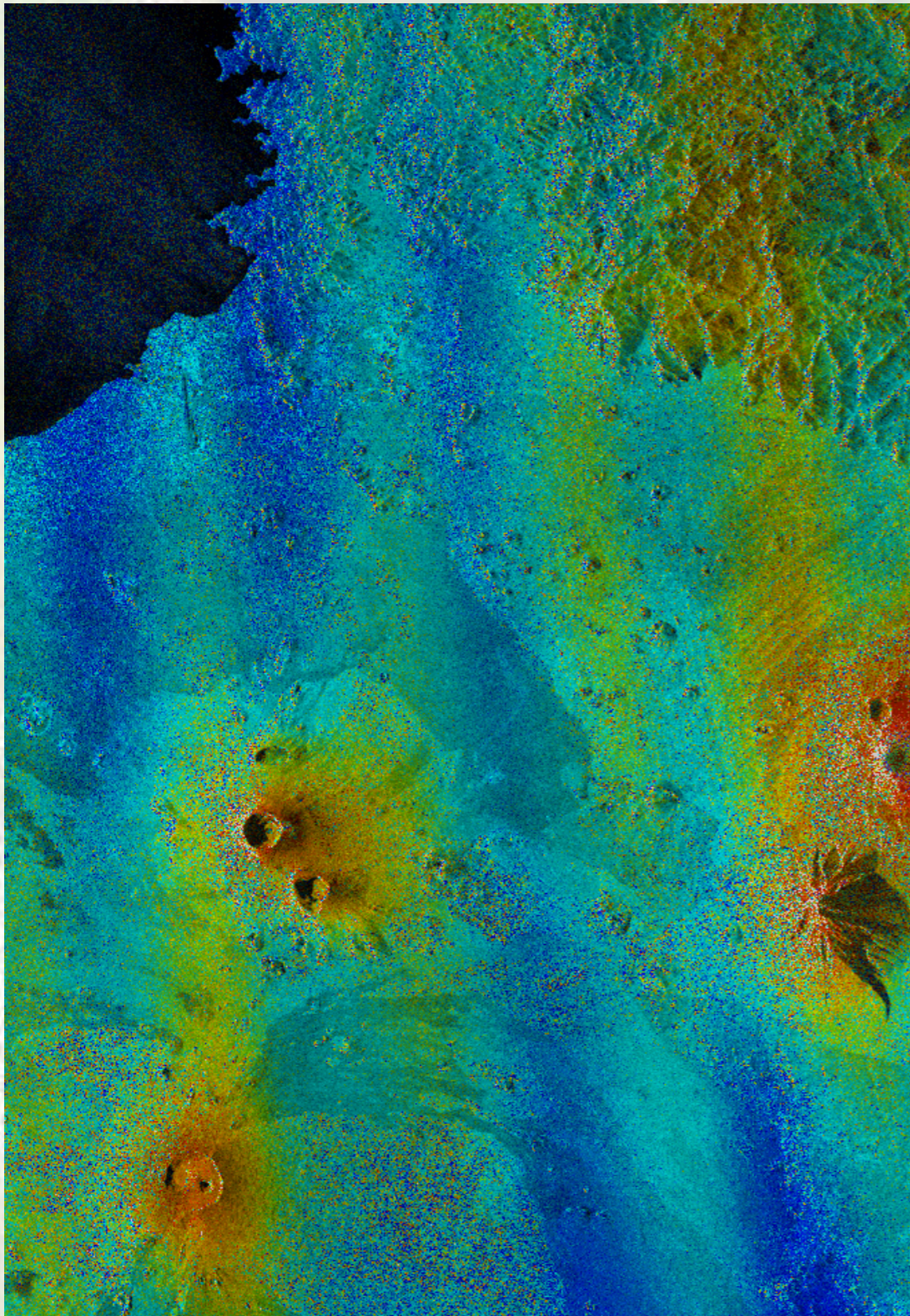
# First results

- The proposed method is shown to work as expected when using independent images (fully controlled processing)
  - ✓ Possibility to re-connect independently unwrapped zones
  - ✓ Best results with largest bandwidth

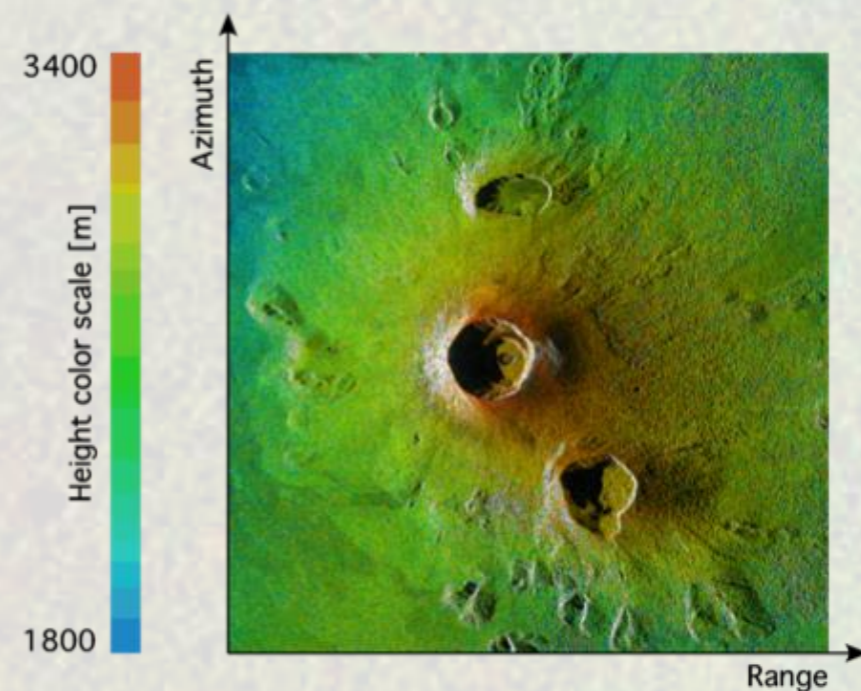




# First results



- Problems encountered :
  - ➔ Proposed method must be adapted when using TanDEM data set
  - ✓ Image pairs provided already co-registered show a range modulation within the derived results





# Conclusions

- MUZUBI aims at getting one step further, developing an **integrated absolute phase unwrapping** method based on SBInSAR technique.
- Proposed method must be corrected/adapted for already co-registered images (TanDEM data set)
  - ✓ Up to now, not applicable to topographic measurements
- Proposed method appears to work for fully-controlled processing using largest bandwidth signal
  - ✓ Method suitable for differential measurements