## An Overview of Black Carbon Observations During HIPPO

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# Outline

- Context for and published results on HIPPO BC measurements
- Comparison of loadings during 5 phases
- Seasonal behavior of latitudinal average vertical profiles
- Mass distribution variations during H4 and H5
- Case studies
  - S. Hemisphere loadings during H4
  - Eastward excursion during H5
- Conclusions

### BC in the global atmosphere



### **HIPPO I Model Intercomparison**

Similar set of **AEROCOM** models to Koch study using 2000 inventory underestimated HIPPO I BC by a factor of ~5.

Pressure (hPa)



H1 – January



H3 – April

![](_page_5_Figure_2.jpeg)

H4 – June

![](_page_6_Figure_2.jpeg)

H5 – August

![](_page_7_Figure_2.jpeg)

#### H2 – November

![](_page_8_Figure_2.jpeg)

### Southern hemisphere source: Biomass burning?

![](_page_9_Figure_1.jpeg)

Torres et al., ACP, 2010

### Northern hemisphere sources: Seasonality of transport and biomass burning?

![](_page_10_Figure_1.jpeg)

>60N

![](_page_11_Figure_2.jpeg)

20N - 60N

![](_page_12_Figure_2.jpeg)

20S – 20N

![](_page_13_Figure_2.jpeg)

![](_page_14_Figure_1.jpeg)

<60S

![](_page_15_Figure_2.jpeg)

## Mass distributions: **HIPPO IV**

Very little geographic variation ۲

d(M)/d(log[D<sub>p</sub>])

8

9

100

Similar to remote distribution from H1

![](_page_16_Figure_3.jpeg)

V<sub>ed</sub> Diameter (nm)

3

4

5

>60N

<60S

20N - 60N 20S - 20N

2

## Mass distributions: **HIPPO V**

Some geographic variation

9

100

V<sub>ed</sub> Diameter (nm)

Slightly different distributions than found during H1

![](_page_17_Figure_3.jpeg)

d(M)/d(log[D<sub>p</sub>])

### Case Study 1: SH loadings during H5

![](_page_18_Figure_1.jpeg)

- Midlevel pollution sampled during RF08 and RF10 (5 days apart)
- Compare particle size and coating state to low-loading case from H4

### Case Study 1: SH loadings during H5

![](_page_19_Figure_1.jpeg)

- Clear structure on RF8 and RF10
- Particles in the pollution layer were less coated
- Particle mass distributions were similar between polluted and clean conditions

![](_page_19_Figure_5.jpeg)

#### Case Study 2: H4 Western excursion

![](_page_20_Figure_1.jpeg)

- H4 RF9 and RF10 can be contrasted with typical Anchorage → Hawaii leg
- Allows us to look at evolution of Asian pollution

### Case Study 2: H4 Western excursion

![](_page_21_Figure_1.jpeg)

- Vertical profile from eastern (AK -> HI) transect shows higher loadings than the western transect.
- Mass distribution is larger in the western transect (180nm) than in the eastern (160nm) and more of the particles are coated (95% vs 50%)
- These measurements likely do not represent simple transport from Asian emissions regions

### Conclusions

- HIPPO BC curtain plots show significant seasonal variability
- Latitudinally averaged seasonal cycles have been generated and will provide useful constraints for global transport models
- Variations are observed in both coating state and particle size