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Analyzing NMVOC Eddy Covariance Data from a PTR-QiTOFMS: An urban test case

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There is a need for new versatile eddy covariance analysis tools to process a wide variety of different trace gases. For example, Proton-transfer-reaction mass spectrometers are used extensively for disjunct eddy covariance (DEC) and eddy covariance (EC) measurements of NMVOC. Recent progress in spectroscopic techniques make it also possible to perform high-rate measurements of various in-organic reactive trace gases that are important players in atmospheric chemistry. Here we present a new software tool that can process a wide range of different datasets, and evaluate the ability to measure urban NMVOC fluxes based on data obtained from a Proton-transfer-reaction-quadruole interface time of flight mass spectrometer (PTR-QiTOFMS). The code can easily be configured to process high frequency, low frequency and disjunct data. We demonstrate the capabilities of the code based on a large urban dataset collected in Innsbruck, Austria, where ambient concentrations of non-methane volatile organic compounds (NMVOC) and auxiliary trace gases were sampled with high temporal resolution above an urban canopy. We use the high frequency NMVOC data set to generate a set of disjunct data and compare these results with the true eddy covariance method. The presented analysis allows testing the applicability of DEC in an urban environment. Our findings confirm that the disjunct eddy covariance method can be a reliable tool, even in complex urban environments, when fast sensors are not available, but that the increase in random error impedes the ability to detect small fluxes due to higher flux LODs. It is planned to share the resulting software development activities as open source, and host it on open source repositories.