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Application of satellite-based sulfur dioxide observations to support the cleantech sector: Detecting emission reduction from copper smelters

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Abstract
In this study, we present the result of the application of space-based sulfur dioxide (SO2) observations to evaluate the efficacy of cleantech solutions in reducing air polluting emissions from metal smelting. We analyse the Ozone Monitoring Instrument (OMI) satellite-based SO2 observations over Tsumeb (Namibia) and Bor (Serbia) copper smelters, where two sulfur-capture plants, designed to transform gaseous SO2 emissions into sulfuric acid, were implemented in 2015. We observe a reduction in the annual SO2 emissions by up to 90% after 2015 at both smelters, as a result of the implementation of the sulfuric acid plants. The OMI-based emission estimates are mostly in line with those reported at facility-level and reproduce the same year-to-year variability. This variability is driven by the changes in the copper production, the sulfur-to-copper ratio and by the technology employed to reduce the SO2 emissions. OMI observations are directly used by the company operating the sulfuric acid plants to confirm the efficacy of the employed technology using independent satellite-based observations.

The results demonstrate how satellite-based observations are able to detect relative changes in SO2 emissions and can be used to verify and complete existing emission informations. The approach presented here can be applied to other sources on global scale to support cleantech companies as well as decision-makers involved in environmental policies and sustainable development.

Keywords
Sulfur dioxide, Emission, Copper smelter, Satellite, Cleantech