Physics 122H - Discussions

Tuesdays 8:30-10:20AM

Tutorial Room 226

From Catalog: This course emphasizes electricity, magnetism, heat and thermodynamics. Topics include Coulomb's law, Gauss's law, electric fields and electric potential, currents, simple circuits and Kirchhoff's laws, generation of magnetic fields by charges in motion, electromagnetic induction, magnetic materials, oscillatory circuits, temperature, heat and the laws of thermodynamics. Prerequisite: PHYS 121.

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Room 429

Course Webpage: http://userpages.umbc.edu/~martins/phys122H

Syllabus: same as Phys 122

Phys 122 Grade

Type of Assignment	Maximum Points
In Class Participation & Quiz	**20** (5.00%)
Discussion (scaled to)	**60** (15.0%)
Homework (scaled to)	**40** (10.0%)
Exam	**200** (50.0%)
Final Exam	**80** (20.0%)
Total	***400***

Discussion Grading = 15% of Phys 122 grade

- Homework 20 points
- Special projects 20 points
- Class participation and Quizzes 20 points

Topics

- Motivation for Physics Discussions
- Class Demonstrations
- Physics in Nature and daily activities
- Problem Solving
- Advanced Math – Calculus and Differential Equations
- Explore Team work

Undergraduate Research

- Phys 450 course
- UMBC URA and URCAD

http://www.umbc.edu/undergrad_ed/research/URA/

- Summer internships

UMBC URA and URCAD

Key Dates

- **Monday, February 1, 2010** – First day Undergraduate Research Award proposals will be accepted.
- **Wednesday, March 3, 2010, 5:00 p.m.** – Final deadline for submission of Undergraduate Research Award proposals, including letters of faculty support – We are unable to grant extensions.
- **March 22 – April 2, 2010** – Undergraduate Research Award faculty review committees meet.
- **Tuesday, April 6, 2010** – Applicants are notified of outcomes.
- **Wednesday, April 28, 2010** – The 2010-2011 Undergraduate Research Award Scholars and their advisors are introduced at URCAD.
- **July 1, 2010 – April, 2011** – Award period.

Pay special attention to units:

Ex: Pressure

Definition

1 pascal (Pa) = 1 N/m^2 = 1 $kg/(m \cdot s^2)$[3]

Pressure Units

	pascal (Pa)	bar (bar)	technical atmosphere (at)	atmosphere (atm)	torr (Torr)	pound-force per square inch (psi)
1 Pa	≡ 1 N/m^2	10^{-5}	1.0197×10^{-5}	9.8692×10^{-6}	7.5006×10^{-3}	145.04×10^{-6}
1 bar	100,000	≡ 10^6 dyn/cm^2	1.0197	0.98692	750.06	14.5037744
1 at	98,066.5	0.980665	≡ 1 kgf/cm^2	0.96784	735.56	14.223
1 atm	101,325	1.01325	1.0332	≡ 1 atm	760	14.696
1 torr	133.322	1.3332×10^{-3}	1.3595×10^{-3}	1.3158×10^{-3}	≡ 1 Torr; ≈ 1 mmHg	19.337×10^{-3}
1 psi	6.894×10^3	68.948×10^{-3}	70.307×10^{-3}	68.046×10^{-3}	51.715	≡ 1 lbf/in^2

Example reading: 1 Pa = 1 N/m^2 = 10^{-5} bar = 10.197×10^{-6} at = 9.8692×10^{-6} atm, etc.

http://en.wikipedia.org/wiki/Pascal_(unit)

Motivation for Discussion: The Atmosphere as a Thermodynamic Engine

Cloud Microphysics and Dynamics.

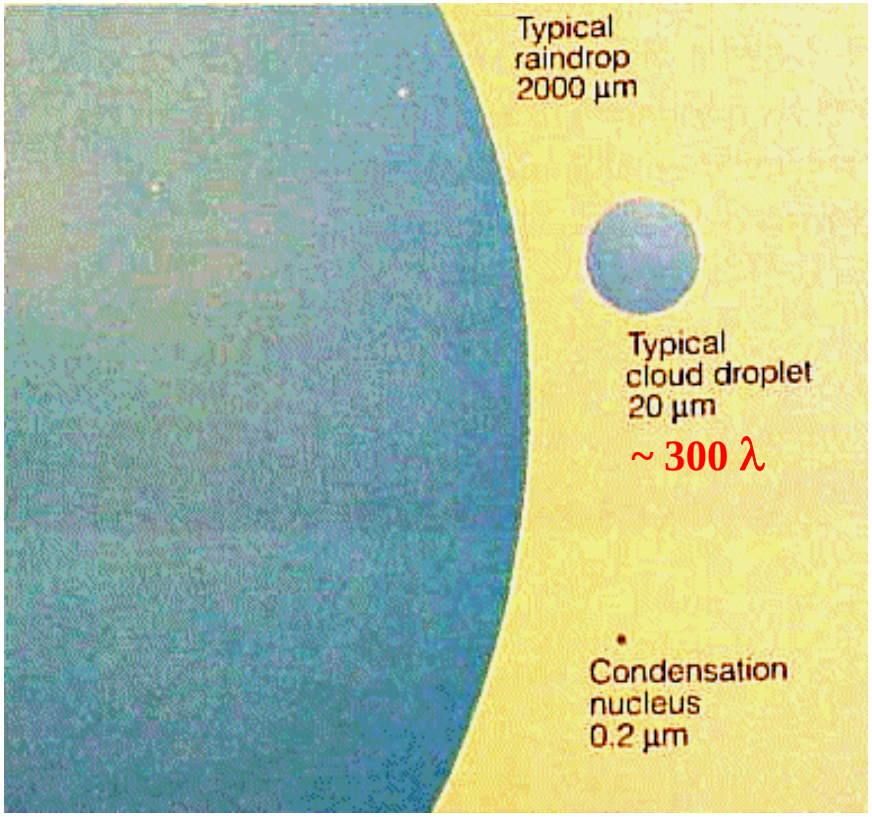
Molecular Mean Free Path: AVG distance between collisions

$$\lambda = \frac{< c >}{\sqrt{2} N \pi \sigma^2 < c >}$$

For air, at 20C and 1 atm:

λ = 0.066μm

Typical Size Scales



Note the different scale for each figure.

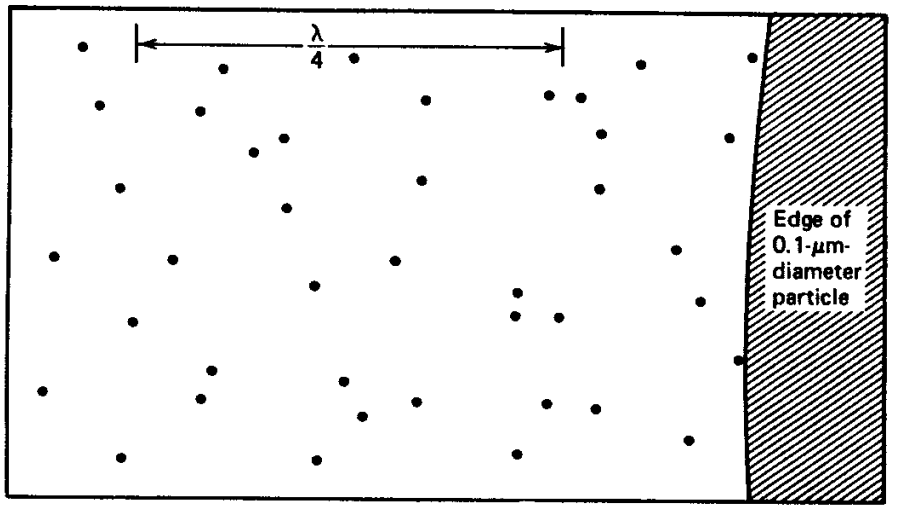
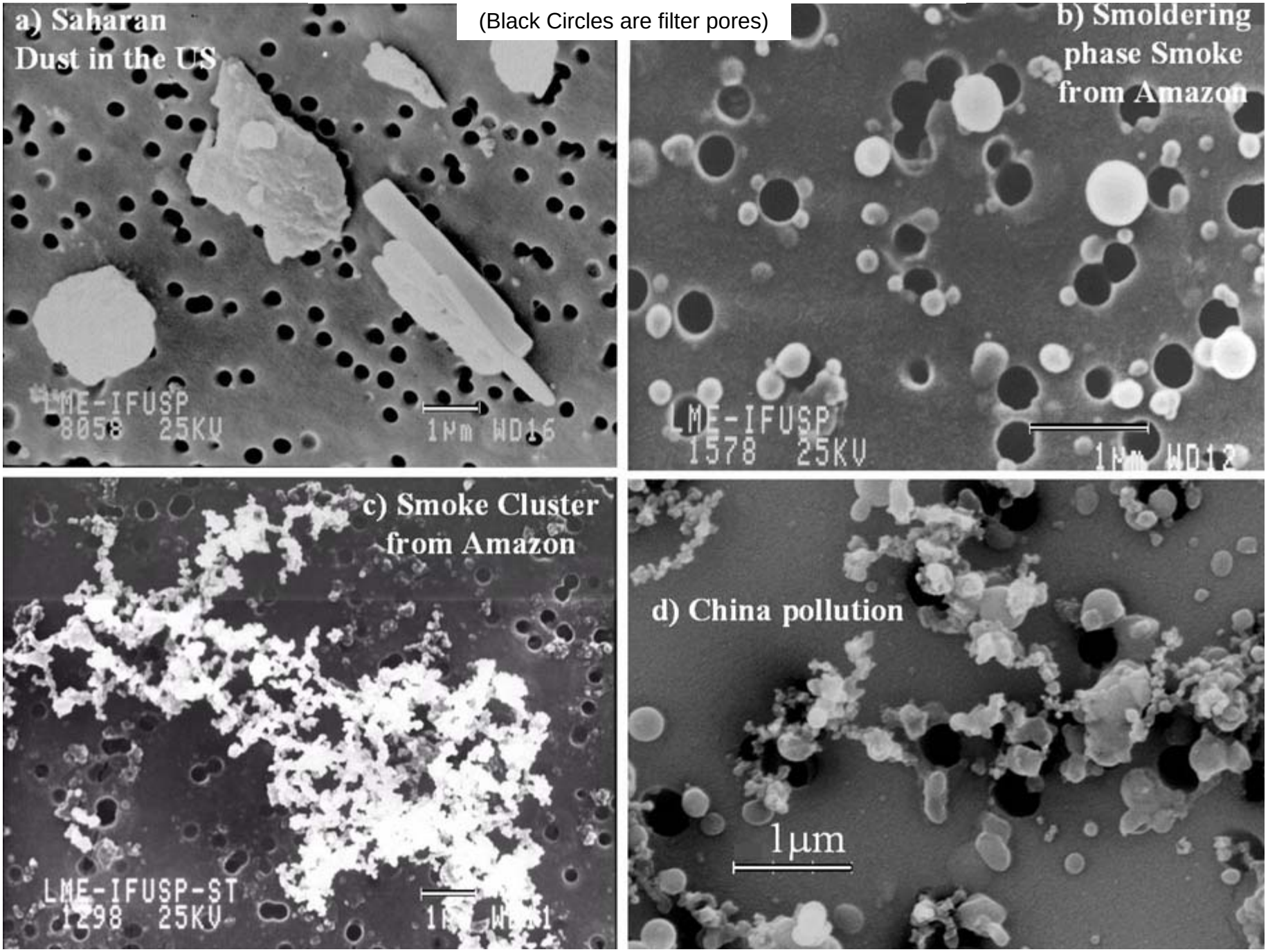


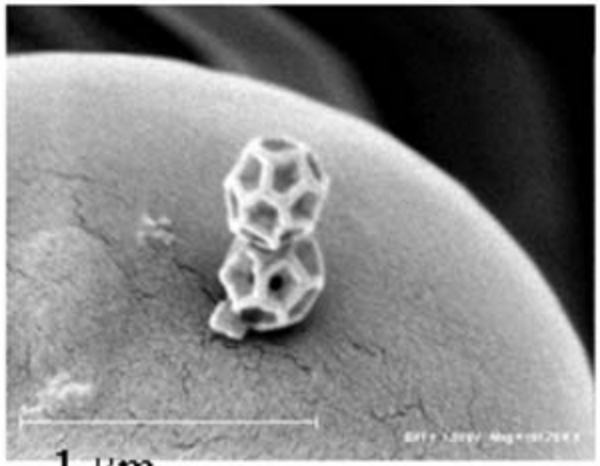
Figure 2.4 Relative size and spacing of air molecules at standard conditions.

Scanning Electron Microscopy of Aerosols:

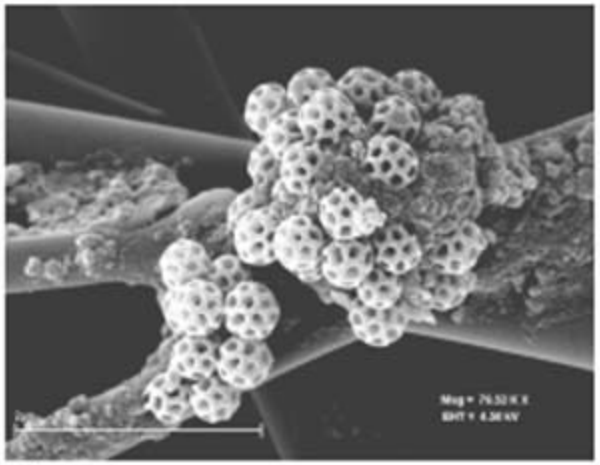
(Black Circles are filter pores)



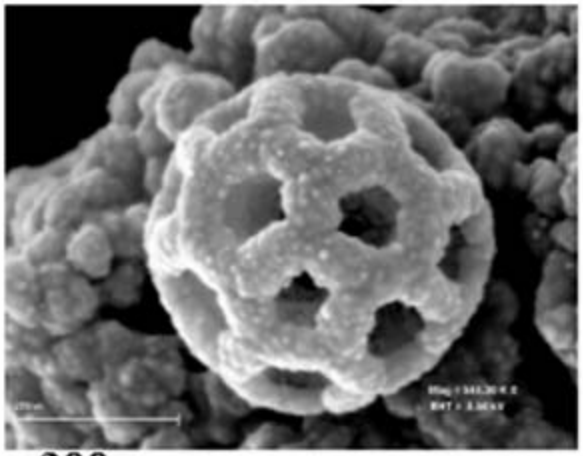
Natural biogenic aerosol particles



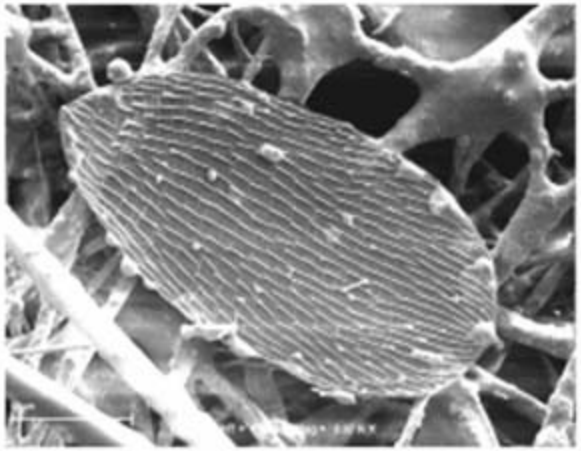
1 μm



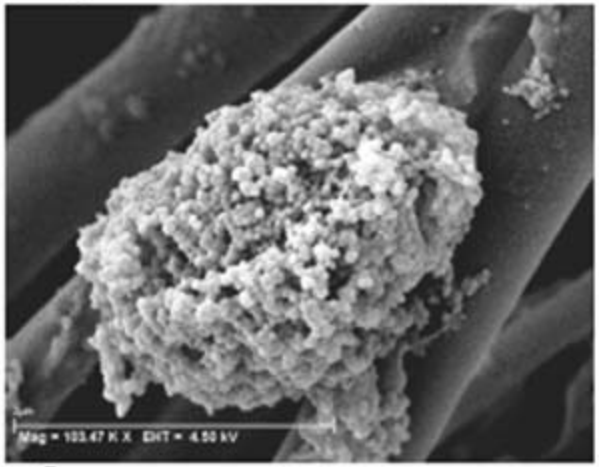
2 μm



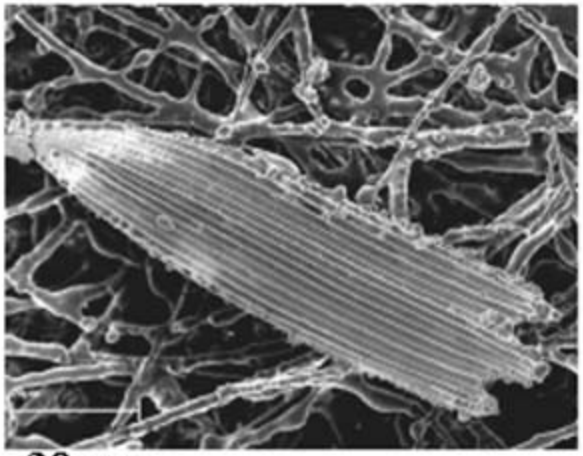
200 nm



10 μm



2 μm



20 μm

EPMA photos from Gunther Helas, MPIC

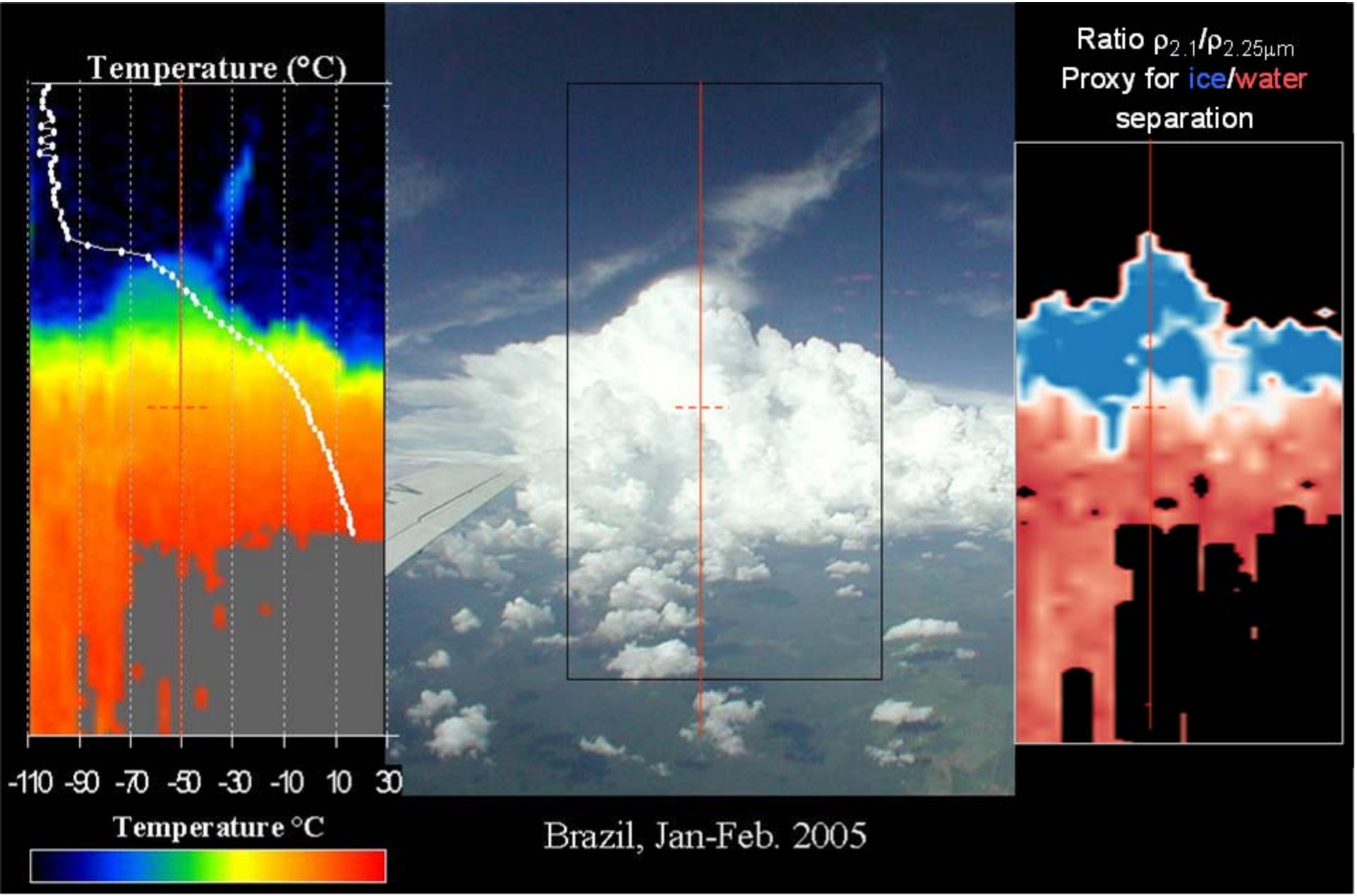
Cirrus Clouds (ice particles)

http://www.clouds-online.com/cloud_atlas/cirrus/images/cirrus_uncinus.htm

Cumulu Nimbus

water droplets and ice particles can be in the same cloud simultaneously

http://www.clouds-online.com/cloud_atlas/cumulonimbus/cumulonimbus.htm



What can we see from the Cloud Side?