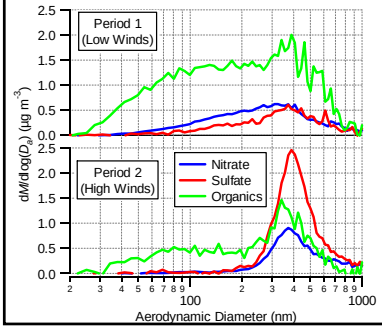
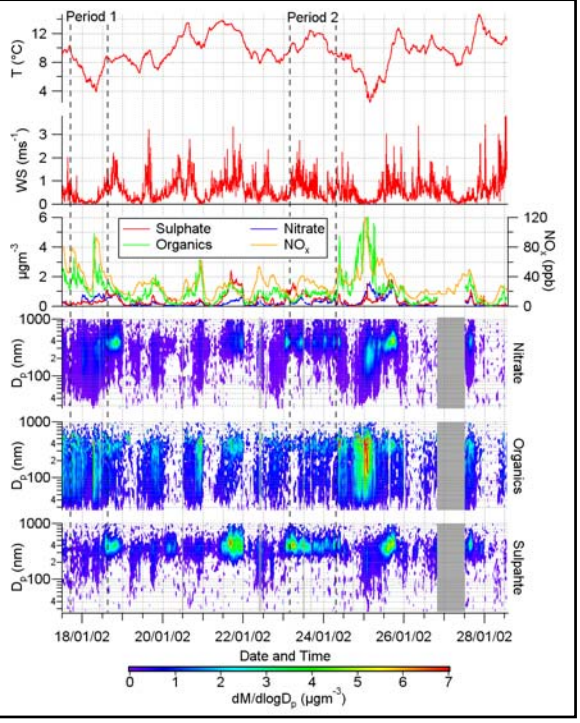
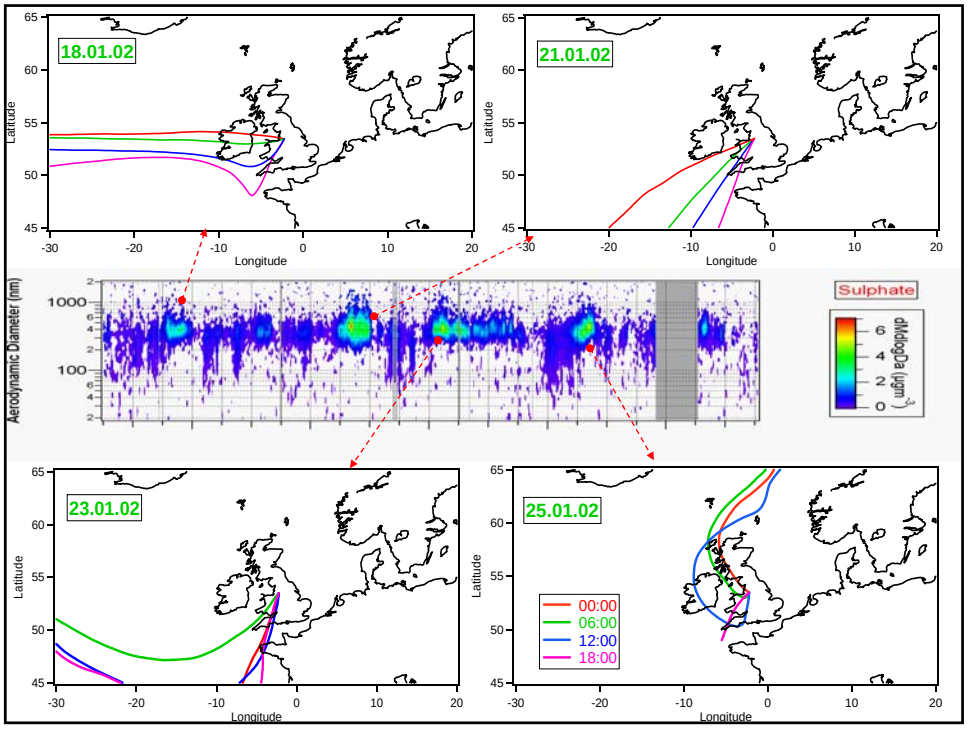
## UMIST AMS FIELD ACTIVITIES

- November 2000 Edinburgh – Central City Urban Measurements
- April 2001- ACE ASIA, Korea, Asian outflow + dust experiment
- June 2001 Manchester -Central City Urban Measurements
- July 2001 PACIFIC 2001 – Lower Fraser Valley, British Columbia, Canada, Urban, suburban, rural sites
- January 2002 Manchester - Central City Urban Measurements
- April 2002 ITCT – CA Coast, marine bkgd and continental, thermal inlet, light scattering, high T heater
- July 2002 Jungfraujoch, CH, Mountaintop site, FT aerosols, aerosol-cloud interactions
- August 2002 NAMBLEX, Ireland, Clean marine site, AMS, Impactors, ATOFMS, HTDMA, wide range of gas phase species and radicals, prediction of thermodynamic state, het loss of nitrogen cycle and halogens. Multi-height measurements to address internal boundary layer development, chamber measurements of UF particles from seaweed.

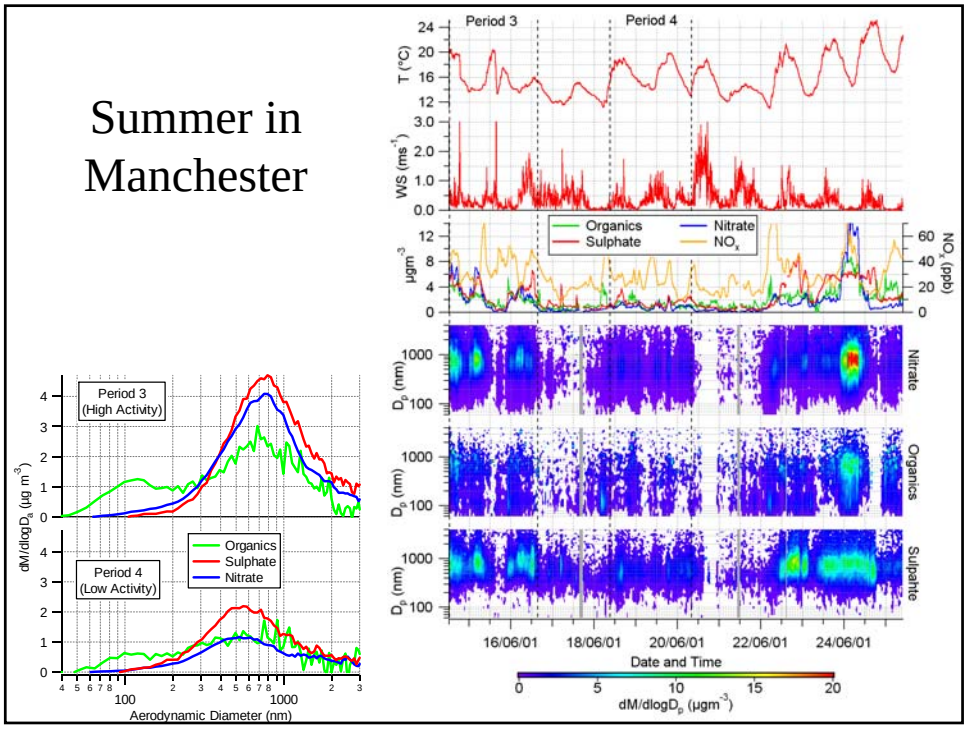
## Winter in Manchester



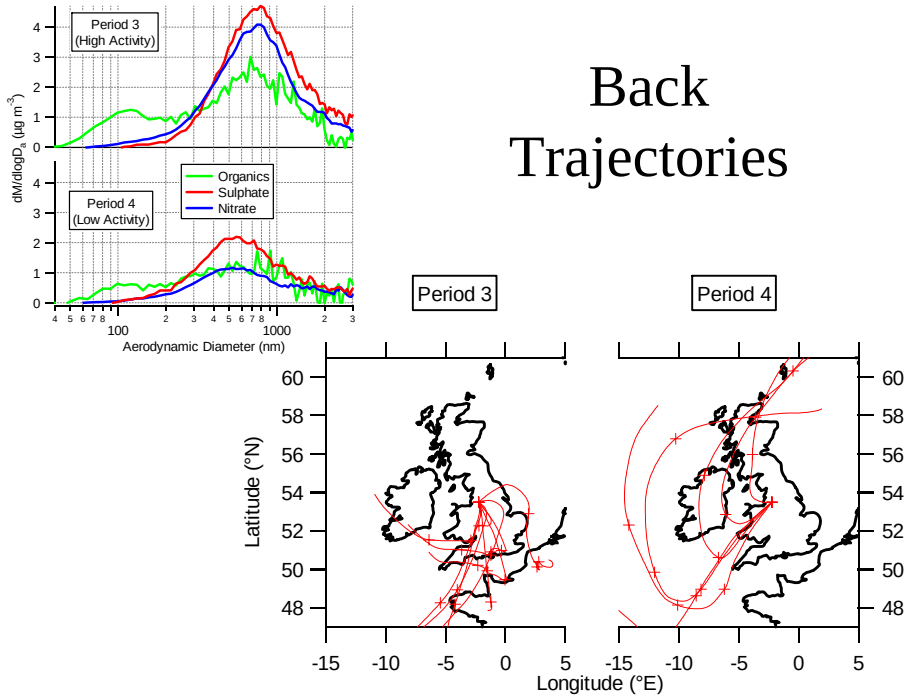





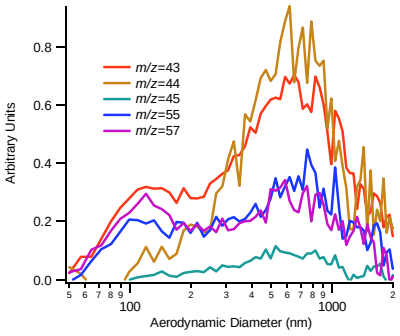

# Summer in Manchester



# Back Trajectories

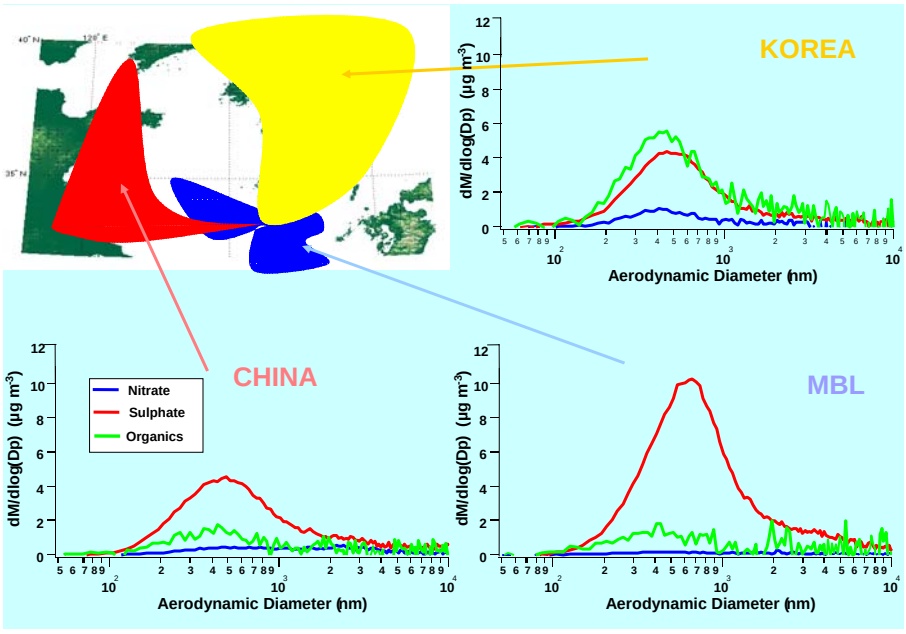


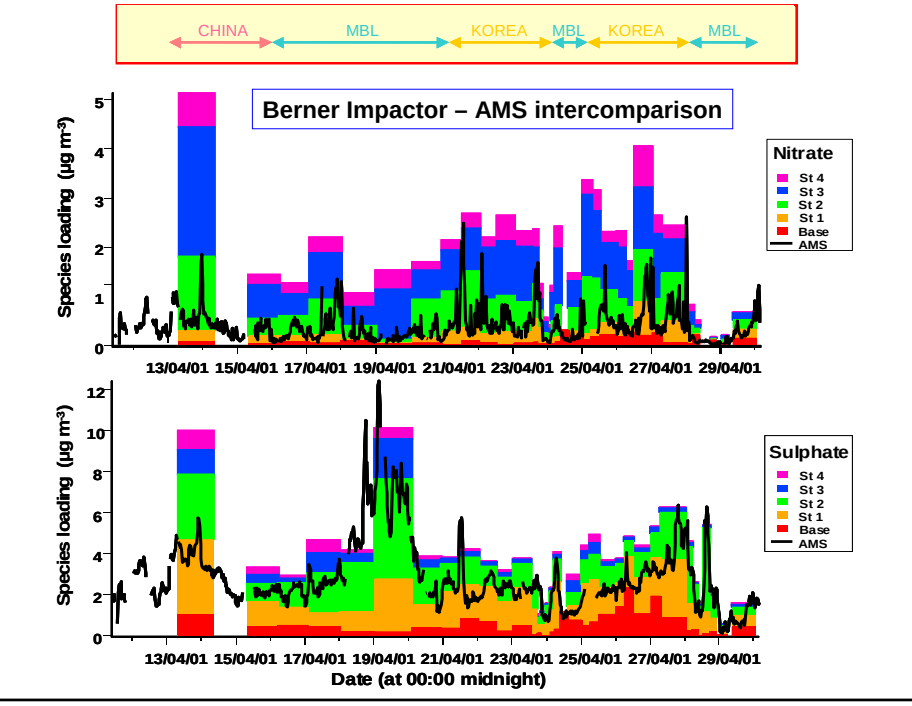

# Comparison of m/z's




| *m/z* | Source | Peak Ratios | |
|---|---|---|---|
| | | January | June |
| 30 | Nitrate | 0.34 | 0.08 |
| 46 | Nitrate | 0.42 | |
| 48 | Sulphate | 0.19 | 0.01 |
| 64 | Sulphate | 0.16 | |
| 98 | Sulphate & Organics | 0.81 | - |
| 15 | Ammonium | 0.49 | 0.09 |
| 36 | Chloride | 0.34 | 0.10 |
| 41 | Organics & Oxidsed Organics | 2.46 | 0.80 |
| 43 | Organics & Oxidsed Organics | 2.23 | 0.52 |
| 44 | Oxidsed Organics | 1.30 | 0.12 |
| 45 | Oxidsed Organics | 1.16 | 0.12 |
| 55 | Organics | 3.59 | 0.92 |
| 57 | Organics | 5.31 | 1.39 |
| 69 | Organics | 3.89 | 1.21 |
| 71 | Organics | 8.00 | 1.49 |
| 83 | Organics | 4.95 | 1.23 |
| 85 | Organics | - | 1.29 |

## AMS : Size Distributions of Major Components

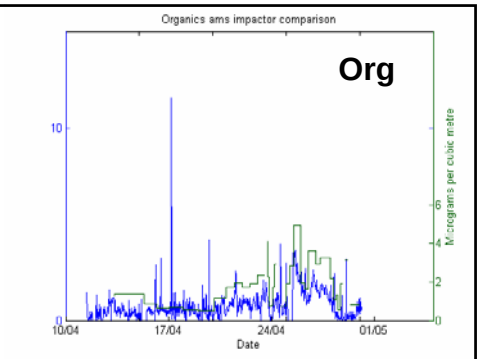


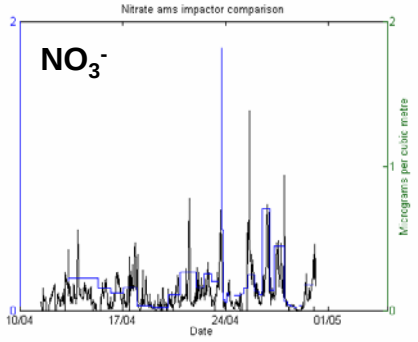



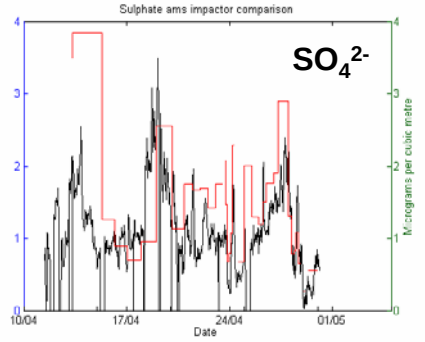
**Berner Impactor – AMS time series intercomparison**

**NB. comparison now over comparable size ranges:**

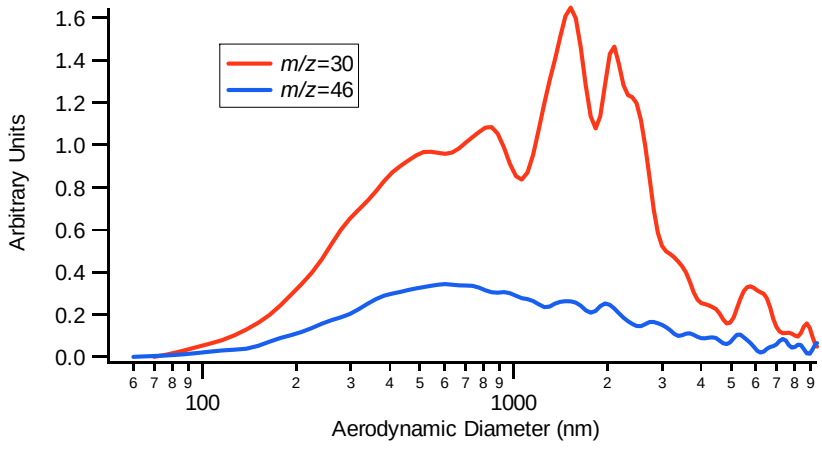
**BI (stage 1) and AMS 0.2-0.5µm**



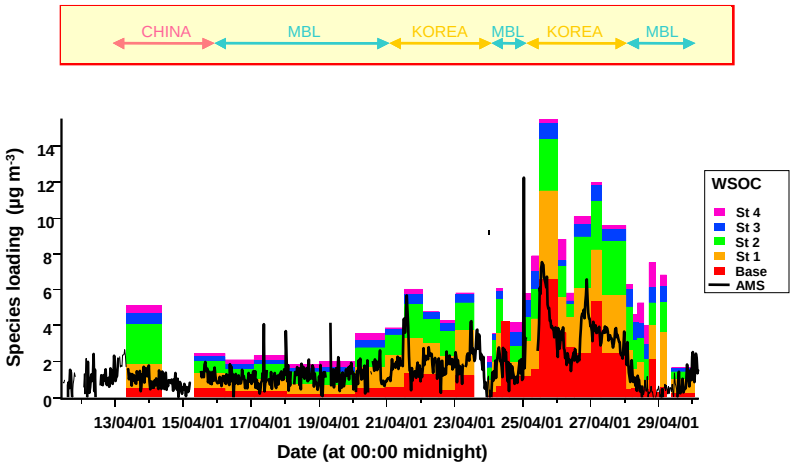




**Comparison of AMS nitrate mass fragments 30 and 46**

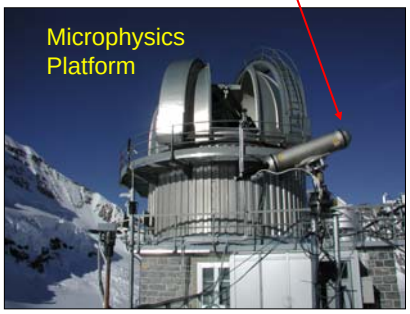


## Berner Impactor – AMS intercomparison for WSOC and Organics

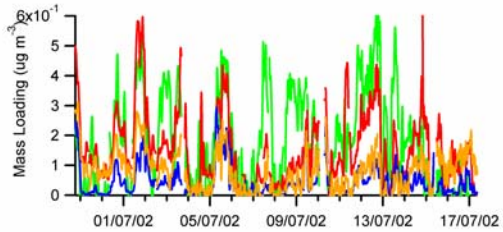



## Experiment Site:Sphinx Observatory, Jungfraujoch ~12,000 ft

Aerosol Inlets: Total & Interstitial. CPC, OPC DMPS HTDMA AMS Carbon



## Data from the Total Inlet



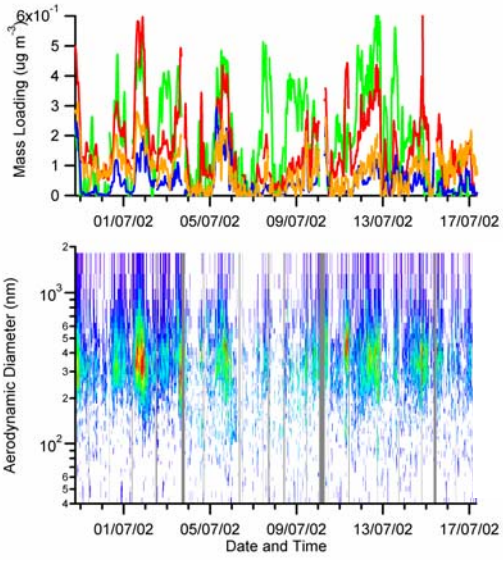

**Organics**

**Sulphate**

**Nitrate**

**Ammonium**

## Data from the Total Inlet



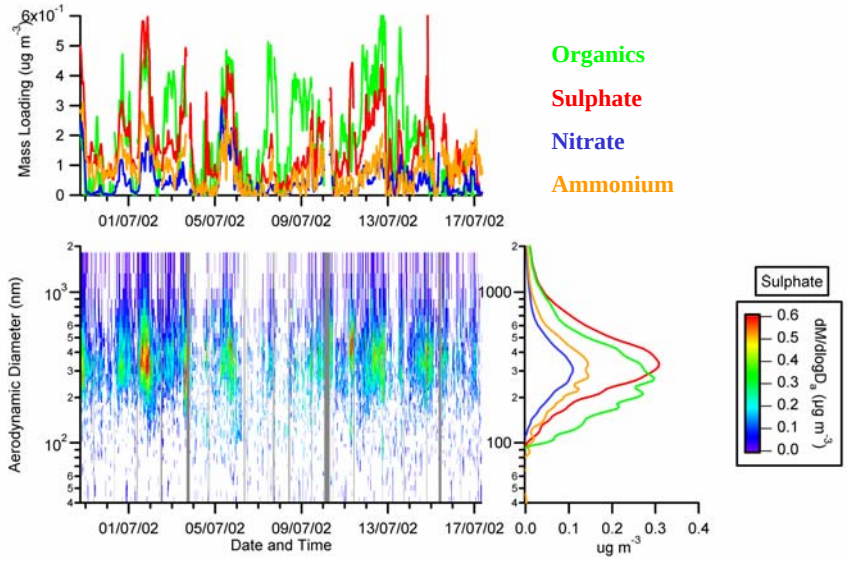

**Organics**

**Sulphate**

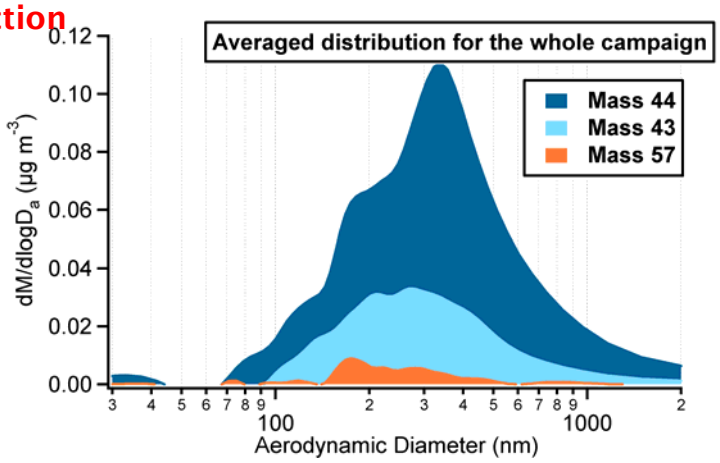
**Nitrate**

**Ammonium**

## Data from the Total Inlet

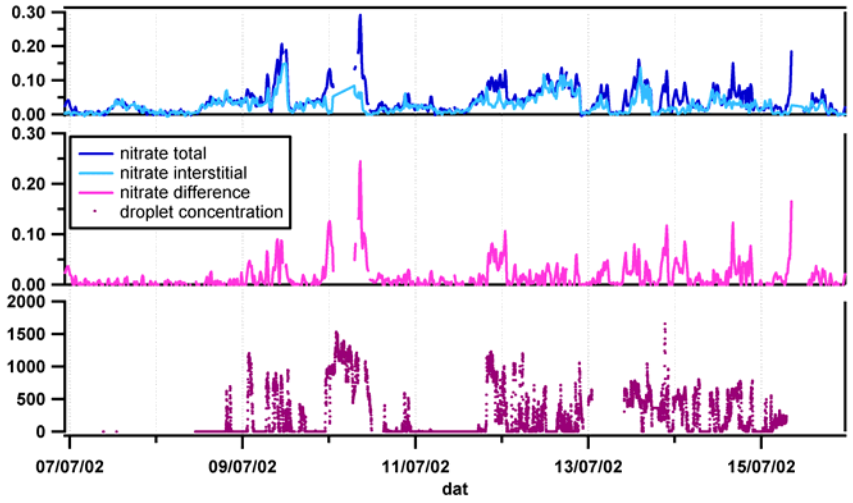



## The size distribution of the organic fraction

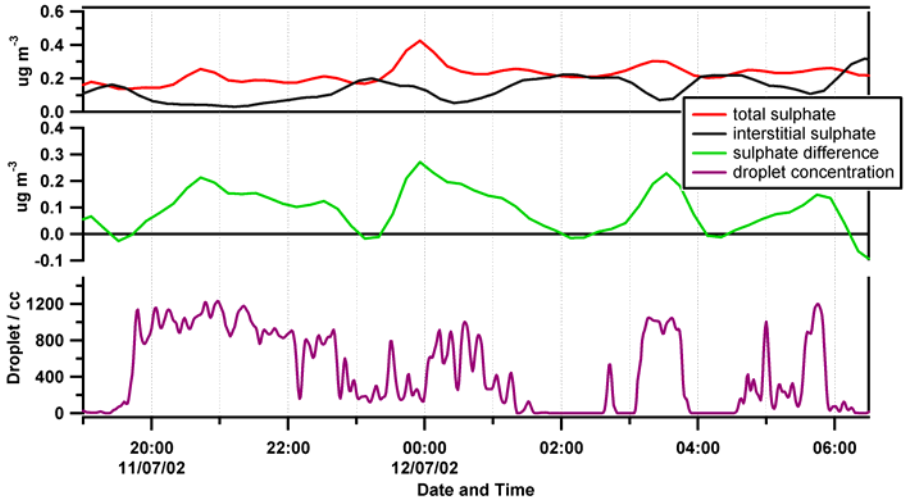



*The largest contribution to the organic mass is from m/z=44, $CO_2^+$.
*Masses arising from oxidised organic fragmentation all have similar size distributions.
*There is little contribution to the total organic mass from masses typical of unoxidised aliphatic fragmentation e.g. m/z = 57

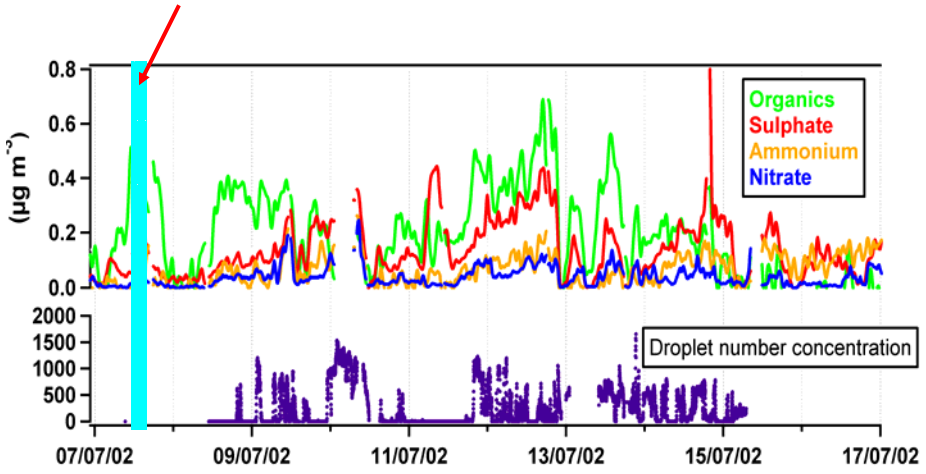
## Differences between the sample inlets in and out of cloud: Nitrate



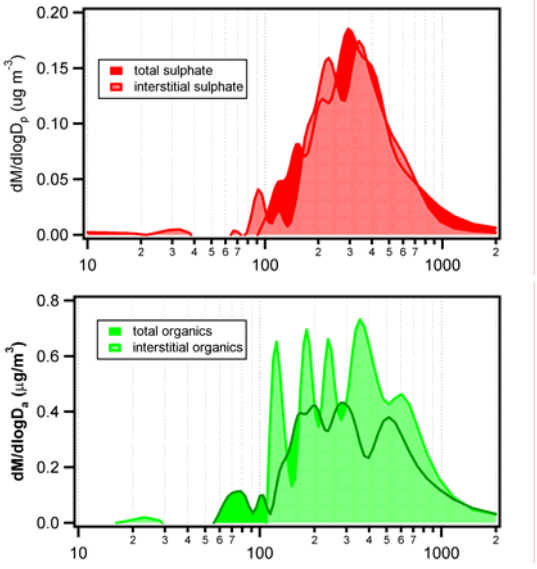

## Differences between the sample inlets in and out of cloud: Sulphate



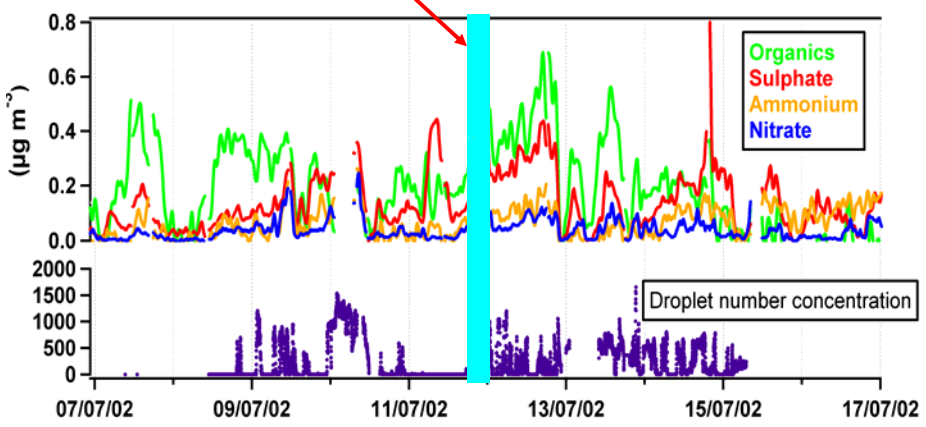
## Run 6: An example of an out of cloud size distribution

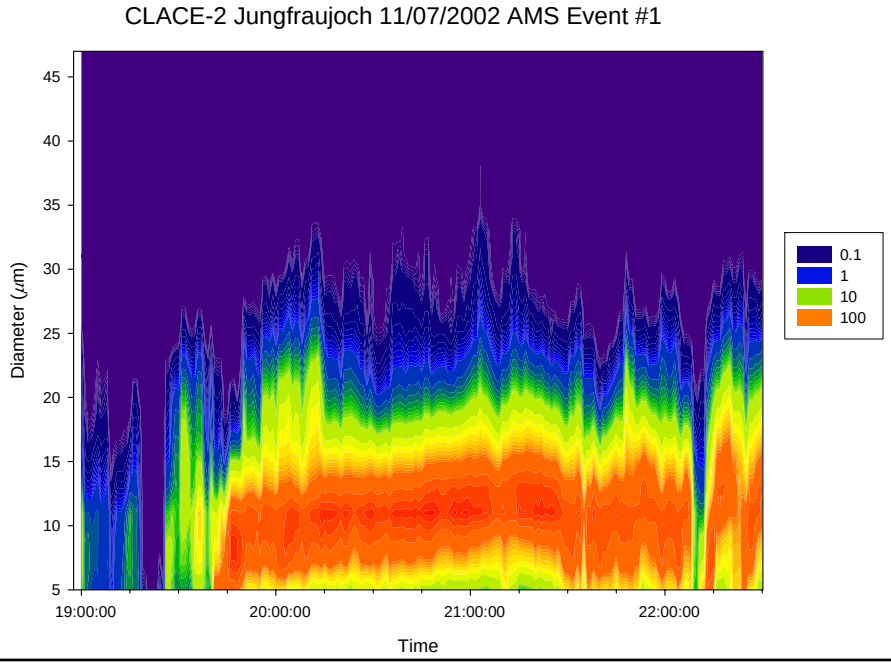



## Run 6: An example of an out of cloud size distribution



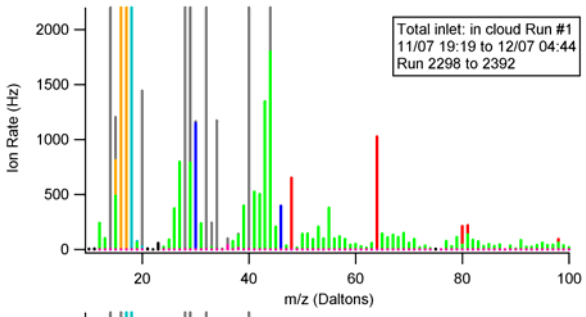
## Run 1: An example of high cloud droplet number and low droplet mean radius



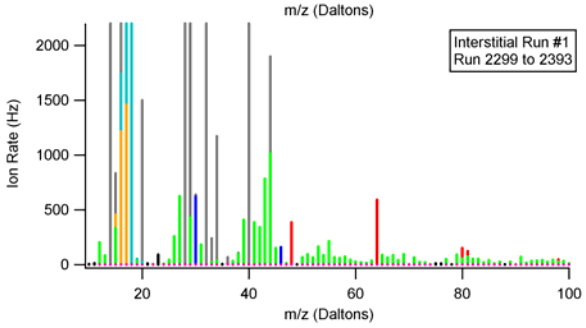



## *Run #1: Mass Spectra from the total and interstitial Inlets*

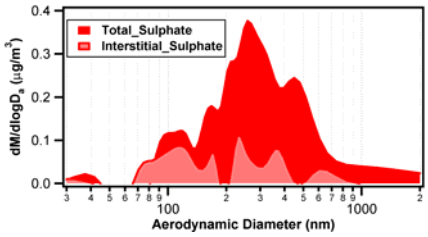
*Total*

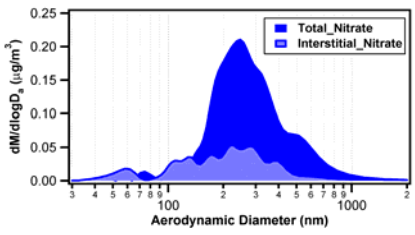



*Interstitial*

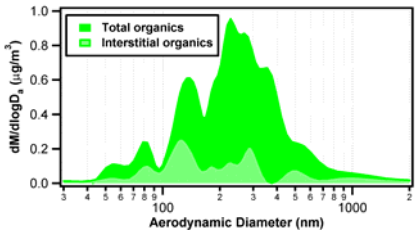



## Run 1: An example of high cloud droplet number and low droplet mean radius

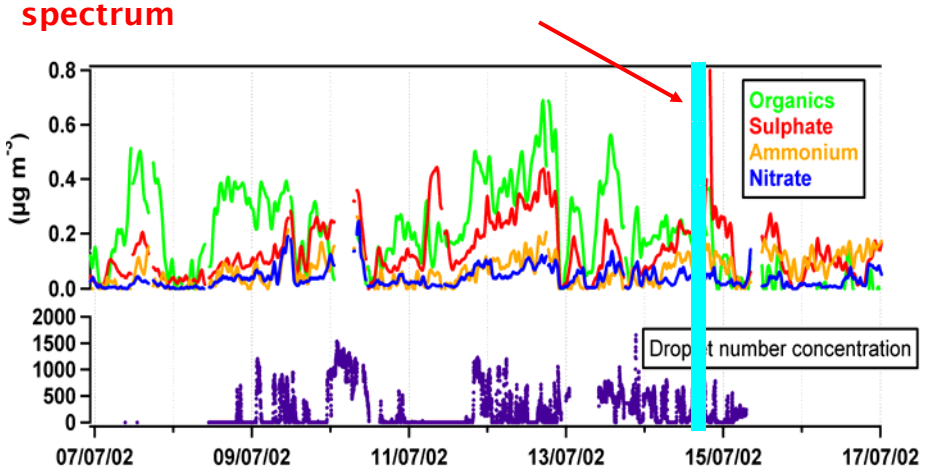


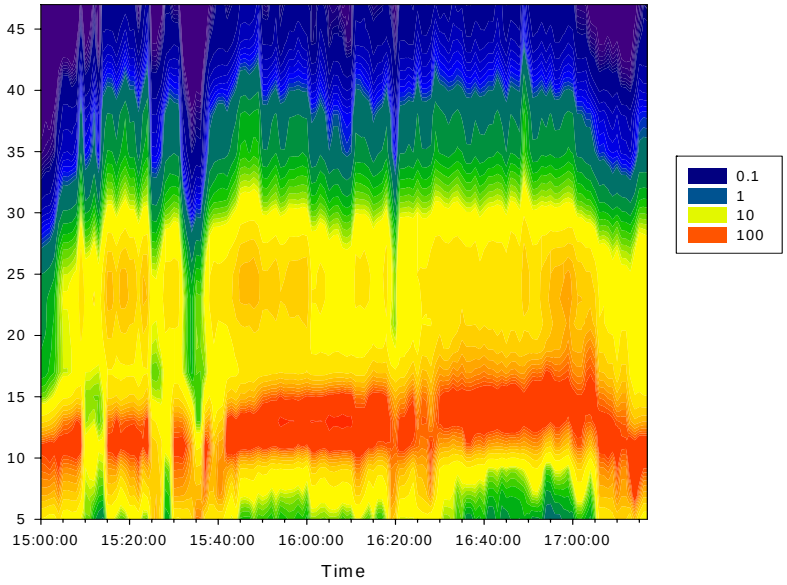

- Most sulphate, organic and nitrate activated
- Little sulphate or nitrate activated below 100 nm
- Mass distributions peak at 300 nm, implying large numbers of small particles
- Organic material activated below 100 nm



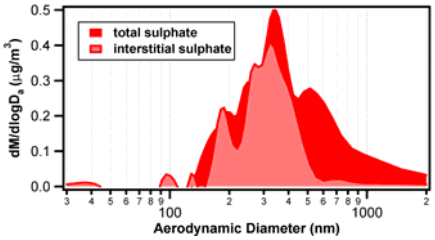
## Run 3: An example of a bimodal cloud droplet spectrum

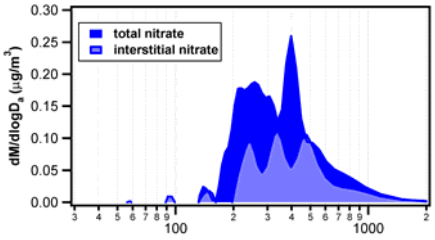


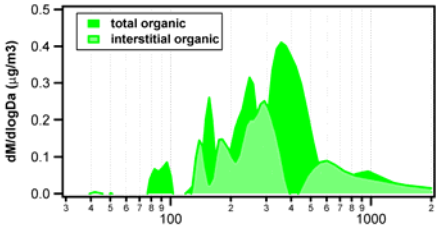

## CLACE-2 Jungfraujoch 14/07/2002 AMS Event #3



## Run 3: An example of a bimodal cloud droplet spectrum

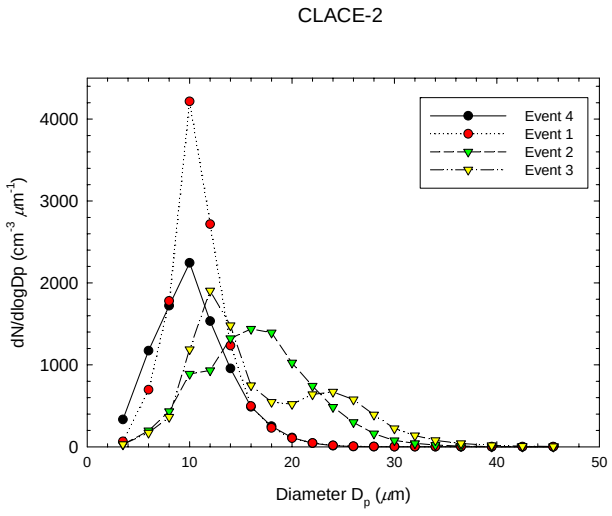


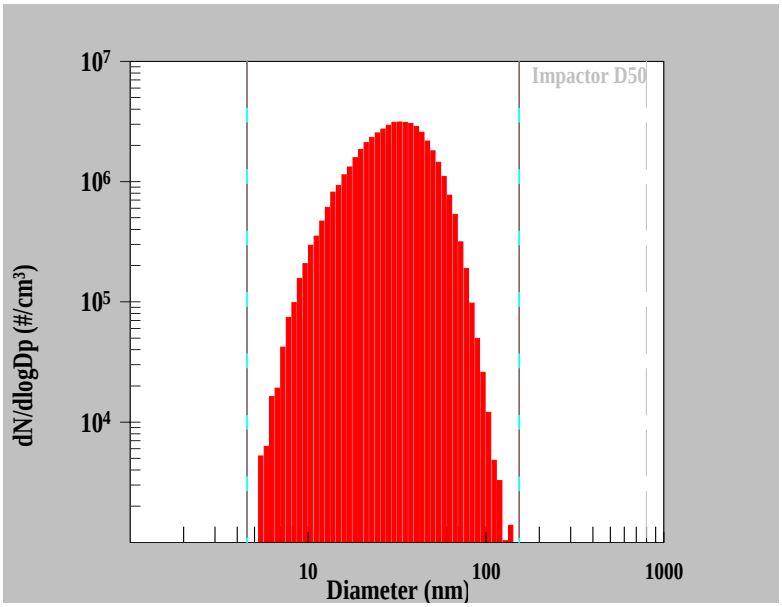

- Little sulphate mass activated below 400 nm
- Considerable activated sulphate mass activated around 600 to 1000 nm
- Bimodal mass distribution peak at 300 nm and 600 nm.
- Organic and nitrate material activated at 400 nm and below

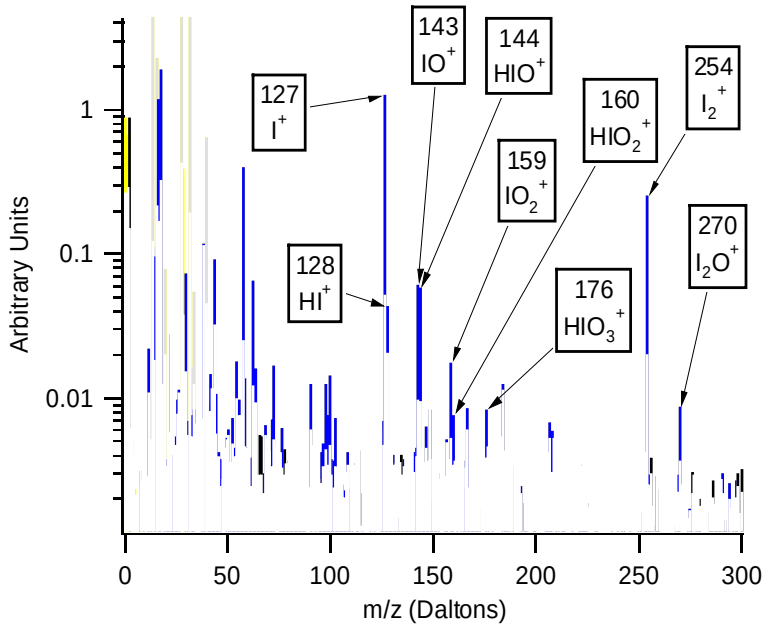
## Bimodality in the cloud droplet spectrum:




High droplet numbers with a mean droplet diameter of around 10 um are found when substantial aerosol mass loadings are present.

A larger mode is also sometimes observed, usually associated with a sulphate mass mode at around 600 nm.


Impactor D50
dN/dlogDp (#/cm³)
10⁷
10⁶
10⁵
10⁴
10
100
1000
Diameter (nm)


Arbitrary Units
1
0.1
0.01
127 I⁺
128 HI⁺
143 IO⁺
144 HIO⁺
159 IO₂⁺
160 HIO₂⁺
176 HIO₃⁺
254 I₂⁺
270 I₂O⁺
0
50
100
150
200
250
300
m/z (Daltons)