

High Humidity-induced Bias in Aircraft Network CO₂ Data Due to Water Condensation in Flasks

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In the Aircraft Program of the NOAA Greenhouse Gas Reference Network, Programmable Flask Package (PFP) samples are filled to a pressure of 40 psi and sample air is typically not dried. Recent comparisons of undried PFP CO₂ measurements with coincident CO₂ measurements made by other methods show evidence for a low CO₂ bias from PFPs related to ambient water vapor concentrations > ~1.7% v/v. We hypothesize the CO₂ has dissolved into liquid water condensed onto the sides of the flask at the time of analysis, although this may be partly compensated by other effects. We recently implemented a flagging scheme for the entire aircraft PFP dataset which resulted in the rejection of ~5% of the data. This poster presentation will show empirical evidence for the high humidity-related CO₂ bias, describe our procedure for identifying affected data, characterize patterns in rejected data, explore the potential for correcting historical data, and offer possible solutions for eliminating this problem in the future. To begin to understand the potential impact of such a bias on CO₂ flux calculations that utilize the aircraft network data, we will investigate the size of the bias relative to the terrestrial uptake signal at individual sites.

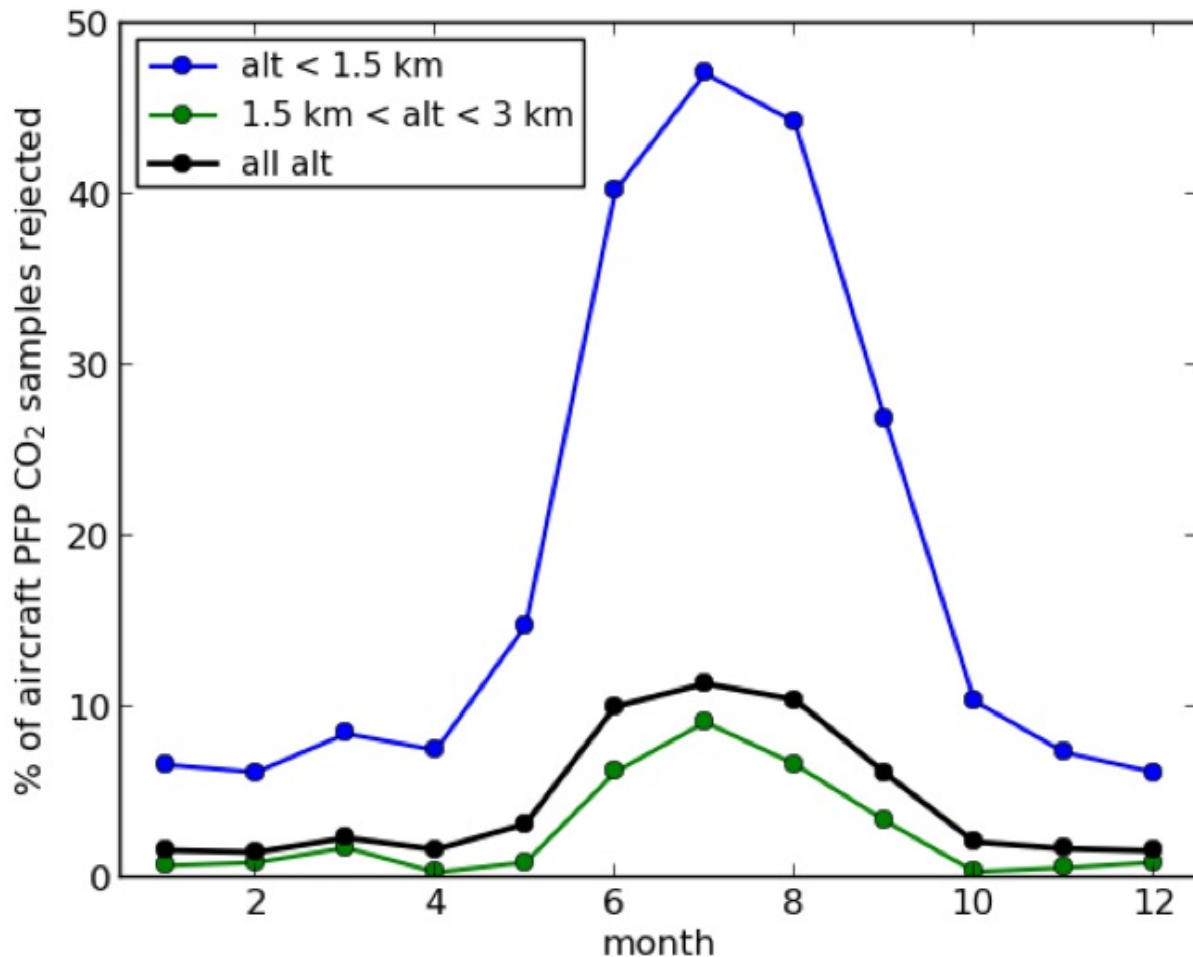


Figure 1. Fraction of CO₂ data from the aircraft PFP network that has been rejected by month and altitude bin based on having ambient humidity levels > 1.7% v/v at the point of sampling.