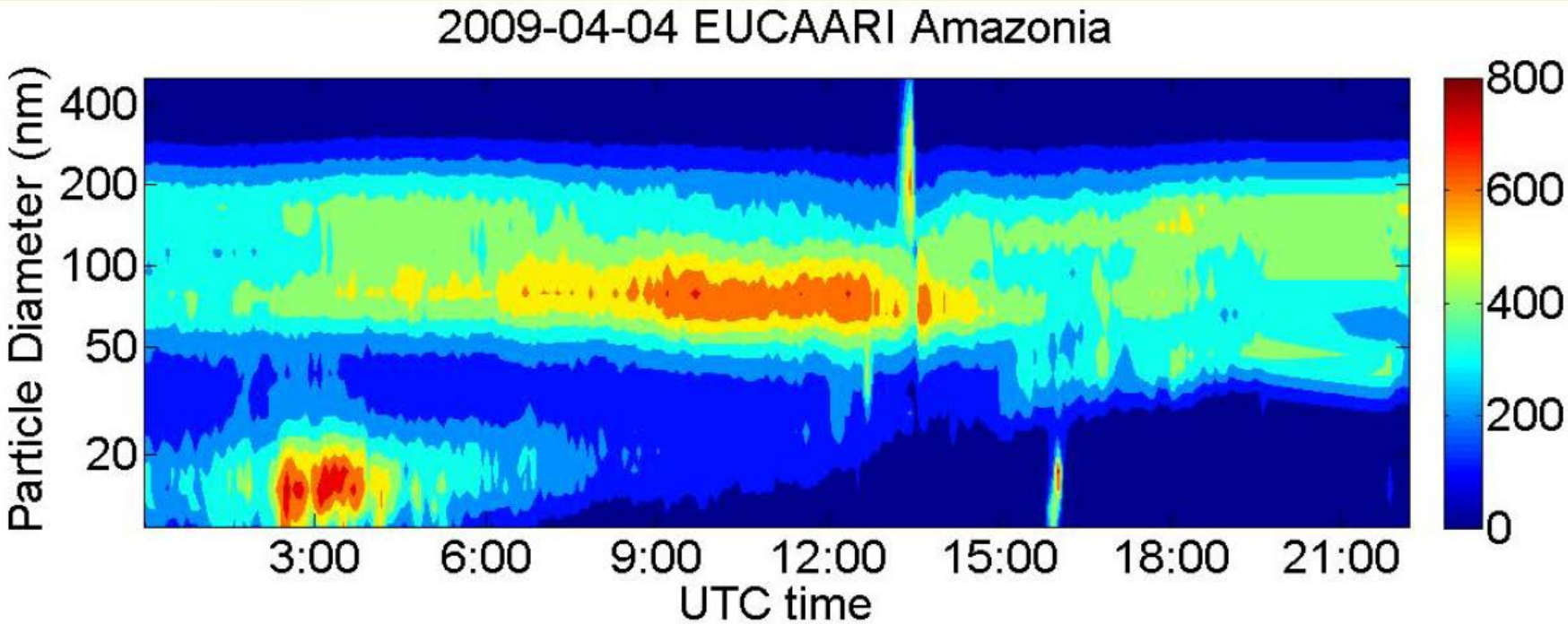
New particle formation? Bursts of particles $10<D_p<30$ nm.

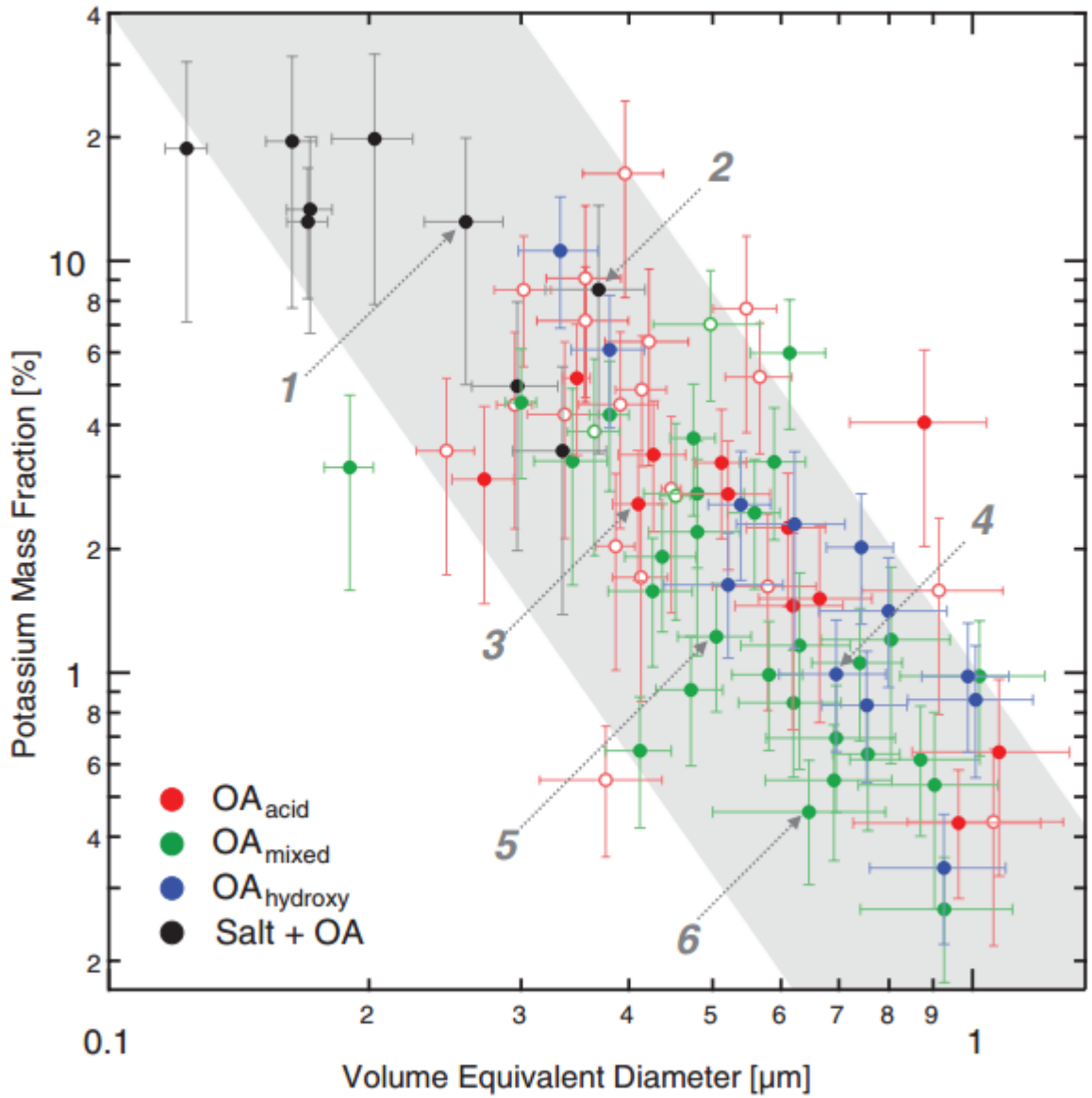


Aerosol size distributions measured in 2009 Apr 4th. There was a burst of ultrafine particles from 2:00 to 4:00 UTC time.

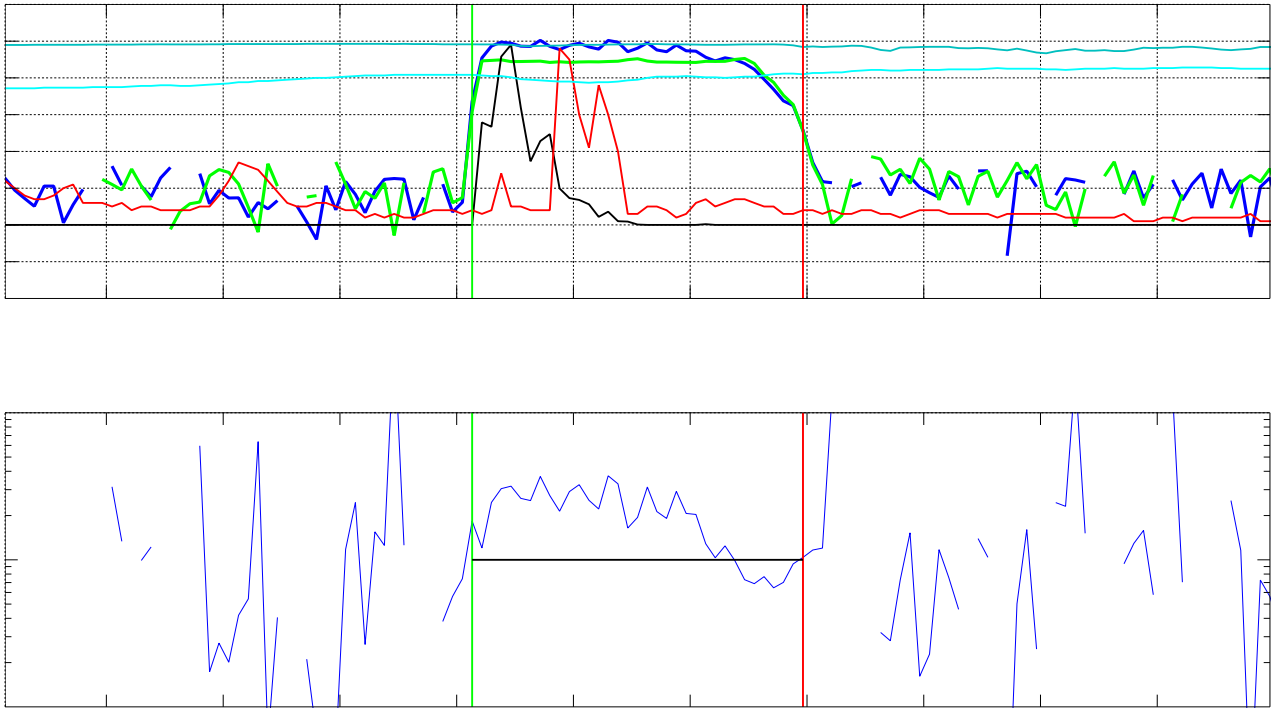
New particle formation and subsequent growth was seldom observed along two years of measurements. Nevertheless, in 70% of the days, bursts of particles with diameters in the range 10-40nm were detected. The events usually lasted from 20 to 120min, and the subsequent growth to larger sizes was not always clearly observed. Source: P. Artaxo.

Biogenic Potassium Salt Particles as Seeds for Secondary Organic Aerosol in the Amazon

Pöhlker et al.

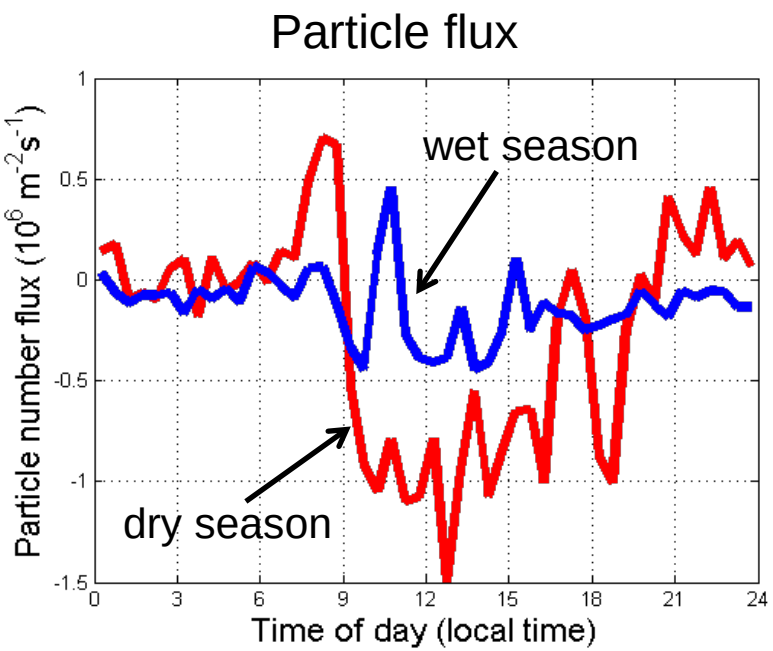


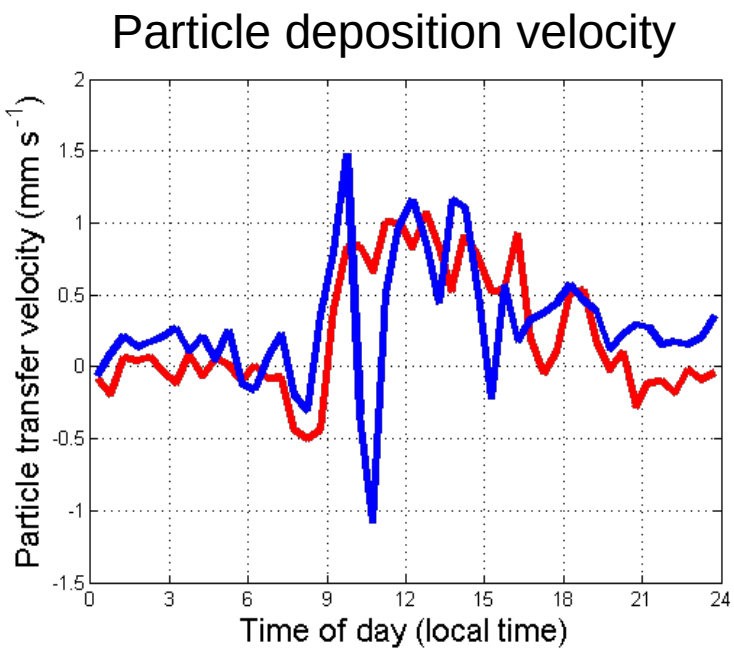
Precipitation produces ions



- M. Matisans, P. Tunved, L. Rizzo, R. Krejci, P. Artaxo, I.Riipinen, T. Hamburger, E. Swietlicki, H.E. Manninen, J. Backman, M. Kulmala

Motivation:



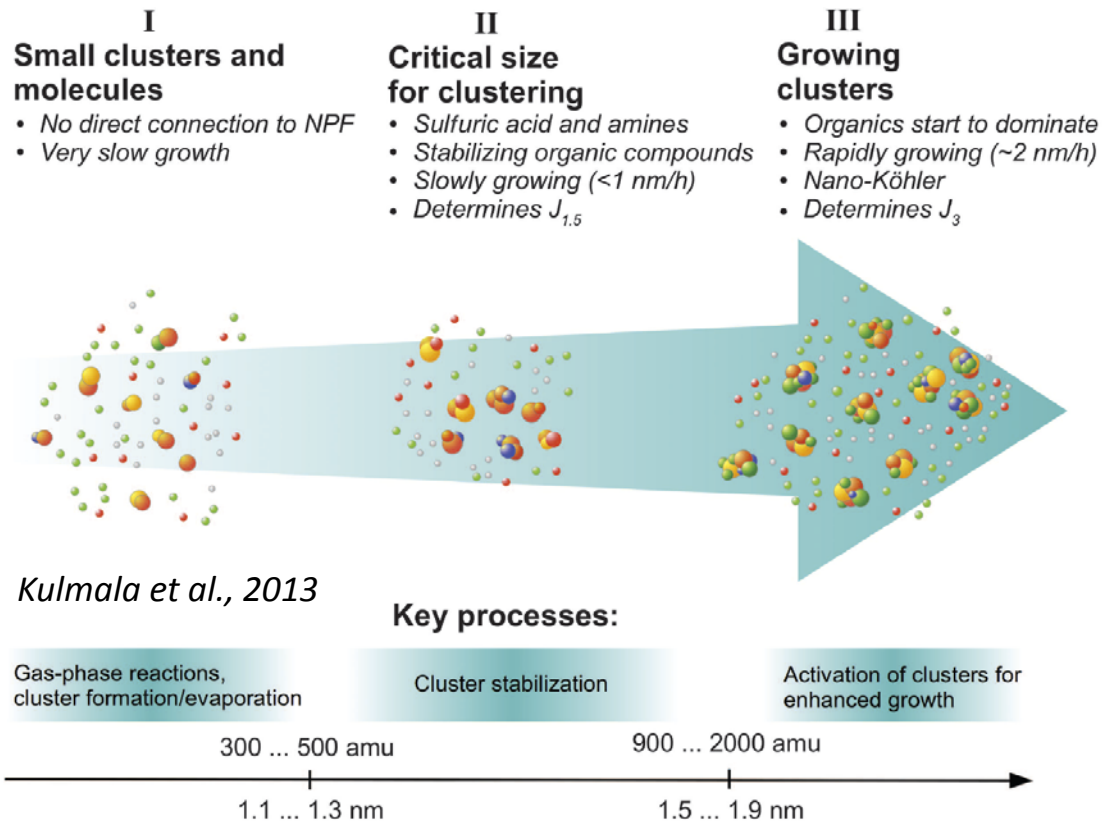


The rain forest is a net number sink of aerosol particles even in the cleanest possible conditions when considering the total aerosol population.

This means that primary aerosol emission seems to be small in terms of number concentrations. It is hard to explain the downward particle fluxes without a large contribution of secondary particles forming in the atmosphere.

Ahlm et al, ACP

No new particle formation observed at surface under pristine conditions in Amazon



Kulmala et al., 2013

New particle formation: a two-step process:

- **1st step: sulfuric acid and amines, ammonia, or organic vapor form stable clusters**
- **2nd step: organic vapor leads to enhance growth rate of the clusters to larger sizes.**

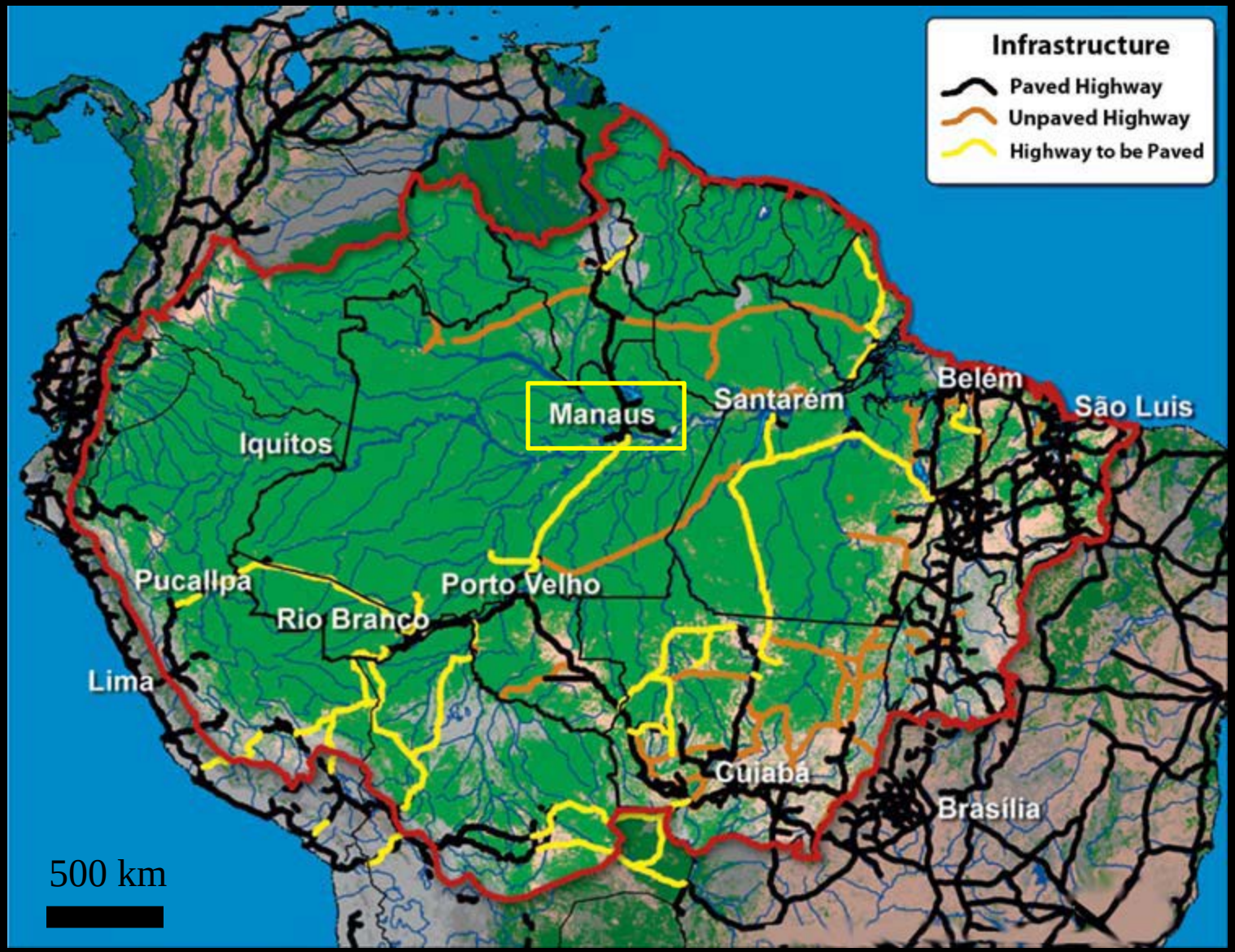
Why no new particle formation?

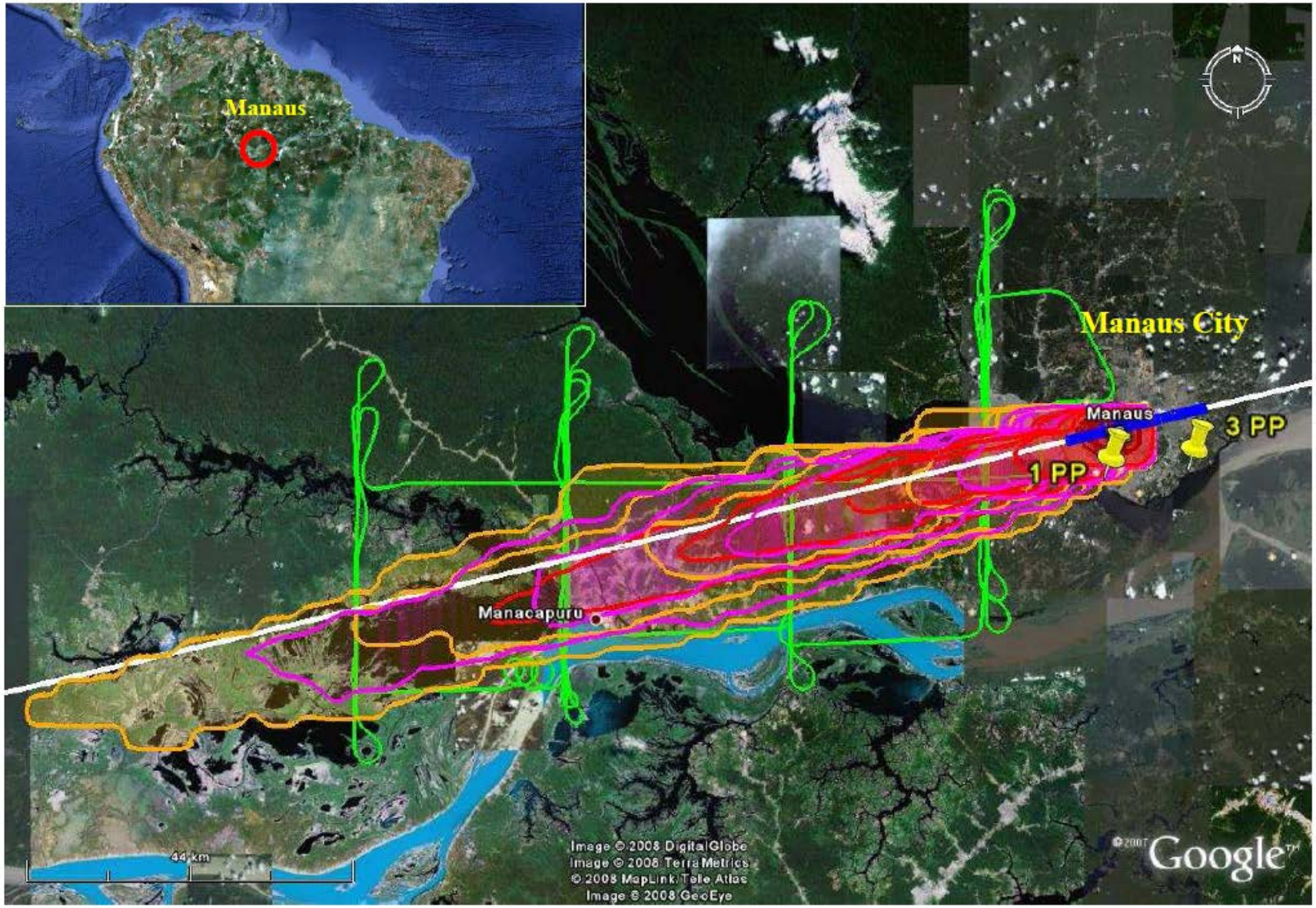
- **Low SO_2 concentration (20-30ppt) suggests the concentration of H_2SO_4 is low**
- **Organic concentration may be low for the growth of stable clusters.**

What is the impact of Manaus plume on NPF?

GoAmazon2014/5

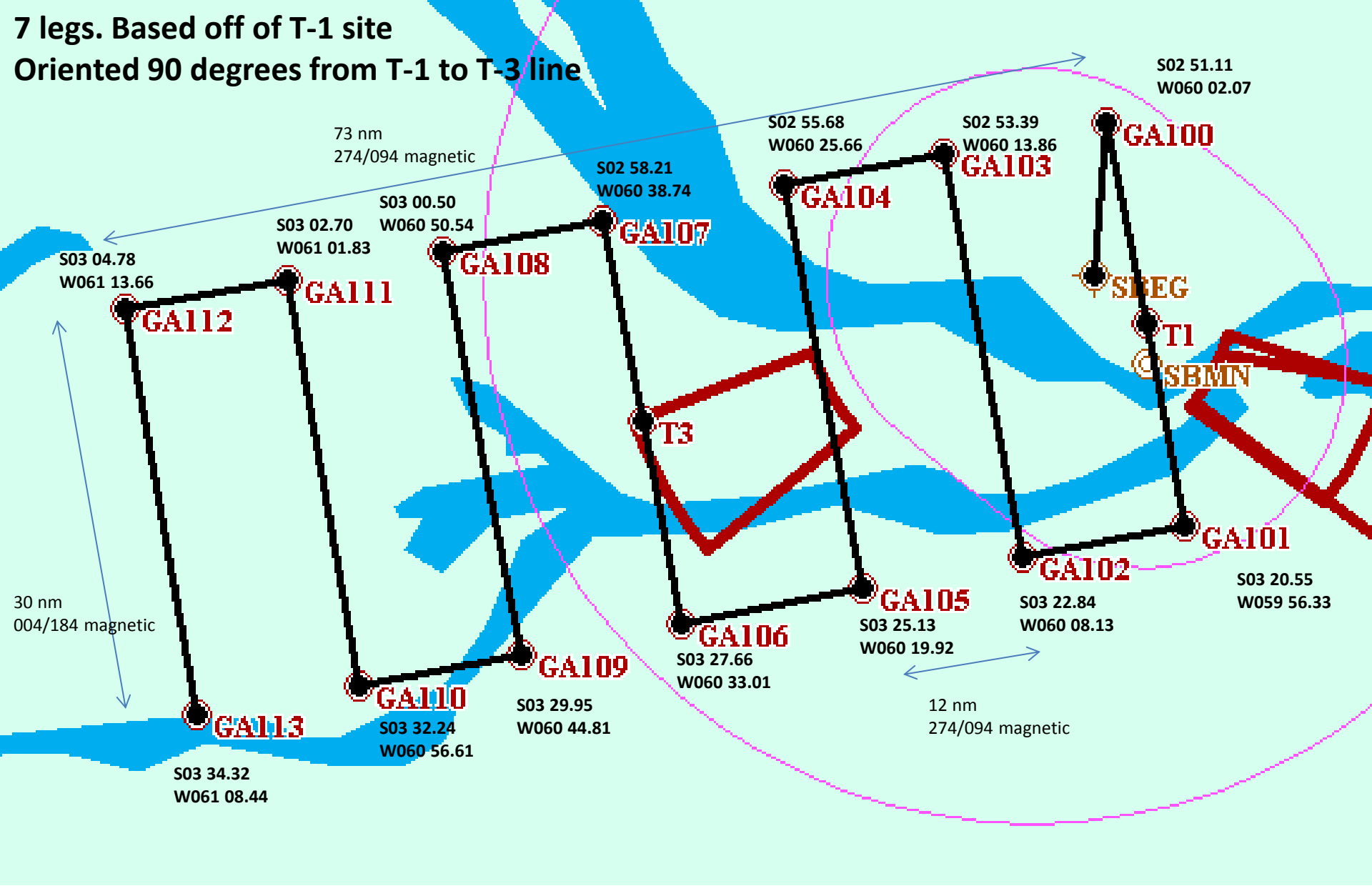
Site Location





Reference: Kuhn, U.; Ganzeveld, L.; Thielmann, A.; Dindorf, T.; Welling, M.; Sciare, J.; Roberts, G.; Meixner, F. X.; Kesselmeier, J.; Lelieveld, J.; Ciccioli, P.; Kolle, O.; Lloyd, J.; Trentmann, J.; Artaxo, P.; Andreae, M. O., "Impact of Manaus City on the Amazon Green Ocean atmosphere: Ozone production, precursor sensitivity, and aerosol load," *Atmos. Chem. Phys.* **2010**, *10*, 9251-9282.

18 March 2013, T3

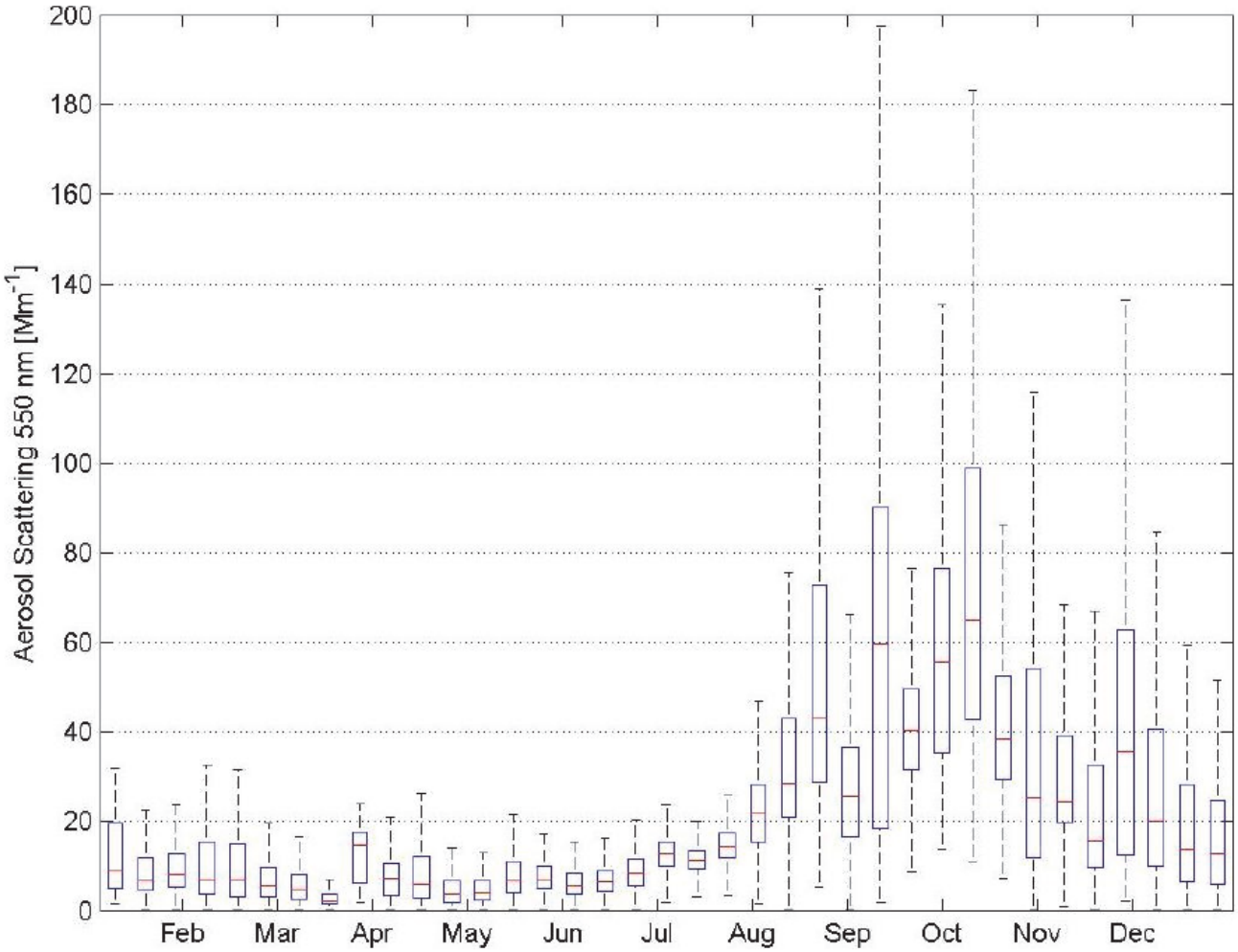


IARA – Intensive Airborne Research in Amazonia

Flight Plan #7

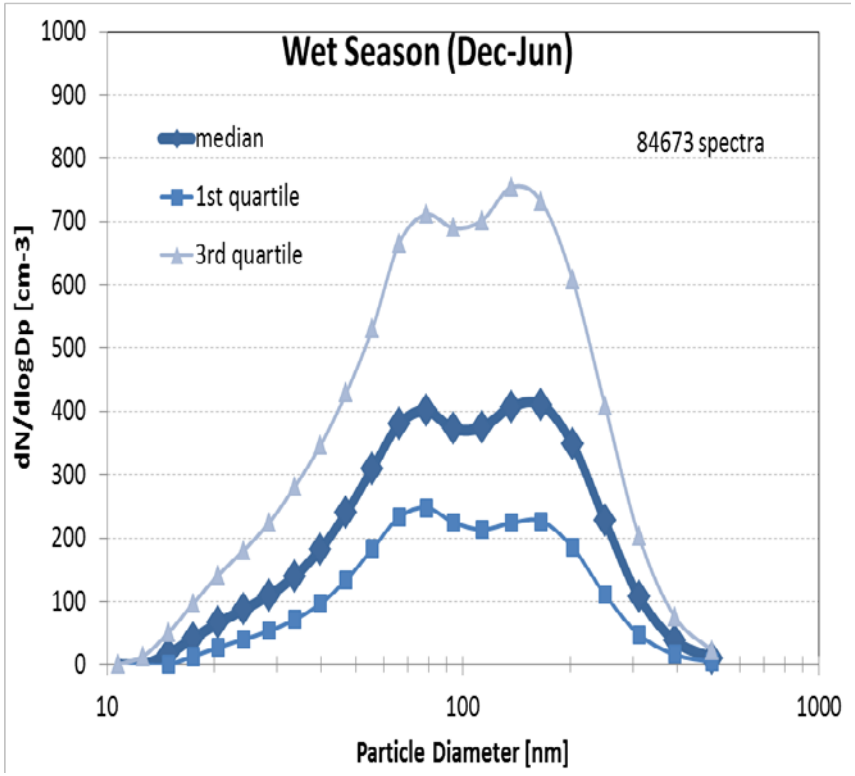
1:35 to complete one pattern.

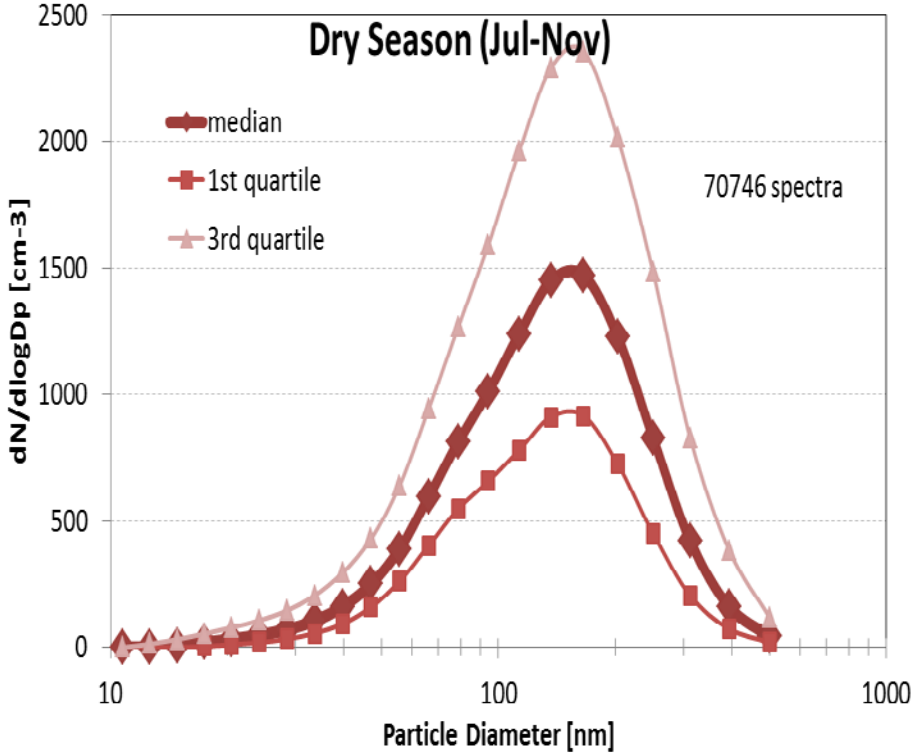
TT34 seasonality of scattering and absorption



Particle scattering coefficients at 550nm between February 2008 and May 2011. Statistics were calculated for each 10 Julian days. Source: P. Artaxo, L. Rizzo.

TT34 aerosol size distributions 2008-2011





Fit Parameters for median size distributions (Source: P. Artaxo, L. Rizzo)**:**

	Ultrafine mode			Aitken mode			Accumulation mode		
	N1 [cm-3]	Dpg1 [nm]	sg1	N2 [cm-3]	Dpg2 [nm]	sg2	N3 [cm-3]	Dpg3 [nm]	sg3
Wet season (Dec-Jun)	121	**34.9**	0.28	314	**71.0**	0.20	403	**163.5**	0.24
Dry season (Jul-Nov)				926	**117.3**	0.36	699	**175.9**	0.22