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Volcanic ash and sulfuric gases are major hazards to aviation since they damage the aircraft engines also at large distance from the eruption and have a significant impact on aviation safety. Many challenges given by volcanic eruptions are still discussed and several issues are far from being solved. They affect the atmospheric structure locally as well as on a global scale, in case of massive eruptions. The cloud top altitude is an important quantity for the air traffic in order to know what altitudes are likely ash free. It also is a key parameter for understanding the contribution of volcanic eruptions to climate variability.
In this study we show the results of preliminary analyses of the stratospheric warming caused by the Nabro 2011 eruption and the cloud top estimation of the Eyjafjo ll 2010 eruption.
Nabro 2011 was a SO_2 and water vapor rich eruption and clearly warmed the stratosphere with mean amplitudes of about 4 K just after the eruption in the volcano region, indicating that the cloud reached the stratosphere. The high vertical resolution of Global Navigation Satellite System (GNSS) radio occultation (RO) allowed for the first time the detection of such an atmospheric impact with this technique.
Eyjafjo ll 2010 was a deeply studied eruption since it affected the whole of Europe and caused large economic losses. We have used MODIS satellite measurements and retrieved the volcanic cloud top altitudes with two different procedures exploiting the thermal infrared CO_2 absorption bands around 13.4 µm. The first approach is a modification of the standard CO_2 slicing method while the second is based on look up table computations. We have then selected all RO profiles co-located with the volcanic cloud detected by MODIS and implemented an algorithm based on the variation of the bending angle for detecting the cloud top altitude. The results show a good agreement amongst the different techniques, with cloud top height estimation uncertainty smaller than 1 km.
These results are encouraging and suggest that thanks to independence from cloud water and cloud ice conditions and due to the high vertical resolution, the RO observations can contribute to improved detection and monitoring of volcanic clouds and help to understand their impact on climate variability.
OSTS session
Regional and Global CAL/VAL for Assembling a Climate Data Record