



A multi-sensor approach for volcanic Ash, SO₂, Ice retrievals and eruption characterization



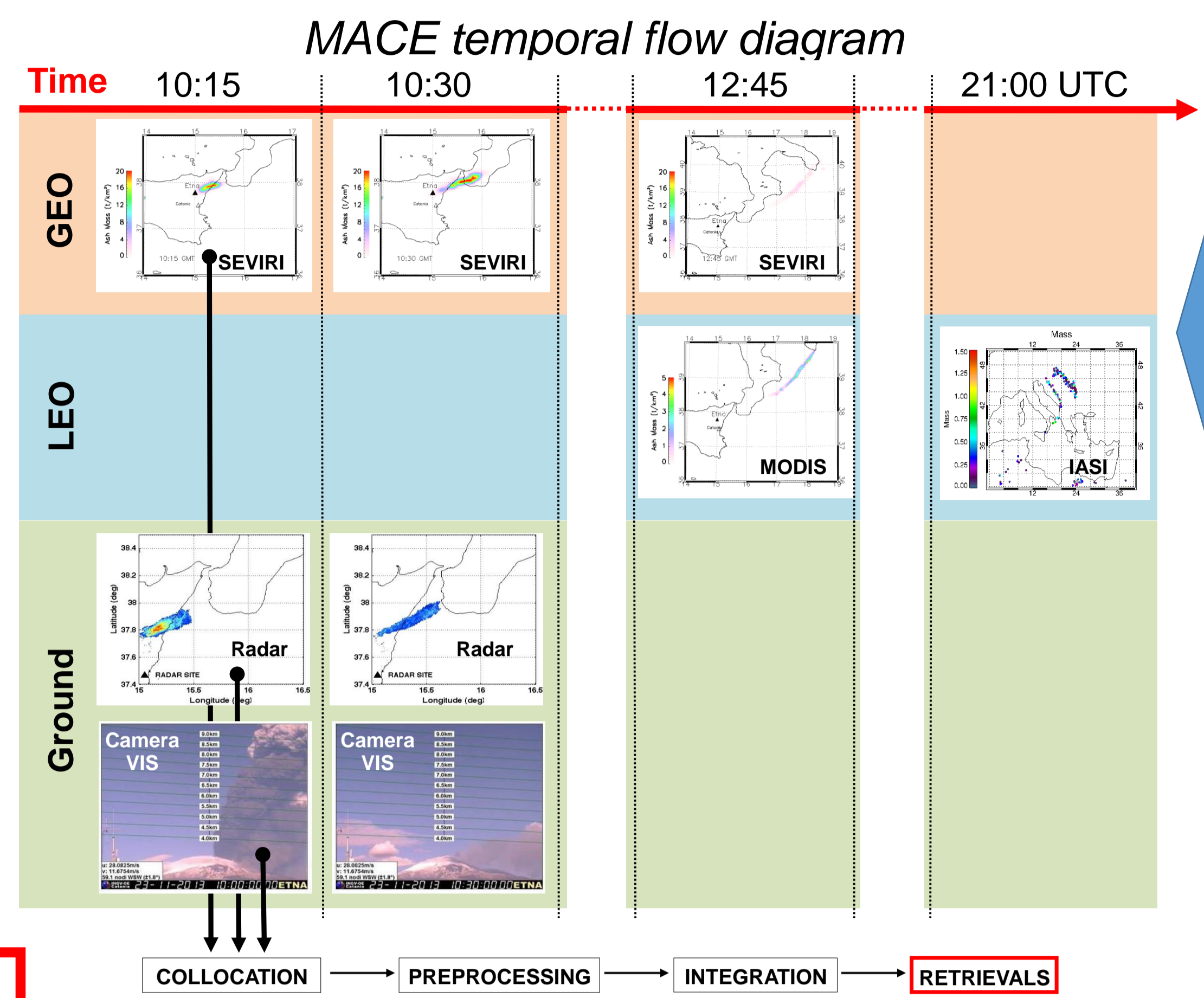
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S. Corradini⁽¹⁾, M. Montopoli^(2,3), L. Guerrieri⁽⁴⁾, Matteo Ricci⁽²⁾, Simona Scollo⁽¹⁾, Luca Merucci⁽¹⁾, Frank Silvio Marzano^(2,3), Sergio Pugnaghi⁽⁴⁾, Michele Prestifilippo⁽¹⁾, Lucy Ventress⁽⁵⁾, Roy G. Grainger⁽⁵⁾, Elisa Carboni⁽⁵⁾, Giuseppe Salerno⁽¹⁾, Gianfranco Vulpiani⁽⁶⁾, Mauro Coltelli⁽¹⁾

The Advanced PROcedures for volcanic and Seismic Monitoring EU-FP7 Project

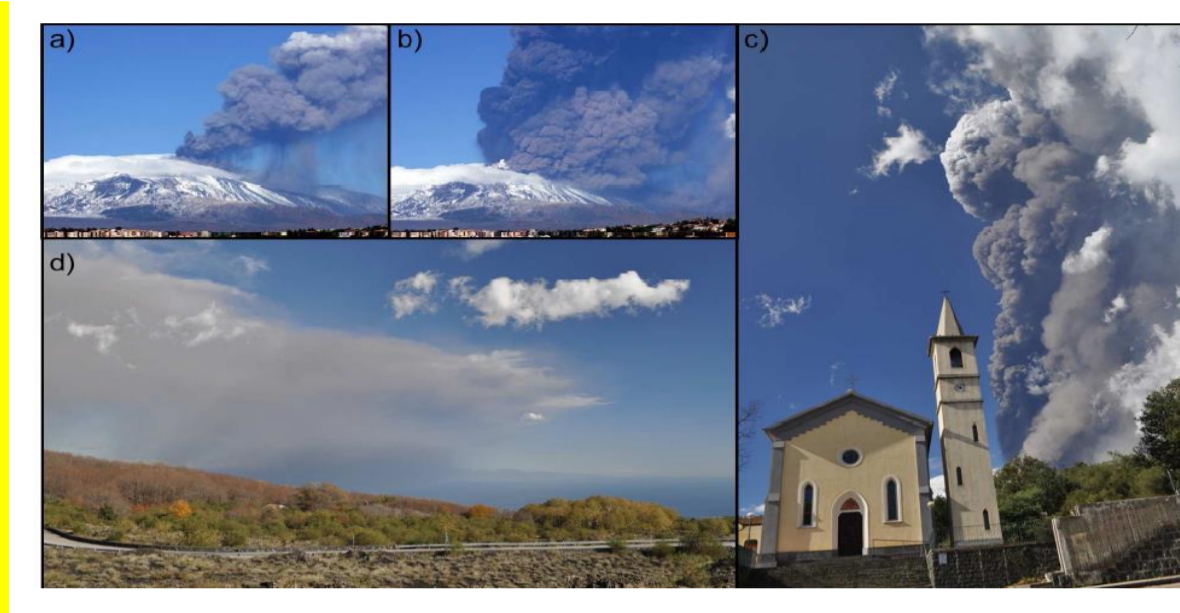
APhORISM project proposes the development and testing of two new methods to combine satellite and ground data. The aim is to demonstrate that these data, appropriately managed and integrated, can provide new improved products useful for the seismic and volcanic crisis management.

The **MACE (Multi-platform volcanic Ash Cloud Estimation)** procedure will exploit the complementarity between geostationary, polar satellite sensors and ground based measurements. The basic idea is to continuously improve both the MSG-SEVIRI ash retrievals and the source characterization by integrating all the LEO and ground-based information from VIS to MW in clear and cloudy sky conditions.



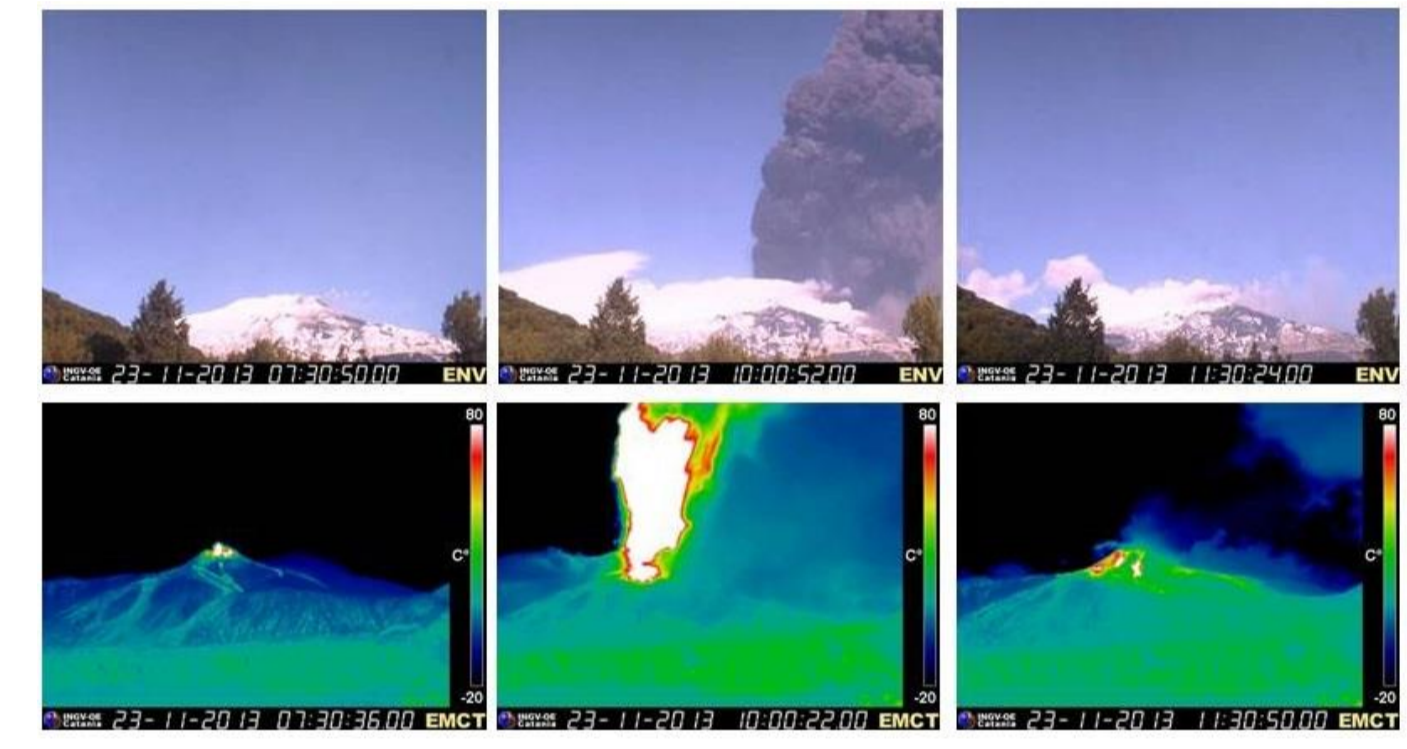
Test case: The 23 November 2013 Etna eruption

This episode has been detected from the **GEO-SEVIRI, LEO-MODIS, LEO-IASI, ground based RADAR X and VIS camera**

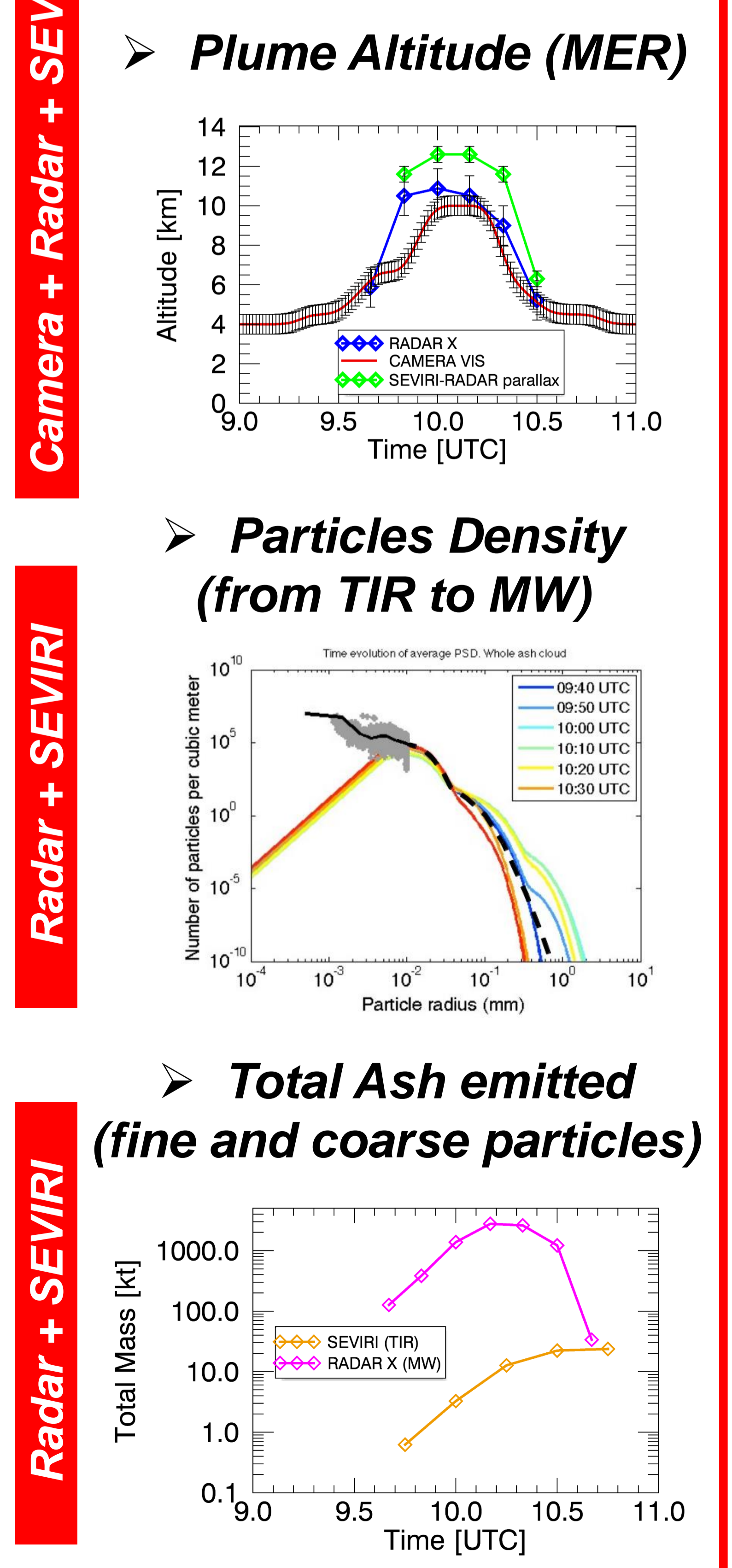


On the morning of 23 November, the New SE Crater has created a new and intense episode of lava fountain, producing the 17th paroxysm of 2013.

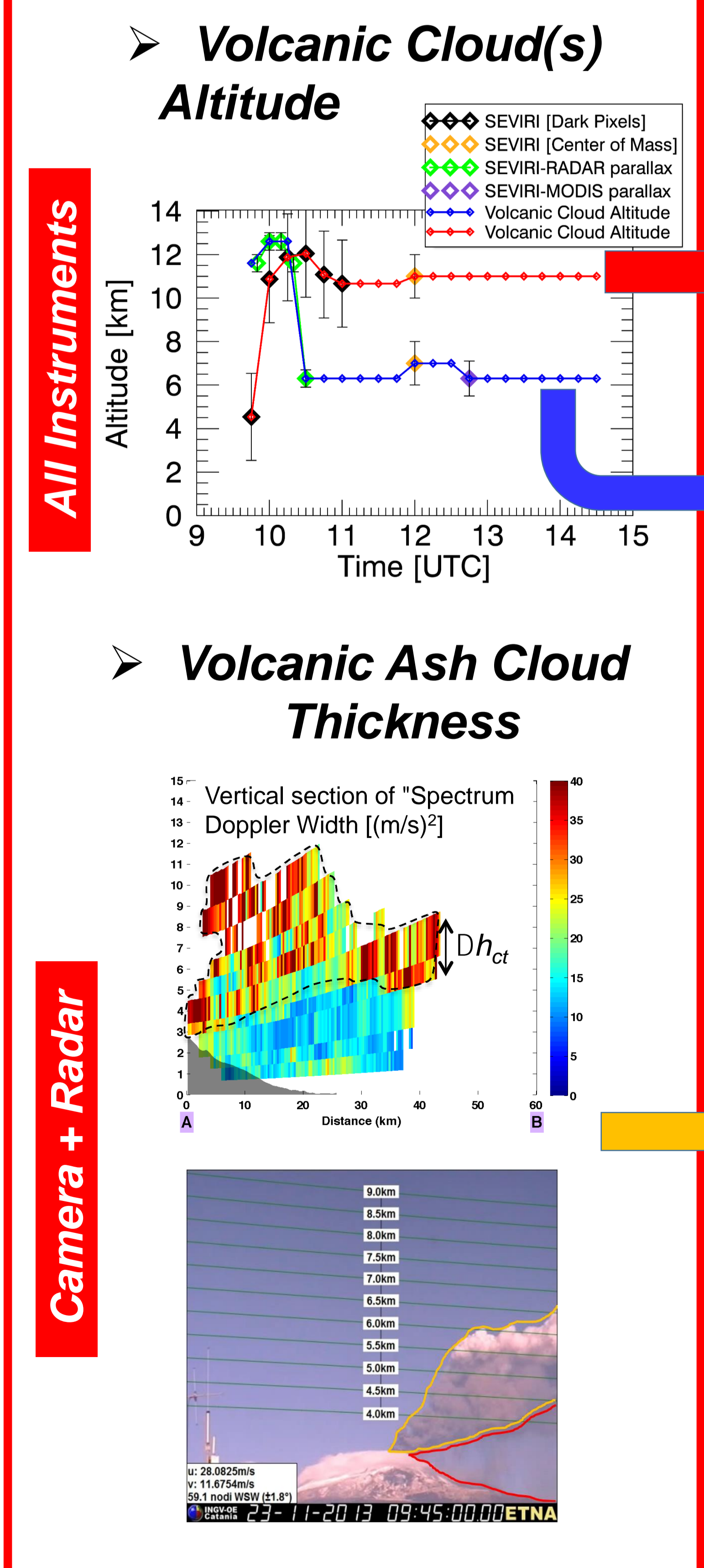
Just before 7 GMT explosions began to intensify. The strombolian activity increased quickly enough to evolve, already from 09:30 GMT, in activities of lava fountains. The paroxysmal episode ended at 10:20 GMT. Above the volcano, the eruption formed a dense and extensive eruption column direct between NE and ENE.



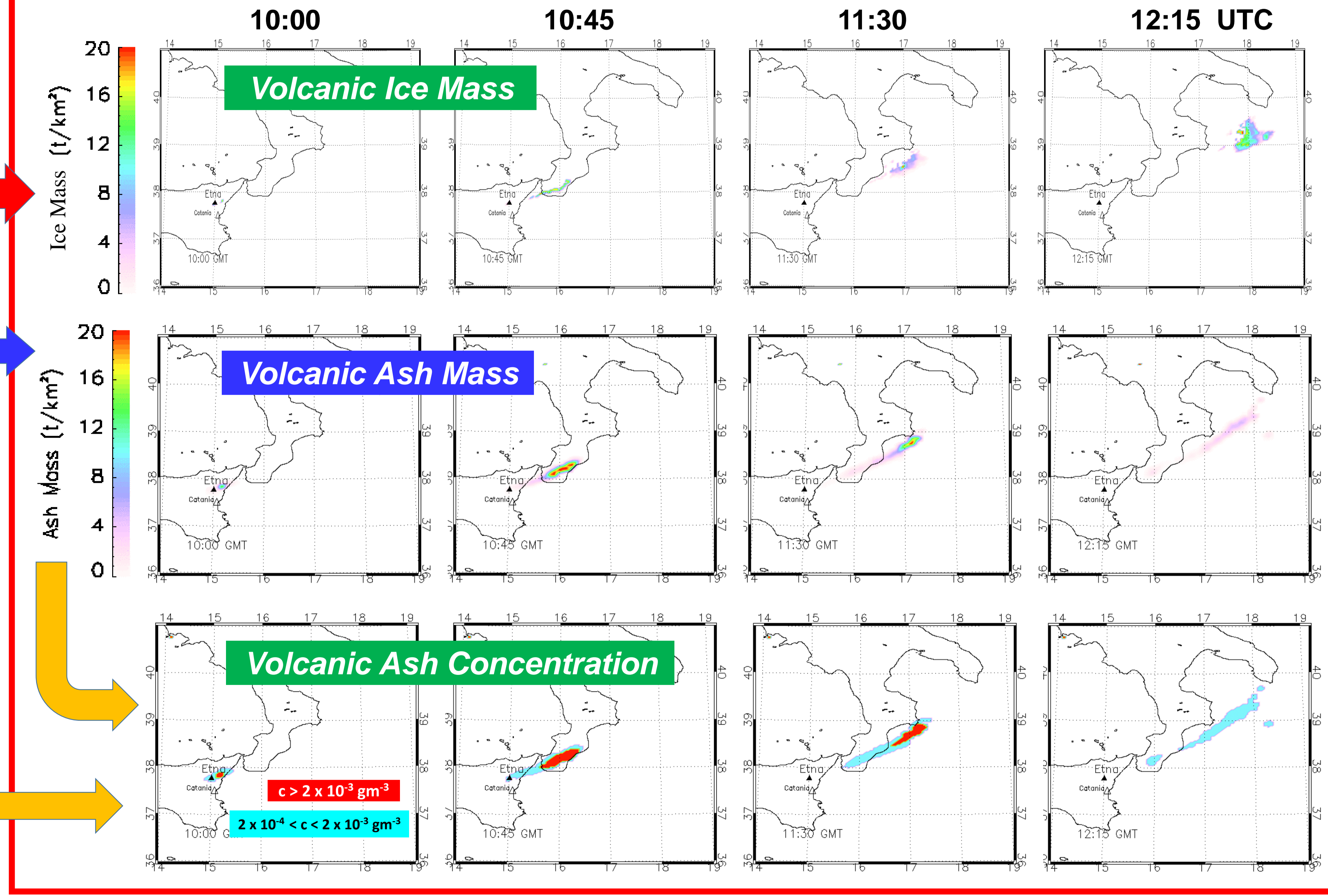
Source Characterization Products



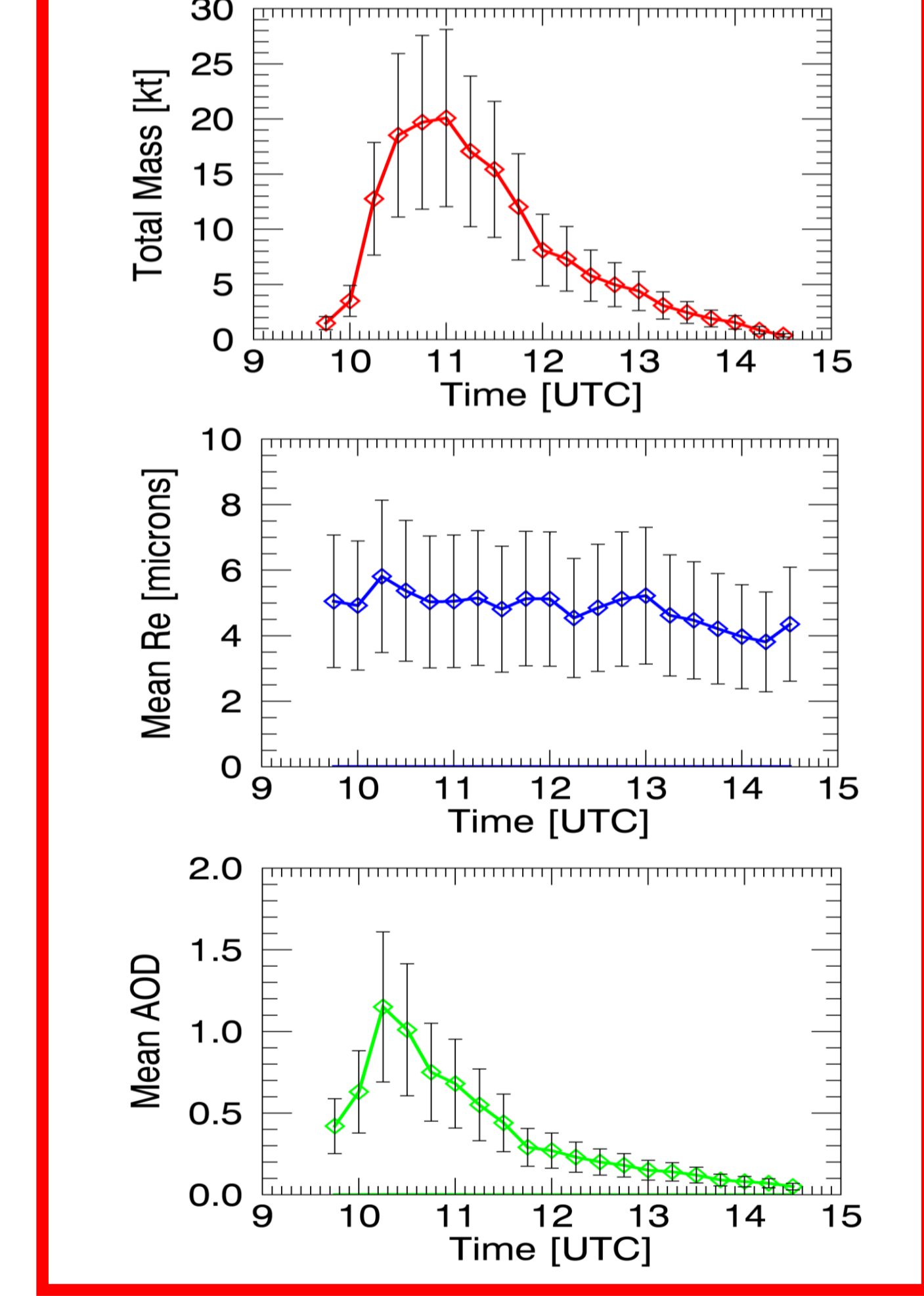
Cloud Geometry Products



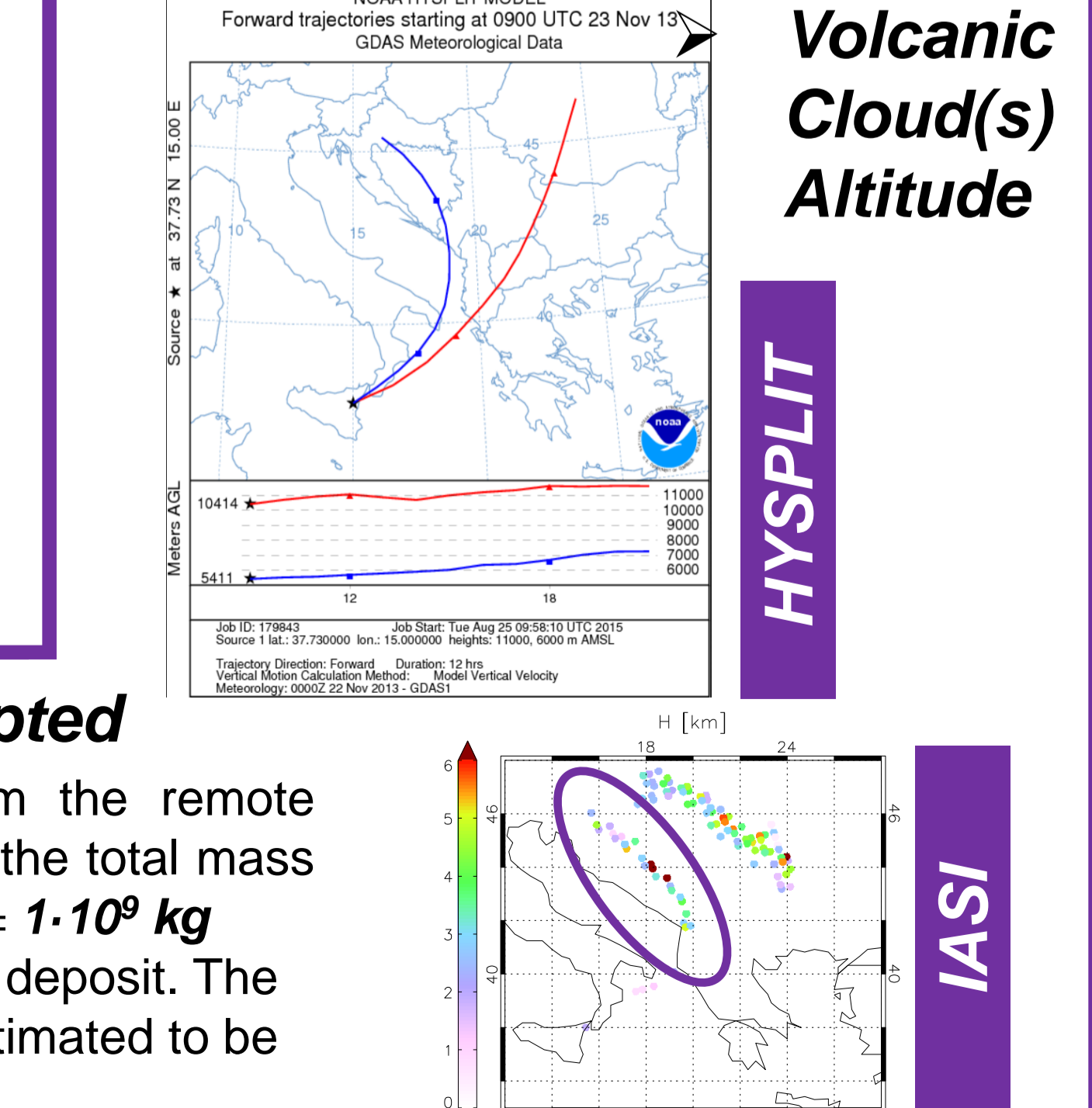
New and Improved SEVIRI Products



Ash Time Series



Validation



- Notes:**
- ✓ The SEVIRI volcanic ash/SO₂/ice retrievals derive from the VPR procedure [Pugnaghi et al., 2013, 2015; Guerrieri et al., 2015].
 - ✓ The volcanic ice detection is realized using the BTD technique.
 - ✓ The Radar X, IASI and VIS camera ash retrievals derive from Montopoli et al., 2014, Ventress et al., 2015 and Scollo et al., 2014.
 - ✓ Details of the work presented here can be found in Corradini et al., 2015.

Total Volcanic Ash Mass erupted
The ash total mass retrieved from the remote sensing instruments (approximately the total mass retrieved by the ground Radar) is $3 \pm 1 \cdot 10^9$ kg. Andronico et al. analysed the tephra deposit. The total mass felt on the ground was estimated to be about $1.3 \pm 1.1 \cdot 10^9$ kg.