Study of N_2O Flux over Central Amazon

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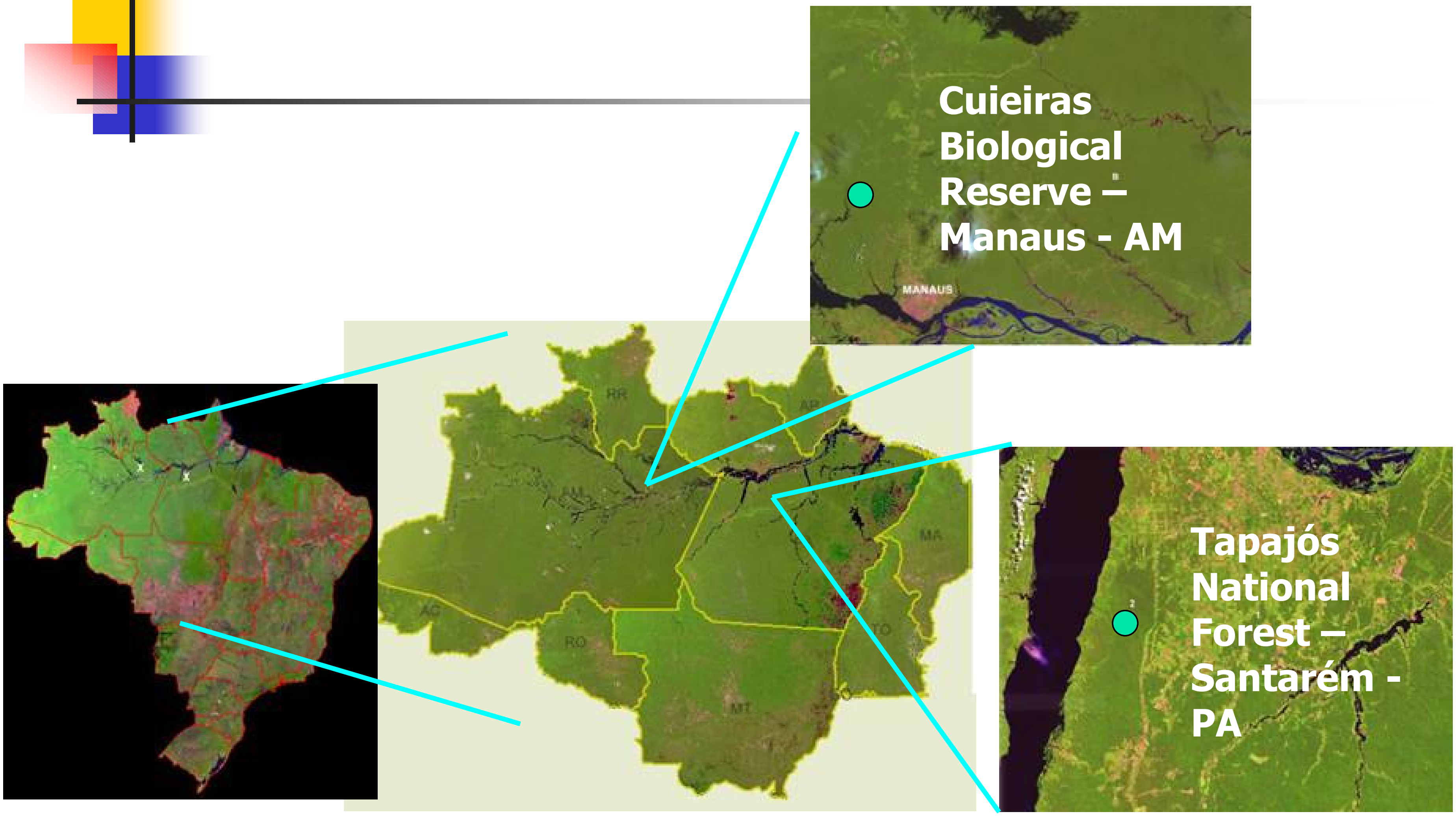
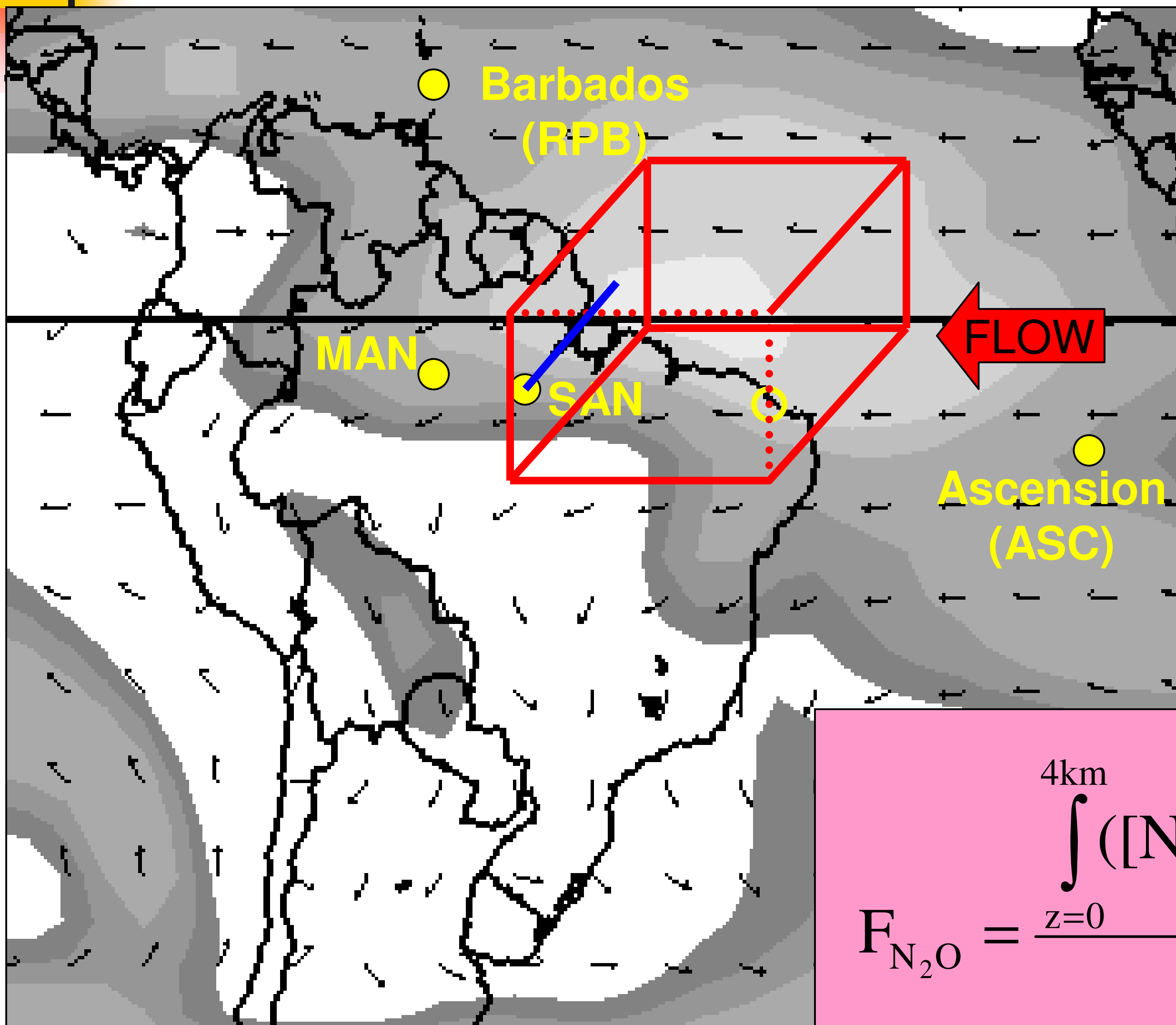
N_2O Sources and Sinks

- N_2O is the 3rd most important anthropogenic greenhouse gas. Life time: 120 years
- Main sources:
  - Nitrification and denitrification in soils: 9-31 TgN_2Oyr^{-1}
  - Ocean: 9-19 TgN_2Oyr^{-1}
  - Agricultural soil: 19.5 TgN_2Oyr^{-1} (77% of anthropogenic contribution)
- Main sinks
  - Decomposition in stratosphere by photodissociation (90%)
  - Reactions with excited oxygen (10%).

Measurement Sites



Flux Calculation



Miller et al., 2007
method

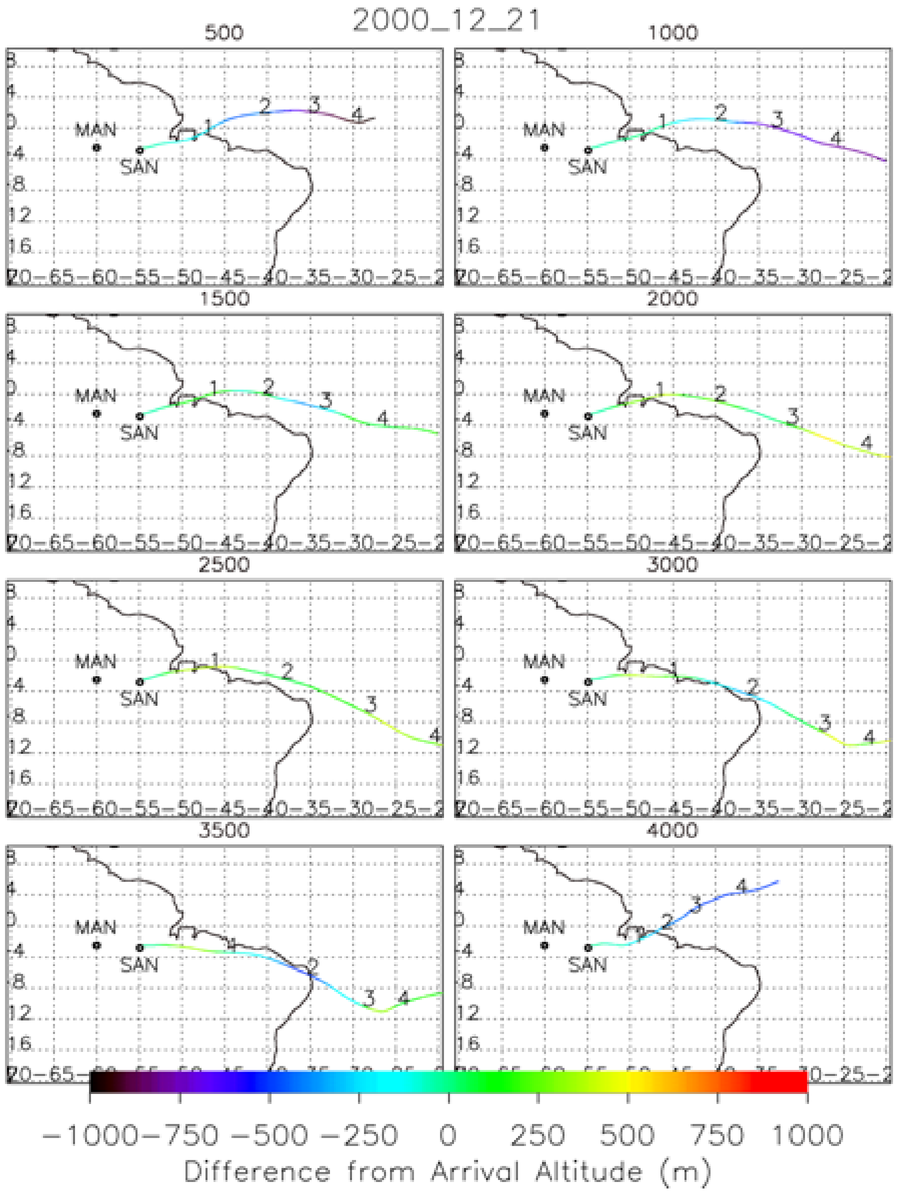
"A Very Large Flux
Chamber"

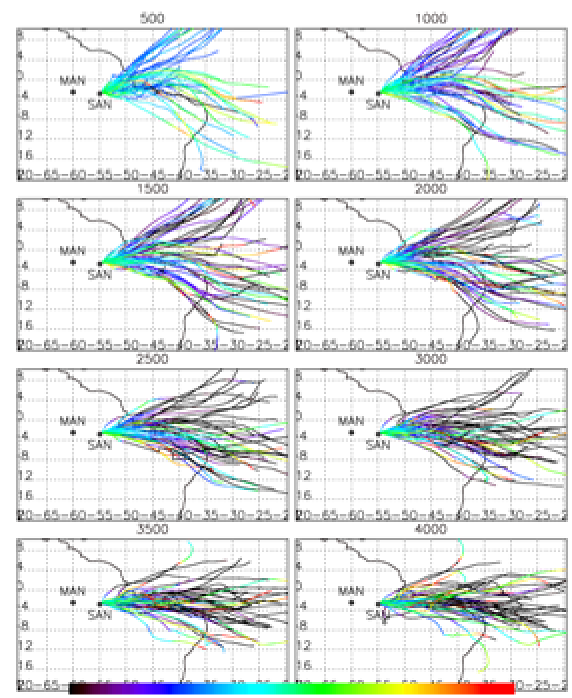
Trajectories Study
(Hysplit model)

$$F_{N_2O} = \frac{\int_{z=0}^{4km} ([N_2O]_{site} - [N_2O]_{bg})\,dz}{\text{time}}$$

Back trajectories

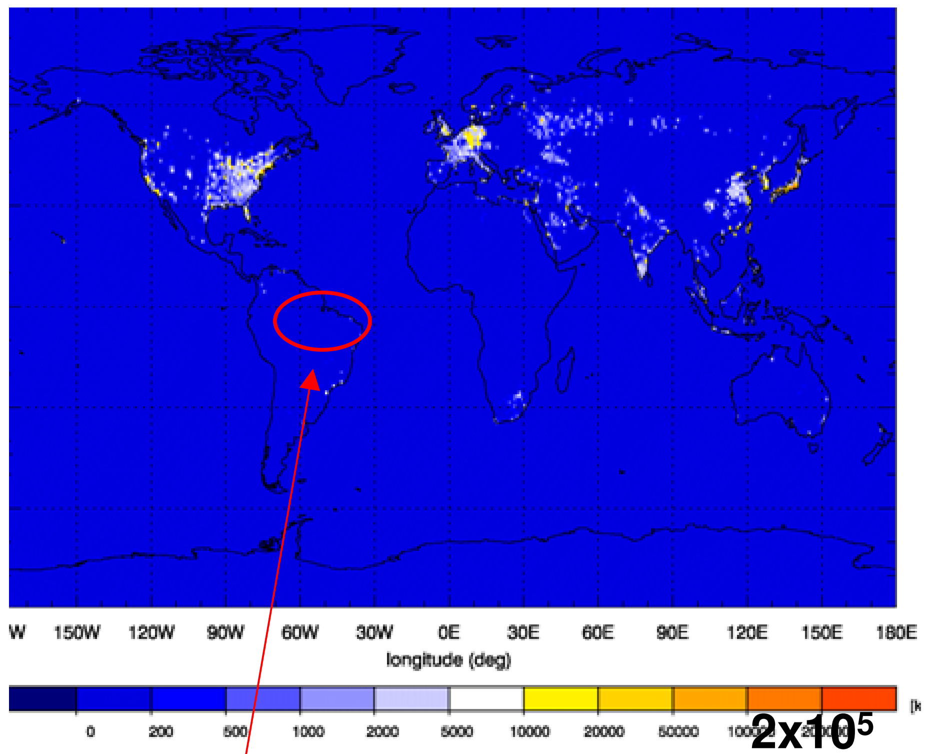
- Used to calculate time air has been over land at 8 altitudes.
- Typically quite similar as a function of altitude.





Calculating the background

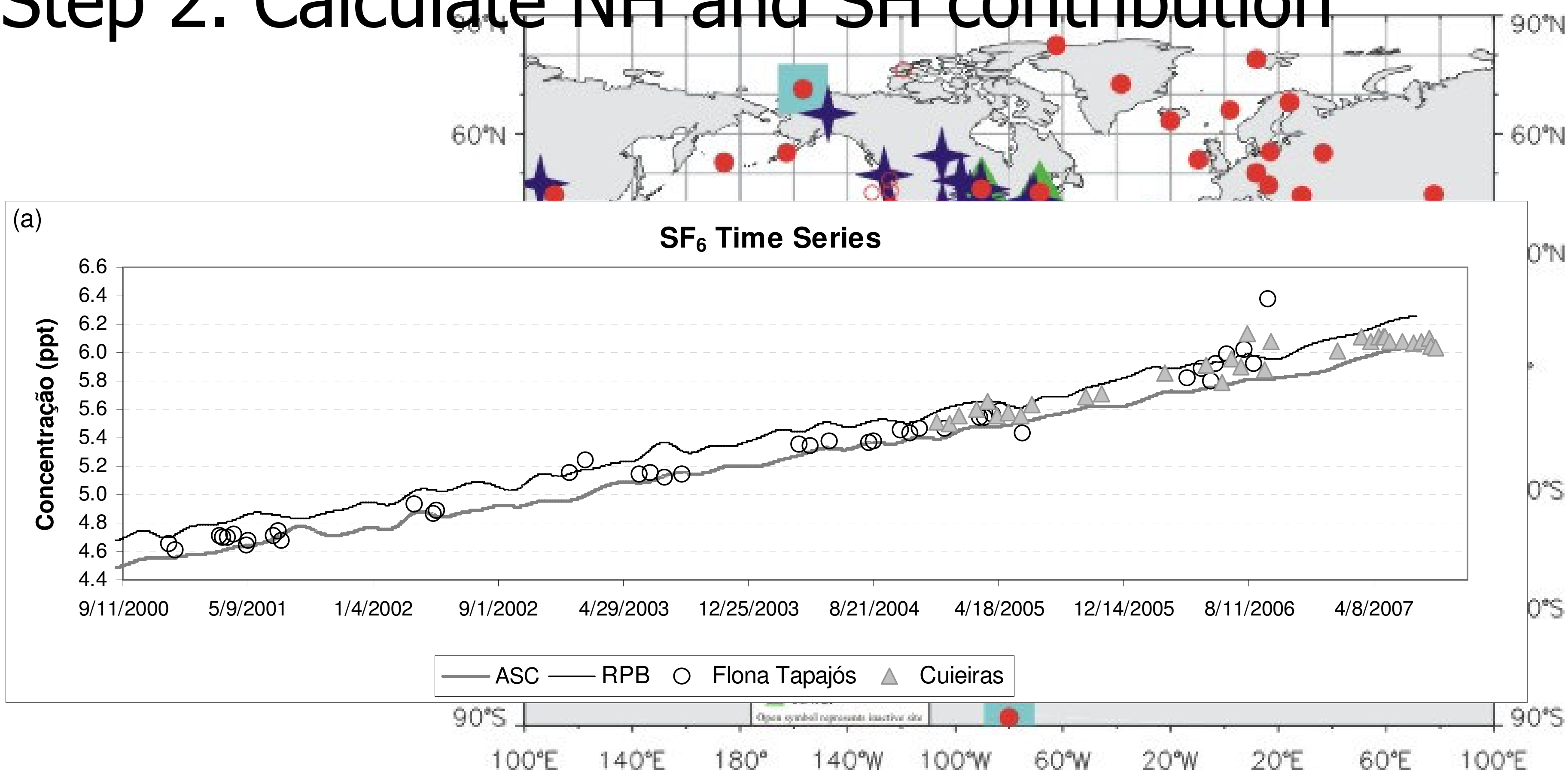
Step 1. Chose SF_6 like a tracer transport



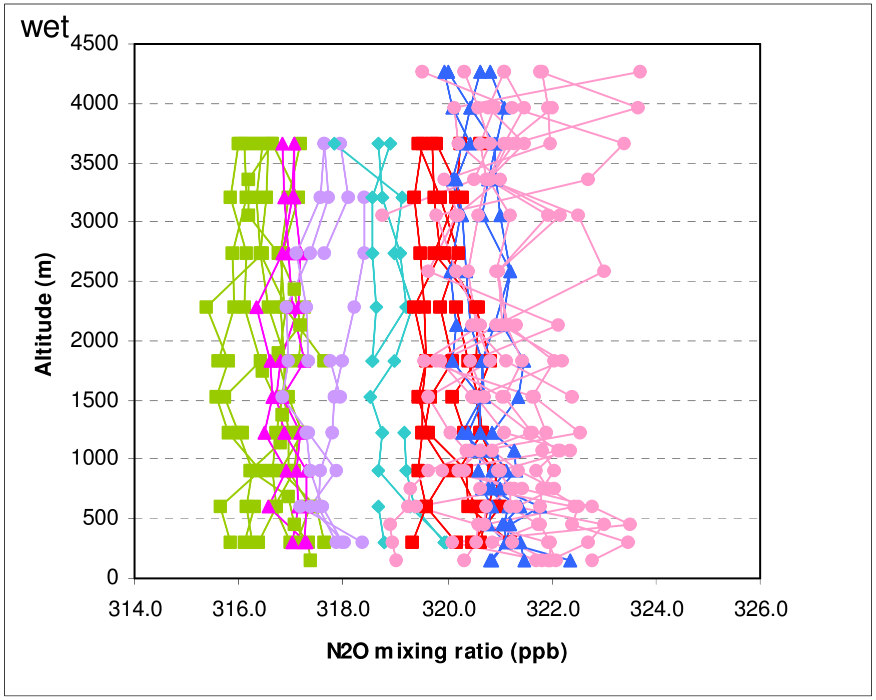
‘No’ Emissions

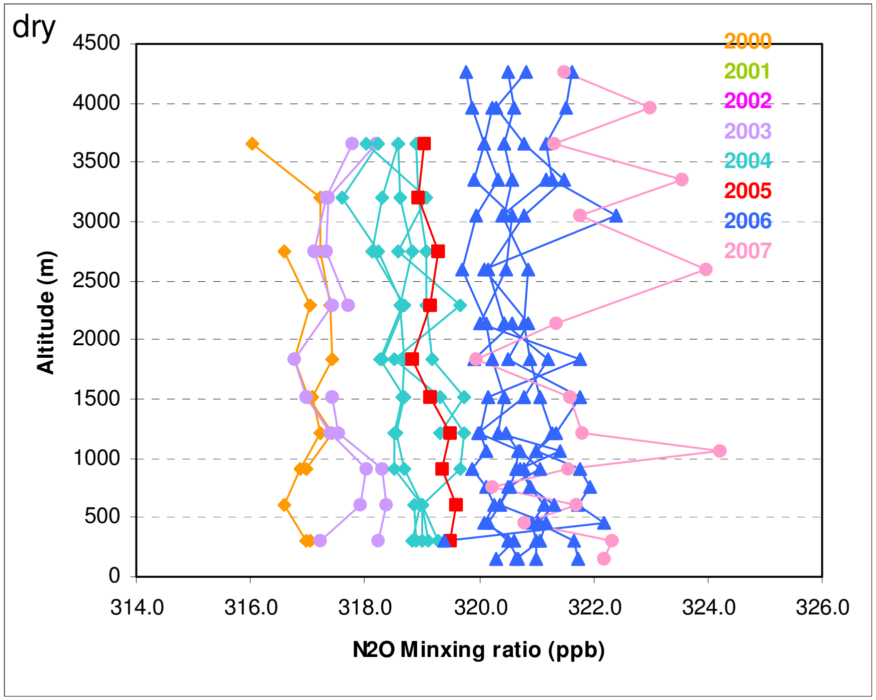
Calculating the background

Step 2. Calculate NH and SH contribution

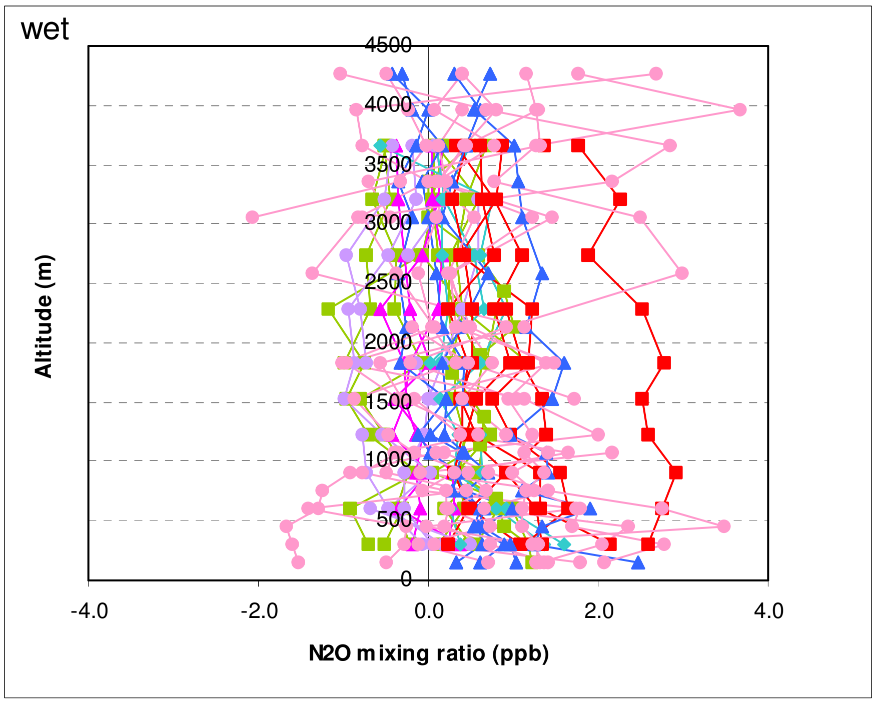


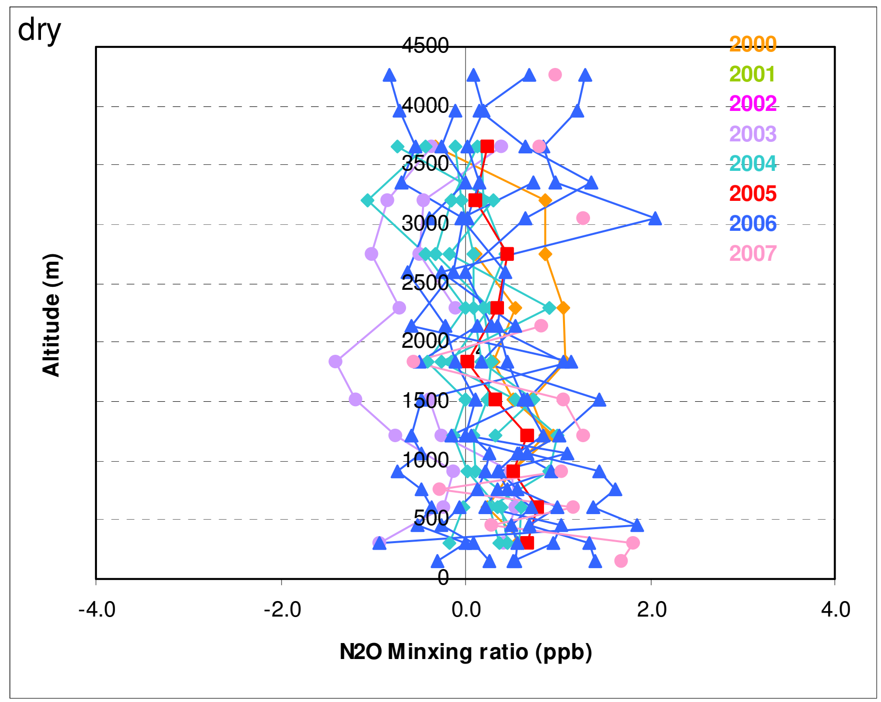
Normalizing Profiles



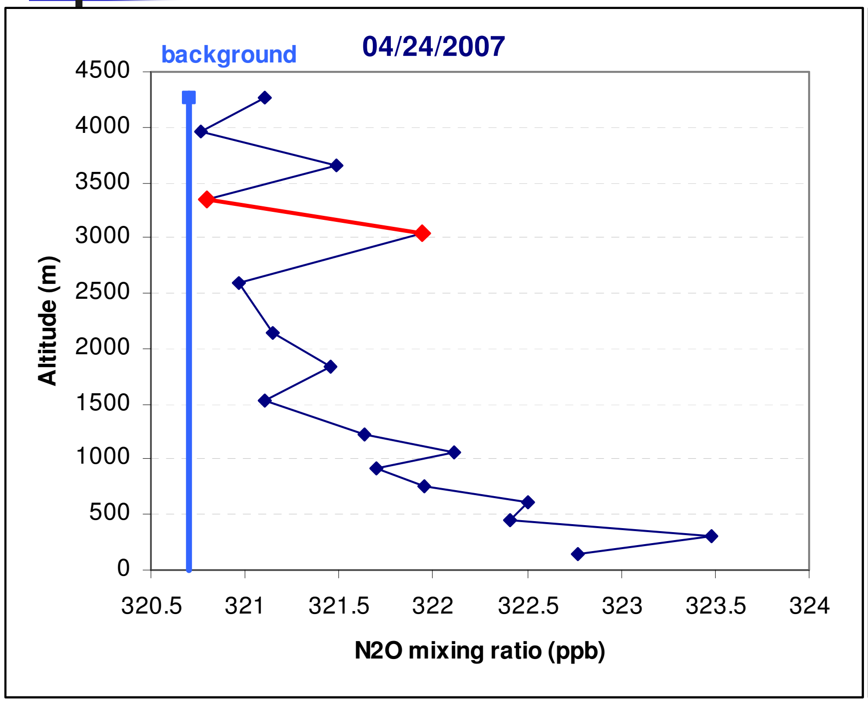


Profiles Normalized

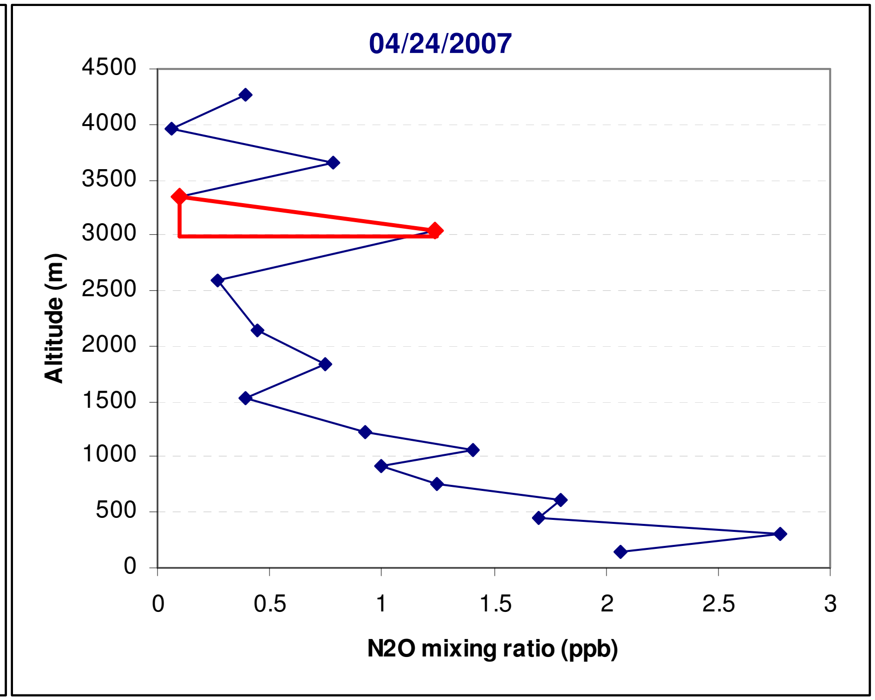




Integration of profiles



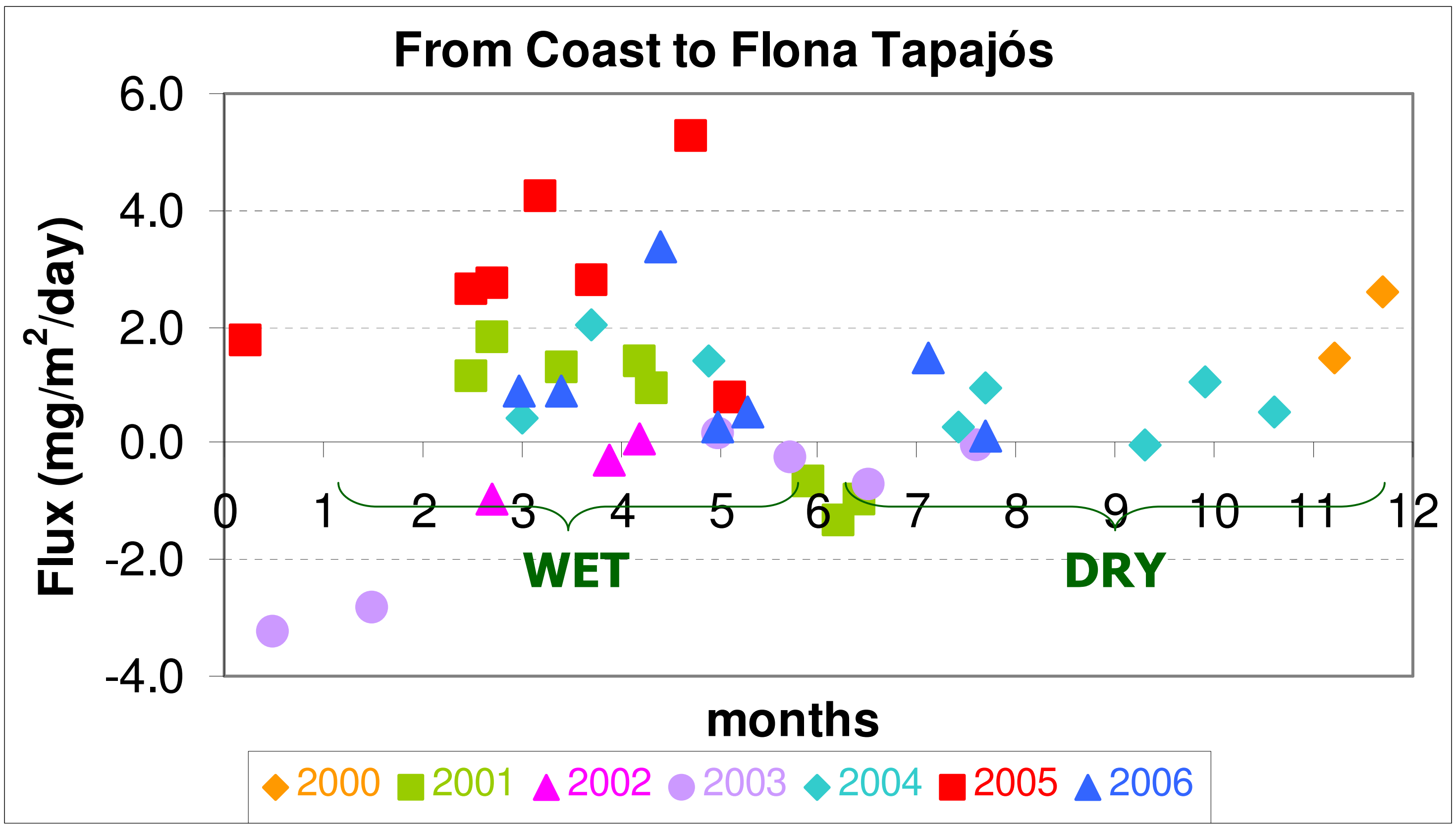
Normalized



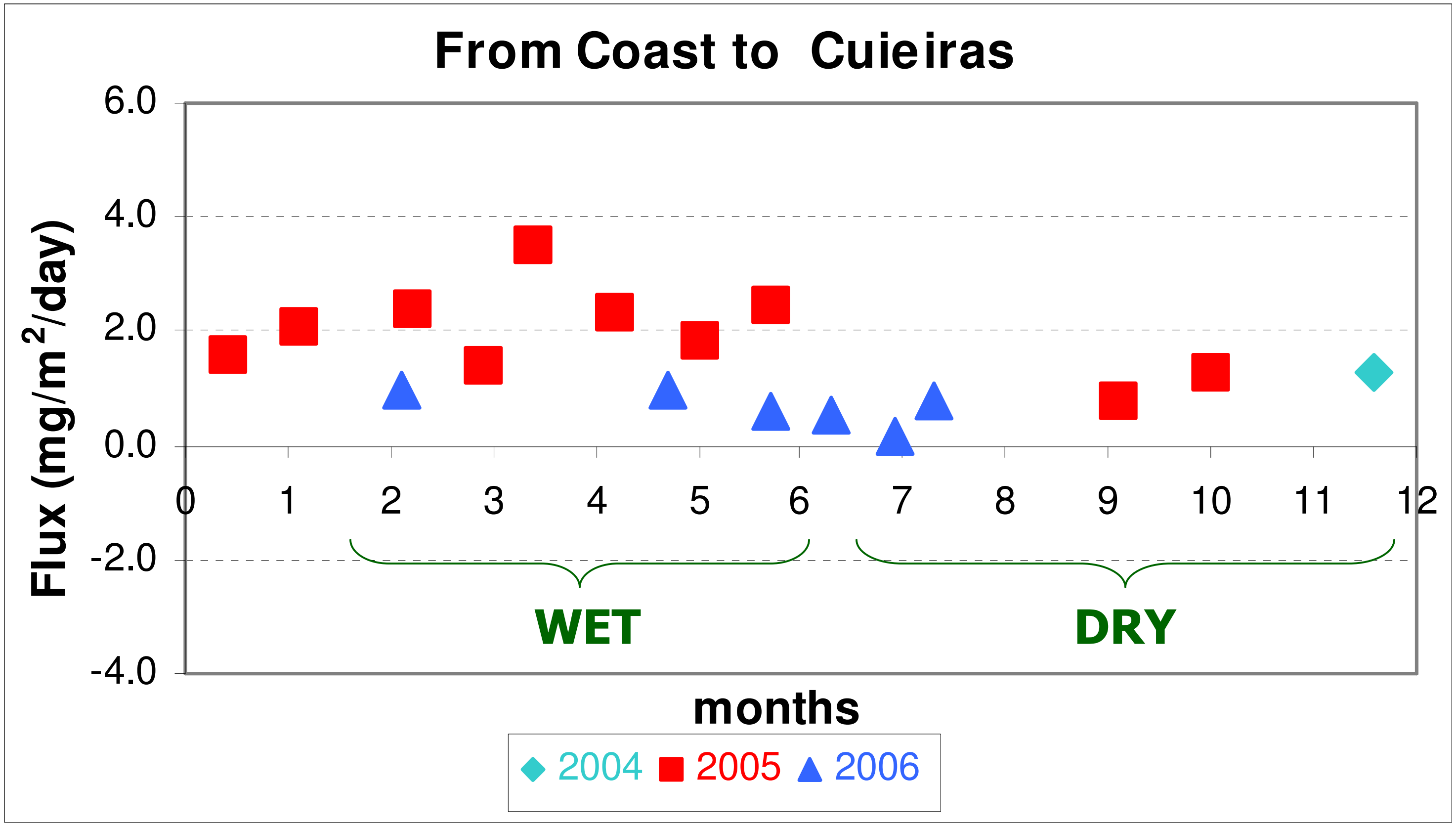
$$F_{N_2O} = \sum \frac{\{([N_2O_{i+1}]_{site} - [N_2O_{i+1}]_{bg}) + ([N_2O_i]_{site} - [N_2O_i]_{bg})\} / 2 \bullet \Delta z}{time_z}$$

“Santarém” Fluxes

2005 Wet season enhancement – probably related to agriculture



"Manaus" Fluxes



Summary and Comparison with other estimates

Years/Site	SAN		MAN	
	Wet	Dry	Wet	Dry
2001-2003	0.0 ± 1.2	-1.65 ± 2.2		
2004-2006	2.1 ± 1.6	0.8 ± 0.6	1.9 ± 0.8	1.1 ± 0.7

- Comparison (mg N_2O/m-2yr-1)

  1.9 – Primary Forest, Rondônia, Brazil (Garcia-Montiel, et al., 2004)

  0.38 – Primary Forest, Manaus, Brazil (Coolman, 1994)

  0.44 – Young Pasture, Manaus, Brazil (Coolman, 1994)

Conclusions

- The normalized profiles show a clear enhancement during wet season.
- SAN fluxes were enhanced until 2005. In 2006 political programs decreased the N-fertilizer used in Para.
- MAN fluxes are lower in 2006 for the same reason.
- Fluxes calculated are similar other studies over near regions.