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One Decade of SO_2 measurements from Space

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Sulphur dioxide (SO_2) is an important trace gas in the atmosphere. It is a key substance in the acidification of the environment and also in the production of sulphate aerosols. It therefore has a direct impact on human health, the aquatic ecosystem, and, through aerosol formation, on radiative forcing.

Sources of SO_2 are both natural (mainly volcanic) and anthropogenic (combustion of fossil fuels, in particular coal and smeltering). While volcanic emissions are usually injected in the free troposphere, anthropogenic SO_2 is often emitted in the boundary layer. Over the last decades, emissions in Europe and the US have been reduced significantly by improved filter technologies and switches to cleaner fuels. In Asia and in particular in China, SO_2 emissions have been increasing as result of the rapid industrialisation.

Sulphur dioxide can be measured from space using its absorption bands in the UV. Here, 10 years of data from the satellite instruments GOME and SCIAMACHY are analysed for the global patterns and changes observed with an emphasis on anthropogenic emissions. Overall, levels are decreasing over the US and are close to the detection limit in Europe. At the same time, there is a substantial increase of SO_2 columns observed over parts of China, and possible reasons for that are discussed.