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Chemical Reactions in Turbulent Atmospheric Flows: Spectra of Scalars, of Variances and Covariances

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Mixing ratios of reacting compounds (OH, HO_2, isoprene; NO, NO_2, O_3) were measured with time resolutions of 0.06 to 0.2 Hz (OH, HO_2; reactivity) up to 10 Hz (isoprene, NO, NO_2, O_3) in parallel to micrometeorological quantities (e.g. temperature, water vapor, wind vector components) during three field studies (SANA, ECHO, ATTO).

The power spectra and their cumulatives of reacting and non - reacting scalars are compared to identify spectral regions of maximum correlation where processes of mixing and transport interact with chemical reactions (isoprene + OH, HO_2 + NO, NO + O_3).

In addition, the power spectra of the OH - production by photolysis are presented. The variance spectra are related to the spectra of segregation intensity of the different reactions. Different spectral ranges (especially of the co-spectra and cross-spectra) are discussed with respect to the influences of transport, mixing and chemical reactions.