Constructing the Brazilian Greenhouse Gas Measurement network

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50% Global Tropical Forest
~120Pg above ground biomass
Amazon river discharge ~20% of
Global fresh water input to ocean
~20% Global biodiversity
2000 – Started Vertical Profiles
2004 – 2009 GHG analysis at IPEN (Funded by NASA – Ecology)
2009-2013 – Funded by FAPESP
2006 IPEN/NOAA/INMET started GHG flasks measures weekly at Arembepe GAW Global station – Closed Jan 2010 by INMET
2010 – Started biweekly Vertical Profiles at: RBA, TAB and ALF - Coast flasks samples Salinopolis and Natal
Sampling with Aircraft Vertical Profiles in Amazon Basin
Flask sampling in surface in Brazilian coast sites
CH$_4$ Vertical Profiles
CH$_4$ concentration
\[ F_{\text{gás}} = \frac{\int_{z=0}^{4\text{km}} [(C_{\text{gás}})_{\text{SITE}} - (C_{\text{gás}})_{bg}] dz}{t} \]
Determining background: \( \Delta F_{\text{gas}} = \frac{\int_{z=0}^{4km} [(C_{\text{gas}})_{\text{SITE}} - (C_{\text{gas}})_{\text{bg}}]dz}{t} \)

Determining background: \( \text{SF}_6 \) as transport tracer

![Map of CO2 mixing ratio (ppm) from 2000 to 2009 with ASC, RPB, SAN, and FTL stations marked.]

![Graph showing CO2 mixing ratio (ppm) from 2000 to 2009 with ASC, RPB, SAN, and FTL stations marked.]

![Inset graph showing SF6 mixing ratio from 2000 to 2009 with This study and Fortaleza marked.]
\[ F_{g \alpha s} = \frac{\int_{z=0}^{4km} \left[ (C_{g \alpha s})_{SITE} - (C_{g \alpha s})_{bg} \right] \, \text{d}l}{t} \]
Back trajectories that arrives in the aircraft sites 0.5; 2 and 4km
Annual mean 2010 Carbon Flux

ALF  0.05 gC/m².day
SAN  0.14 gC/m².day
RBA  0.00 gC/m².day
TAB  -0.07 gC/m².day

Carbon Flux (gC/m².day)

Month

0  1  2  3  4  5  6  7  8  9  10  11  12

ALF  SAN  RBA  TAB
Constructing a Brazil Network in Climate Change Observation System

- Vertical Profiles
- CO₂, CH₄, N₂O, CO and SF₆
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- Towers

CO₂ flux tower
Eddy covariance
- Create a protocol for tower measures with automatic calibrations

- Central Laboratory Facilities (LQA/IPEN) for calibrate all standards used in GHG measures

- Comparison program with towers using flasks
Thank you

NOAA HYSPLIT MODEL
Backward trajectories ending at 1600 UTC 21 Aug 09
GDAS Meteorological Data

Source ★ at 2.86 S 54.95 W

NOAA/ESRL/GMD
NASA
WMO
NERC
FAPESP
MCT/BRAZIL GOV.