# Investigation of the Mt Etna eruption in December 2015 using IASI observations and numerical modelling

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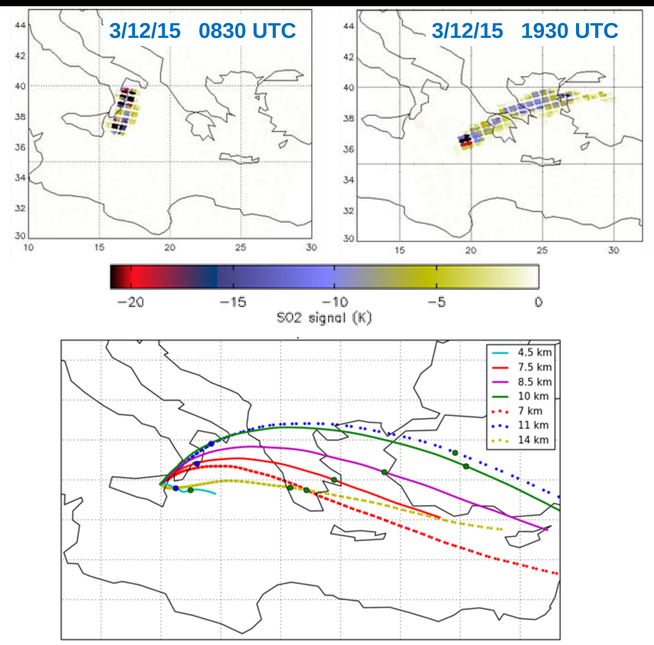
## Detection

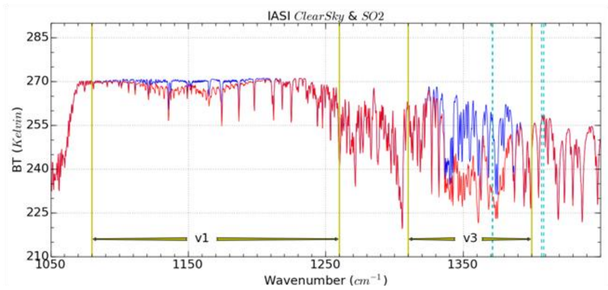
$SO_2$ plume identification (horizontal extent):

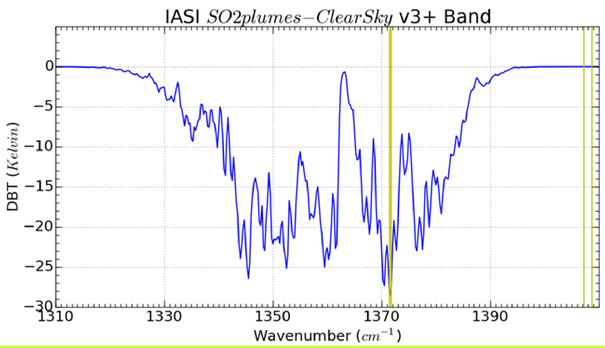
- BT differences (DBT) at selected IASI channels, inside and outside the ν3 $SO_2$ absorption band
- Clarisse et al., 2008 channel selection (light blue dashed vertical lines in top figure below)
- Pixels with negative DBT = $SO_2$ plume

$SO_2$ plume concentrations: ~ 70 Dobson Units

- Line by line calculations using HT-FRTC model
- For DBT = -26K (T+16) and plume height 7-14 km

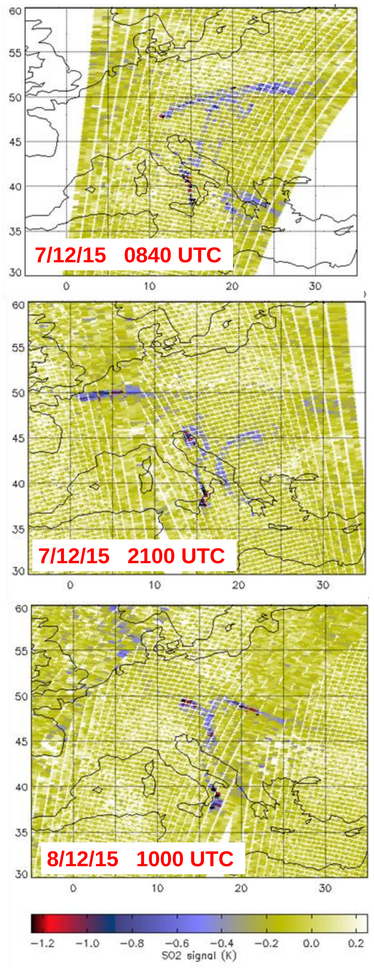


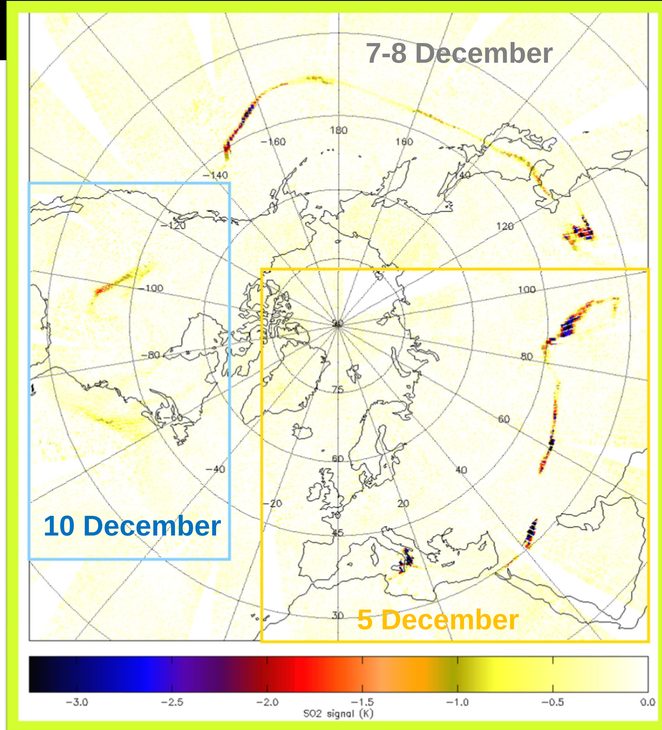




## Plume Height

- Using Lagrangian model NAME and winds from the Unified model (Met Office models)
- Particles released over Mt Etna (at eruption time) are followed forward in time by 3D flow trajectories
- The positions of the trajectories are matched (in the horizontal) with pixels identified as $SO_2$ plume, at times there are IASI observations
- In the figures above, blue circles match plume at 0830UTC (T+6), green circles at 1930UTC (T+16)
- The plume height is obtained from the vertical position of the trajectories at the matching points
- $SO_2$ plume estimated between 7 and14 km




Composite of the $SO_2$ plume from the Mt Etna eruption

## The volcano & the eruption

Mt Etna in Sicily, Italy: 37.734º N, 15.004º E

- **3 December 2015, 0230 – 0310 UTC**
  The plume shown above, traveling around the world, is from this eruption
- 4 - 7 December 2015, at various times.
  The plume over Europe from these, is shown on the left (blue and dark colours)

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Plume animation available from:
https://www.researchgate.net/profile/Maria_Athanassiadou

**Maria Athanassiadou** (2016): The Mt Etna $SO_2$ eruption in December 2015 – The view from space, *Weather*