Since nearly two years, the operational SO$_2$ product from the TROPOspheric Monitoring Instrument (TROPOMI) onboard Sentinel-5 Precursor (S5P) platform has provided important information on volcanic and anthropogenic SO$_2$ emissions, with an unprecedented level of details. In this presentation, we critically discuss the advantages and disadvantages of the current operational algorithm in light of the validation results obtained so far, and present how the retrieval scheme could evolve in the future.

In the first part, we briefly present the main algorithm features and an overview of the SO$_2$ product validation. One challenge in this respect is the current lack of ground-based SO$_2$ measurements for anthropogenic source regions. We therefore rely largely on comparisons with other satellite datasets (e.g., OMI and OMPS). The main lesson learnt is that satellite SO$_2$ retrievals generally agree very well for large SO$_2$ columns (mostly volcanic) while persisting differences exist for low columns when different algorithms are compared. This motivates the second part of the presentation which aims at extensively comparing the results from existing S5P SO2 operational and scientific algorithms, notably DOAS and PCA retrievals (or other alternative approaches). Here, all configuration settings and auxiliary data (e.g. absorption cross-sections) are aligned in order to better understand the differences through sensitivity tests. This effort is not only important to improve the TROPOMI SO2 results but it is also particularly relevant in the context of the forthcoming Sentinel-4 mission that will mainly probe weak anthropogenic SO$_2$ sources. The last part of the presentation gives a general overview of new features planned for the next versions of the operational SO$_2$ algorithm.
