



First satellite measurements of chemical changes in coincidence with sprite activity

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The last twenty years have seen the discovery of electric discharges in the Earth's atmosphere above thunderstorms, the so-called sprites and jets. It has been suggested that they impact the atmospheric chemistry and possibly affect the ozone layer through their repeated occurrence. Whereas theoretical studies and laboratory experiments suggest enhancement of such gasses as nitrogen oxides by up to hundreds of percent within sprites, a definitive detection of their chemical effects have to date been unsuccessful. In this paper, we report on the first measurements of atmospheric chemical perturbations recorded in coincidence with sprite activity. A striking event occurred on 25 August 2003 when the MIPAS spectrometer onboard the Envisat satellite recorded spectroscopic measurements soon after a sequence of 11 sprites observed above Corsica (France) by Eurosprite ground facilities (details of the convective system are discussed in a companion paper by São Sabbas et al.). The measurements show an enhancement of ambient nitrous oxide by 80% at 52 km altitude in the region above the parent thunderstorm. The recorded chemical changes imply sprites can exert significant modification of the atmospheric chemistry at a regional scale, confirming model and laboratory predictions of sprite-chemistry, and requiring a new estimate of their global impact. The results of the analysis and their implications are discussed.