The purpose is to replicate the Brightness Temperature Difference (BTD) algorithm (based on the radiative transfer model) for the Ash detection and Ash mass retrieval with a Neural Networks (NNs) based technique.

The tracking of volcanic clouds is a key task for air traffic safety, allowing to beware the dangerous effects of fine volcanic ash particles on aircrafts.

The BTD (Prata et al., 1989; Wen & Rose, 1994) requires many input parameters and it can be so time consuming that could prevent the utilization during the crisis phases. A trained NN can process new data in a very fast manner, this characteristic together with the high revisit time of the Moderate resolution Imager Spectroradiometer (MODIS) allows the development of Ash detection and Ash mass maps from the acquired satellite image in real time.

**SCENARIO AND DATA SET**

Mt. Etna [37.73°N, 15.00°E] is a massive stratovolcano (3330 m a.s.l.) located in the eastern part of Sicily (Italy). MODIS is a multi-spectral instrument that covers 36 spectral bands, from visible (VIS) to thermal infrared (TIR) with a global coverage in 1 to 2 days. The spatial resolution ranges from 250 m to 1000 m, depending on the acquisition mode.

The considered MODIS measurements are representative of different (high and medium) Mt. Etna volcanic ash emissions in different seasons (spring, autumn, winter).

**REFERENCES**

- Corradini et al., “Mt. Etna tropospheric ash retrieval and sensitivity analysis using Moderate Resolution Imaging Spectroradiometer (MODIS) TIR considered channels and their characteristics.” JARS, Vol. 2, 023550 ; DOI: 10.1117/1.3046674.
- Wen & Rose, 1994: Moderate resolution Imager Spectroradiometer (MODIS) allows the Ash total mass BTD results. JARS, Vol. 2, 023550 ; DOI: 10.1117/1.3046674.
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**EXPERIMENTAL RESULTS**

We investigated the possibility of applying the NNs to the problems of Ash detection and Ash mass estimations.

A minimum set of MODIS channels have been used.

The obtained results show that the NNs can replace the BTD procedure in the crisis phase management.

Future investigations will concern the study of information content of other MODIS channels to improve the discrimination of meteorological clouds, as well as the inversion of other parameters such as the ash optical thickness (AOT) and the ash effective radius ($r_e$).

**CONCLUSIONS**

- The considered MODIS measurements are representative of different (high and medium) Mt. Etna volcanic ash emissions in different seasons (spring, autumn, winter).
- The purpose is to replicate the BTD algorithm for Ash detection and Ash mass retrieval with a Neural Networks (NNs) based technique.
- The tracking of volcanic ash is a key task for air traffic safety, allowing to beware the dangerous effects of fine volcanic ash particles on aircrafts.
- The BTD (Prata et al., 1989; Wen & Rose, 1994) requires many input parameters and it can be so time consuming that could prevent the utilization during the crisis phases. A trained NN can process new data in a very fast manner, this characteristic together with the high revisit time of the Moderate resolution Imager Spectroradiometer (MODIS) allows the development of Ash detection and Ash mass maps from the acquired satellite image in real time.
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