Geophysical Research Abstracts
Vol. 17, EGU2015-13219, 2015
EGU General Assembly 2015

On the sensitivity decay of the cumarine targets for fast ozone measurements. Implications for the estimation of the instrumental zero and flux calculations

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Fast ozone concentrations measurements are necessary in order to measure ozone fluxes with the eddy covariance technique. Since the development of the first instrument early in the 90s several other instruments, all based on a chemiluminescent reaction between ozone and a cumarine target, were developed but only in 2010 Mueller et al. recognized the importance of estimating the zero (i.e. the voltage at zero ozone concentration) which depends both on instrument and target performances.
In this work we will show a new methodology to estimate the zero, this new methodology avoids some problems which were unsolved by the Mueller's one. Our first assumption wais that the sensitivity of the targets decays in an exponential way rather than a linear one, as proposed by Mueller et al. (2010). This assumption was in agreement with what proposed by Ermel et al. (2013)
Similarly to the Mueller's approach, the first step we performed was plotting the instrument voltage output versus the ozone concentrations, but two main differences were introduced in our methodology: first of all we compared periods in which the target received a comparable ozone dose and then the estimation of the zero is extrapolated with an exponential fit of the data rather a linear one. In this way it was possible to avoid negative zeroes which were sometimes obtained, especially in the first 24/36 hours of the target life, by applying Mueller's methodology; negative zeroes lead to an underestimation of the ozone fluxes .
After estimating the zero for some sub-periods of the target life, the evolution of the zero is modeled by interpolating the zero data as a function of the ozone dose received by the target. Moreover, with this approach the zero changes continuously with no abrupt change during the target life, avoiding remarkable discontinuities in the fluxes.
Comparisons between the two methodologies will be showed.