TG-06 A New High-precision Trace Gas Analysis System in Brazil

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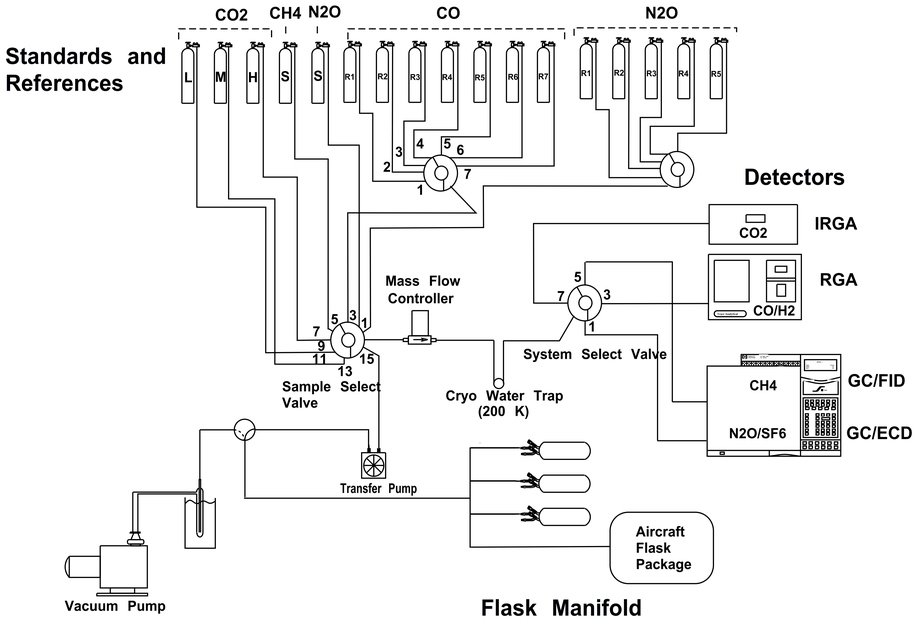
1. Introduction

Our goal in LBA has been to make regular airborne trace gas measurements (CO_2, CH_4, CO, H_2, N_2O and SF_6; and isotopes of CO_2) in order to better understand the regional carbon balance of the Amazon basin. Unfortunately, our planned sampling activities have been plagued with import and export problems resulting in highly irregular sampling that has produced a limited set of data. To remedy this, we have begun to transfer our analysis technology to Brazil. A new analysis system (for the non-isotopic species) began operation at IPEN in April, 2004. Later in 2004, we will help to enable highly precise measurements of the carbon and oxygen isotopic ratios of CO_2 in coordination with the stable isotope group at CENA/USP. We plan to have this system operational by early 2005.

Now, the entire process of sampling and anslysis takes place inside Brazil. This should allow us to greatly increase the frequency of measurements, which should translate into an enhanced understanding of Amazon basin trace-gas fluxes. From the global point of view, the CO_2 fluxes from the tropics are the most uncertain. New measurements from vertical profile and surface sites will add to a global network of CO_2 observations and could dramatically decrease the uncertainty of fluxes in Amazonia and globally.

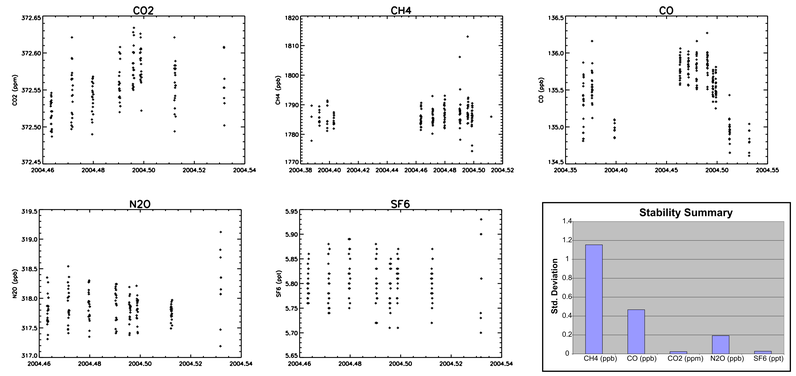
2. Analysis System



3. Results

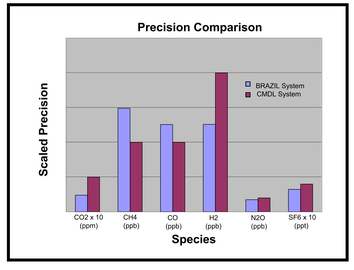
A. Instrument Stability

The following shows the repeated analysis of air from a tank, treated as an unknown.



B. Instrument Precision

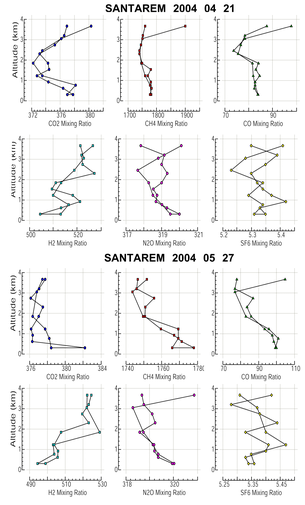
Comparison of the precision of the new system with the orginal NOAA/CMDL system



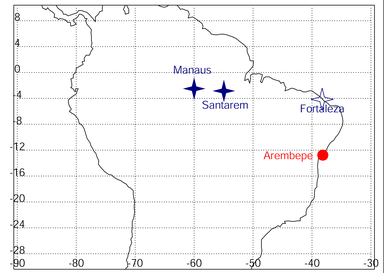
The precision of the analysis system installed at IPEN in Brazil meets or exceeds the standards set by the original system operating at NOAA/CMDL in Boulder, USA. The challenge for the long term will be to maintain this high level of precision and to ensure that measurements stay closely tied to the international scales for each gas.

C. First Measurements

Two vertical profiles from Santarem measured on the new system



4. Sampling Sites



5. Conclusions

1. We have succeeded in building and installing a high-precision system for the analysis of CO_2, CH_4, CO, H_2, N_2O, and SF_6.

2. The initial results suggest that the system is highly precise and very stable over time. These two elements are essential and will allow future measurements to be integrated confidently into global data sets.

6. Future Goals

Our goals for the remainder of our project are:

1. Establish weekly or bi-weekly sampling at Manaus and Santarem.

2. Establish a sample inter-comparison project with the IPEN lab using small sample flasks, in which both IPEN and NOAA/CMDL will measure air samples collected at Arembepe.

3. Install high-precision CO_2 extraction system for isotopic ratio measurement at CENA/USP by early 2005. Once the installation is completed, they will begin to measure isotopic ratios on these samples.