Emissions of International Shipping as seen by Satellites

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Seagoing ships emit exhaust gases and particles into the marine boundary layer and significantly contribute to the total budget of anthropogenic emissions from the transportation sector. For example, annual NOx emission from ships are similar to NOx emission from road traffic. An accurate assessment of the environmental impact of emissions from shipping requires detailed knowledge on the emission patterns and fluxes, typically based on bottom-up emission inventories. With the availability of satellite sensors being able to detect relevant tracegases (here NO2) and aerosol along the major shipping corridors with sufficient spatial resolution, new methods are emerging to verify bottom-up emission inventories with the data from satellite observations. For example, tropospheric NO2 data from the SCIAMACHY (Scanning Imaging Absorption spectroMeter for Atmospheric CHartographY) instrument on board the ENVISAT satellite shows clear indication for NO2 produced from ship emissions over the Red Sea and along the main shipping lane to the southern tip of India, to Indonesia and north towards China and Japan. In addition, the change in cloud droplet size due to aerosol emitted by ships is observable from satellite instruments like MODIS. This talk will give first results of observing shipping emissions like NO2 and aerosol from satellites. The results will highlight the importance of ship emissions for the marine boundary layer and demonstrate the potential of satellite observations.