First Aircraft Measurements of NO_y by Cavity Ring-Down Spectroscopy

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The sum of total reactive, oxidized nitrogen, commonly referred to as NO_y is important for understanding emissions of reactive nitrogen species to the atmosphere and for photochemical production and chemical loss of ozone. NO_y has traditionally been measured by chemical conversion to nitric oxide, NO, followed by chemiluminescence detection. NO_y was measured during the WINTER (Wintertime Transport, Emissions and Reactivity, February – March 2015) campaign conducted on the NCAR C-130 via Cavity Ring-Down Spectroscopy (CRDS). NO_y was measured by immediately passing the sampled air through a quartz tube heated to 650°C, which will decompose any higher oxidized nitrogen species into NO or NO_2. Ozone was added to the NO/NO_2 mixture to convert any NO to NO_2. The NO_2 was measured via multi mode diode laser CRDS near 405 nm. These were the first aircraft-based measurements of NO_y via CRD and, as such, there were aspects of the data that require farther analysis. As these measurements were conducted during a campaign with a rich suite of other measurements to compare with, we can determine the accuracy of the new method for NO_y measurements. By looking at reactive nitrogen budgets with other measurements that had already been aircraft-tested, we can determine if there are conditions when NO_y may be under- or over-measured. This presentation will describe the advantages and disadvantages of the new method for NO_y detection from aircraft.