

New Aerosol Diagnostics Package

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Current Status

- Provide users and model developers a quick look at aerosol simulations
- About 200 figures + budget analysis for each aerosol species are generated by a simple run script (specifying where the climo files are)
- Takes about 3 minutes to complete
- Includes lat-lon plots, lat-height plots, scatter plots, vertical profile plots, seasonal cycle plots



PNNL Aerosol Diagnostics

Test case: **CAM5_1deg**

Control case: **CAM5_2deg**

Model-to-Model Comparison

1. [Aerosol budget](#)
2. [Vertical contour plots of zonal means](#)
3. [Horizontal contour plots](#)

Model-to-Observation Comparison

1. [Scatter plots](#)
2. [Vertical profile plots](#)
3. [Seasonal cycle plots](#)
4. Size distribution plots
5. Satellite simulator plots



Aerosol budget

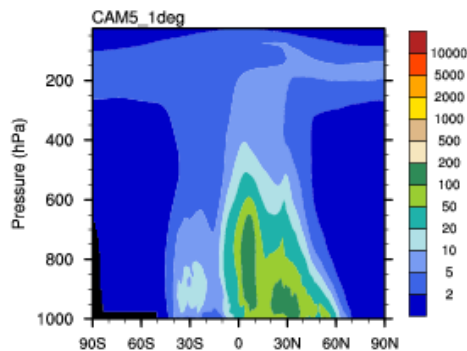
Black carbon	DJF	JJA	ANN
Dust	DJF	JJA	ANN
Primary organic matter	DJF	JJA	ANN
Sea salt	DJF	JJA	ANN
Secondary organic aerosol	DJF	JJA	ANN
Sulfate	DJF	JJA	ANN

S04	CAM5_1deg	CAM5_2deg	difference	rel diff(%)
Sources (TgS/yr)	43.409	43.448	-0.039	-0.090
emission	1.664	1.664	-0.000	-0.011
gas-phase prod	13.772	13.989	-0.218	-1.579
aq-phase prod	27.942	27.764	0.178	0.638
nucleation	0.030	0.030	0.000	0.214
Sinks (TgS/yr)	43.418	43.453	-0.035	-0.081
dry_dep	5.031	5.017	0.014	0.278
wet_dep	38.387	38.436	-0.049	-0.128
Lifetime (days)	5.836	5.877	-0.041	-0.702
Burden (TgS)	0.447	0.447	-0.000	-0.060
accumulation	0.425	0.426	-0.001	-0.190
Aitken	0.014	0.013	0.001	6.327
coarse	0.008	0.008	-0.000	-3.580

Vertical contour plots

- Black carbon
- Dust
- Primary organic matter
- Sea salt
- Secondary organic aerosol
- Sulfate

BC (DJF) (ng/kg)



[JJA](#)

[ANN](#)

[JJA](#)

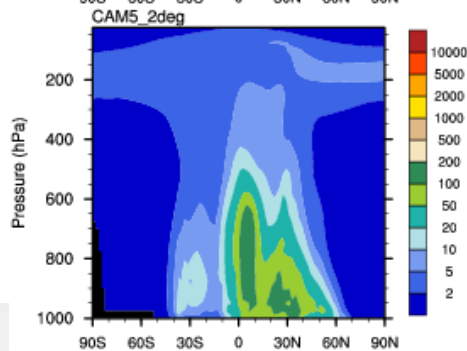
[ANN](#)

[JJA](#)

[ANN](#)

[JJA](#)

[ANN](#)

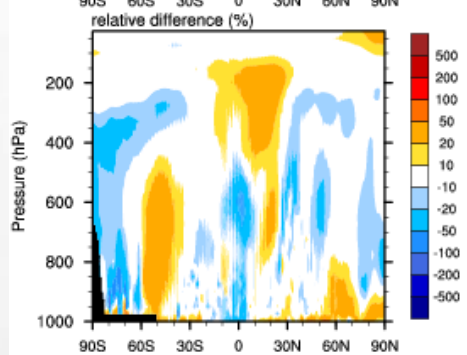
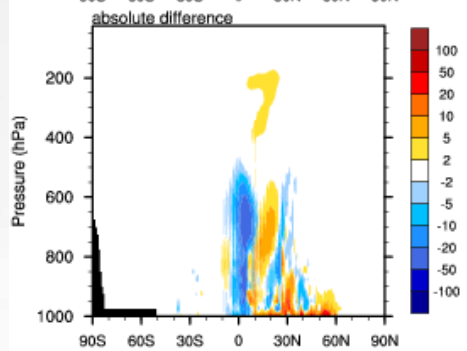


[JJA](#)

[ANN](#)

[JJA](#)

[ANN](#)



Horizontal contour plots

Column-integrated burden

Black carbon	DJF	JJA	ANN
Dust	DJF	JJA	ANN
Primary organic matter	DJF	JJA	ANN
Sea salt	DJF	JJA	ANN
Secondary organic aerosol	DJF	JJA	ANN
Sulfate	DJF	JJA	ANN

Surface

Black carbon	DJF	JJA	ANN
Dust	DJF	JJA	ANN
Primary organic matter	DJF	JJA	ANN
Sea salt	DJF	JJA	ANN
Secondary organic aerosol	DJF	JJA	ANN
Sulfate	DJF	JJA	ANN

850 hPa

Black carbon	DJF	JJA	ANN
Dust	DJF	JJA	ANN
Primary organic matter	DJF	JJA	ANN
Sea salt	DJF	JJA	ANN
Secondary organic aerosol	DJF	JJA	ANN
Sulfate	DJF	JJA	ANN

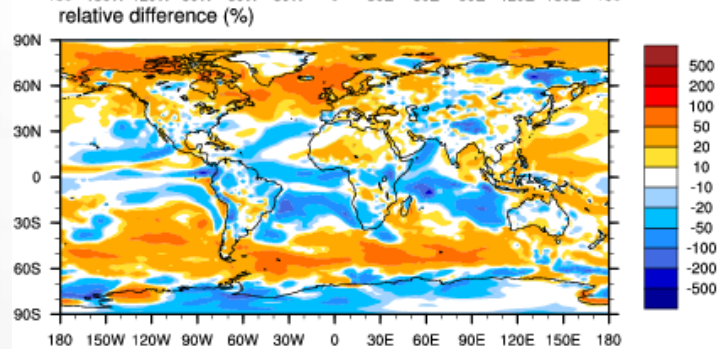
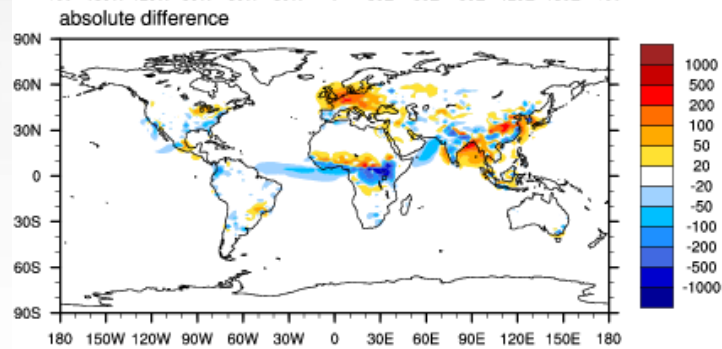
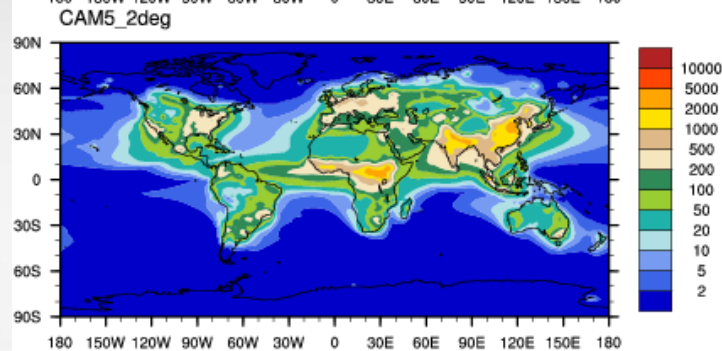
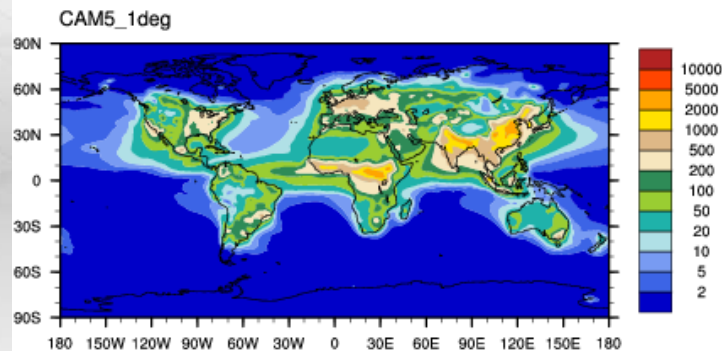
500 hPa

Black carbon	DJF	JJA	ANN
Dust	DJF	JJA	ANN
Primary organic matter	DJF	JJA	ANN
Sea salt	DJF	JJA	ANN
Secondary organic aerosol	DJF	JJA	ANN
Sulfate	DJF	JJA	ANN

200 hPa

Black carbon	DJF	JJA	ANN
Dust	DJF	JJA	ANN
Primary organic matter	DJF	JJA	ANN
Sea salt	DJF	JJA	ANN
Secondary organic aerosol	DJF	JJA	ANN
Sulfate	DJF	JJA	ANN

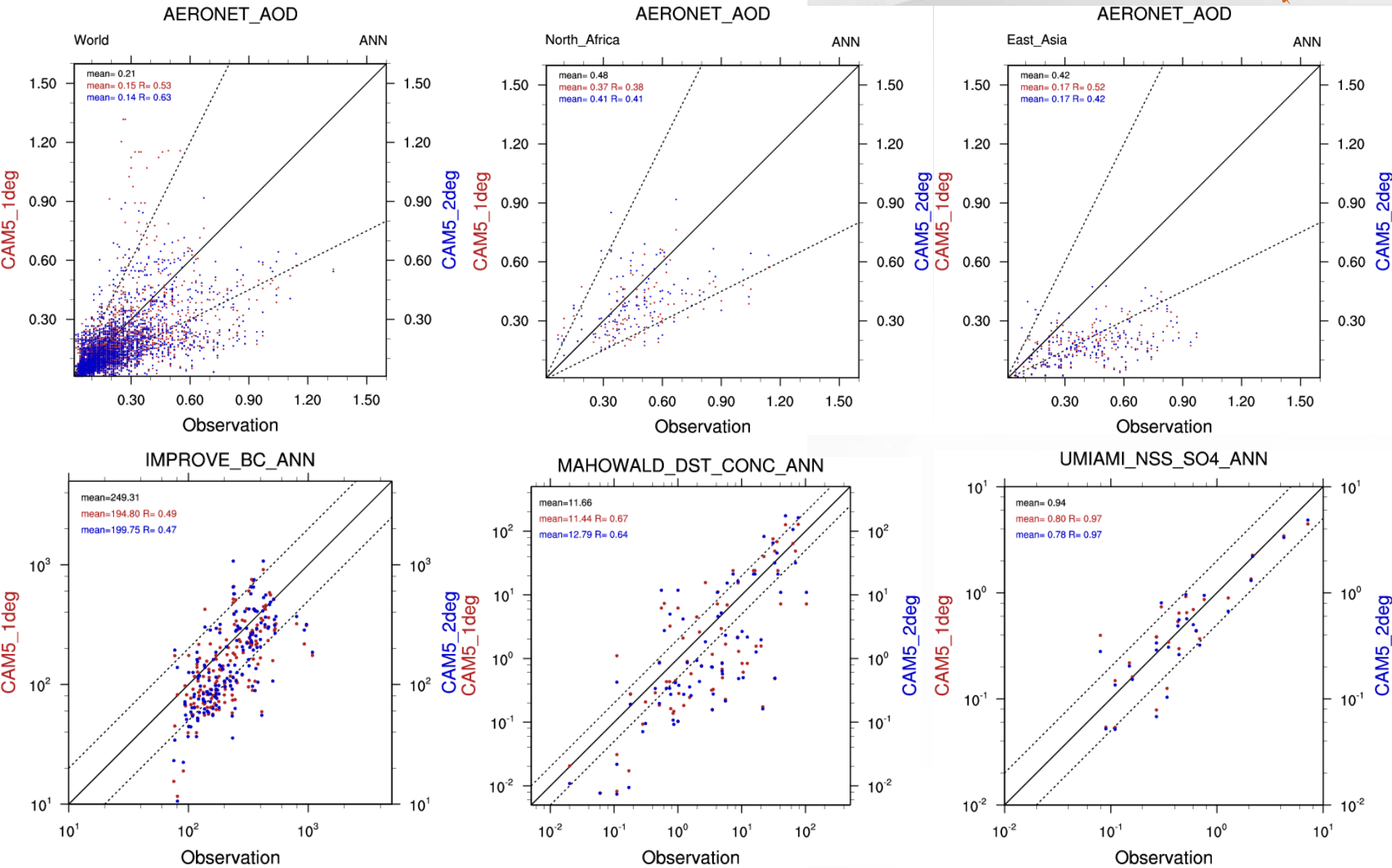
BC (DJF) at surface (ng/kg)



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Scatter plots



IMPROVE sites (1990-2005) [BC](#) [OC](#) [Total SO4](#)

Mahowald (2009) [Dust concentration](#) [Dust deposition](#)

University of Miami marine sites [Non-sea-salt SO4](#) [Sea salt](#)

Vertical profile plots

BC

ARCPAC (2008)

[spring](#)

ARCTAS DC8 (2008)

[spring](#)

[summer](#)

ARCTAS P3B (2008)

[spring](#)

[summer](#)

AVE-Houston (2004)

[au](#)

CARB (2008)

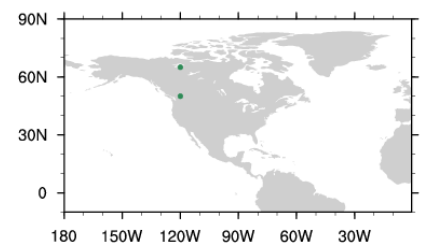
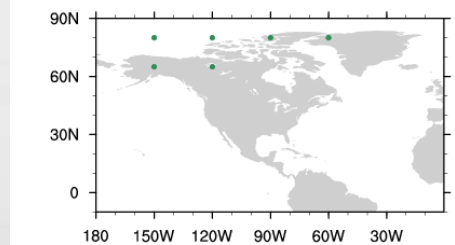
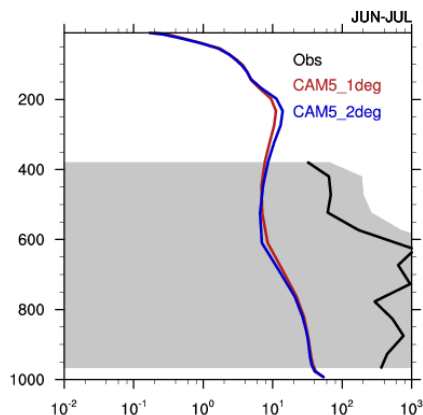
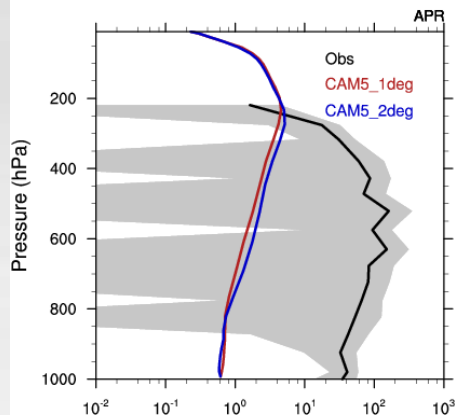
[summer](#)

CR-AVE (2006)

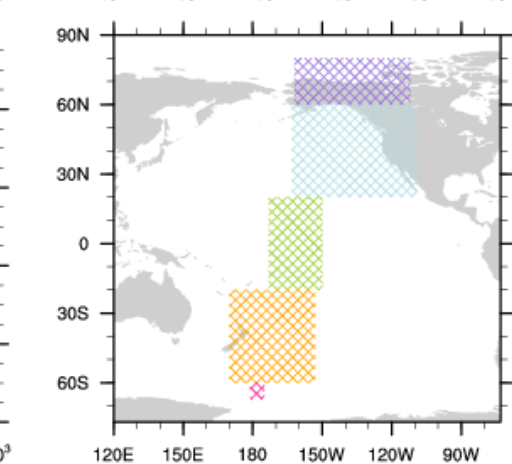
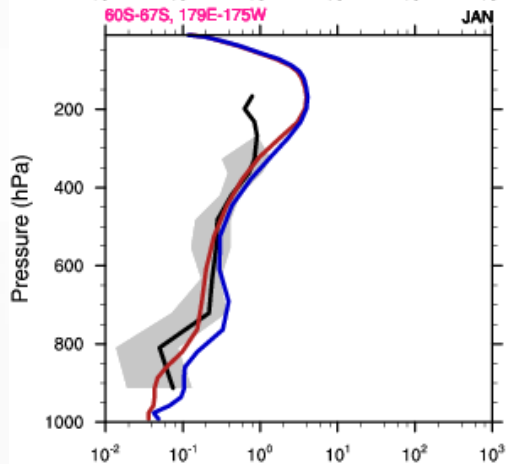
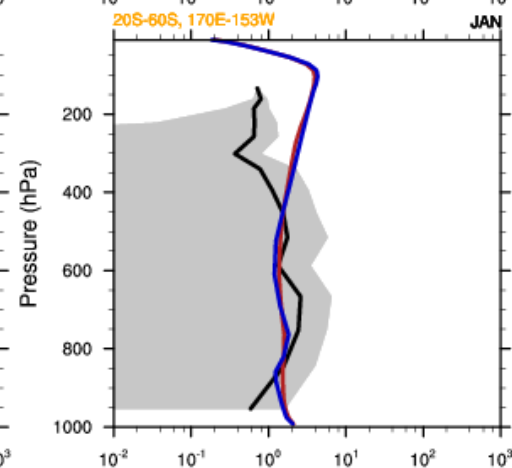
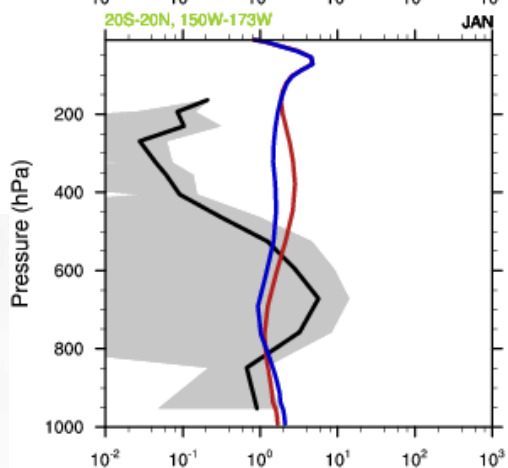
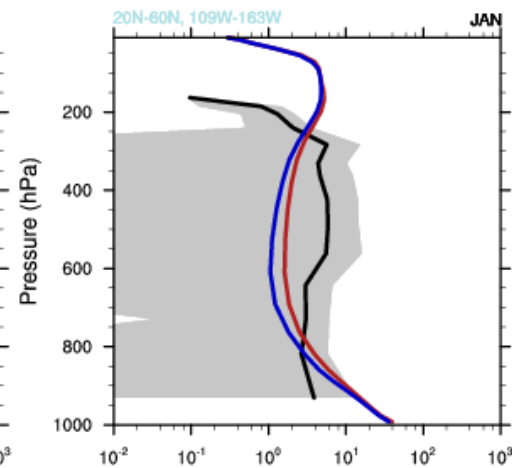
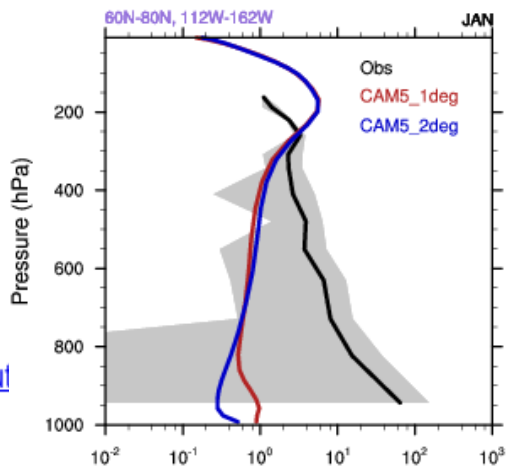
HIPPO (2009)

ARCTAS_DC8_SPRING

ARCTAS_P3B_SUMMER



HIPPO

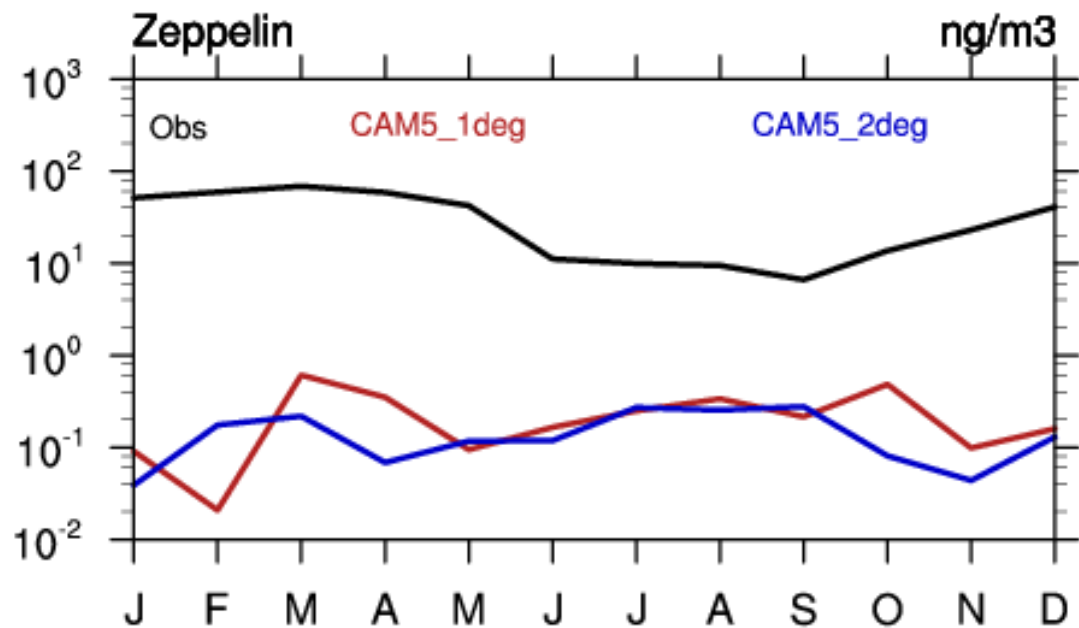
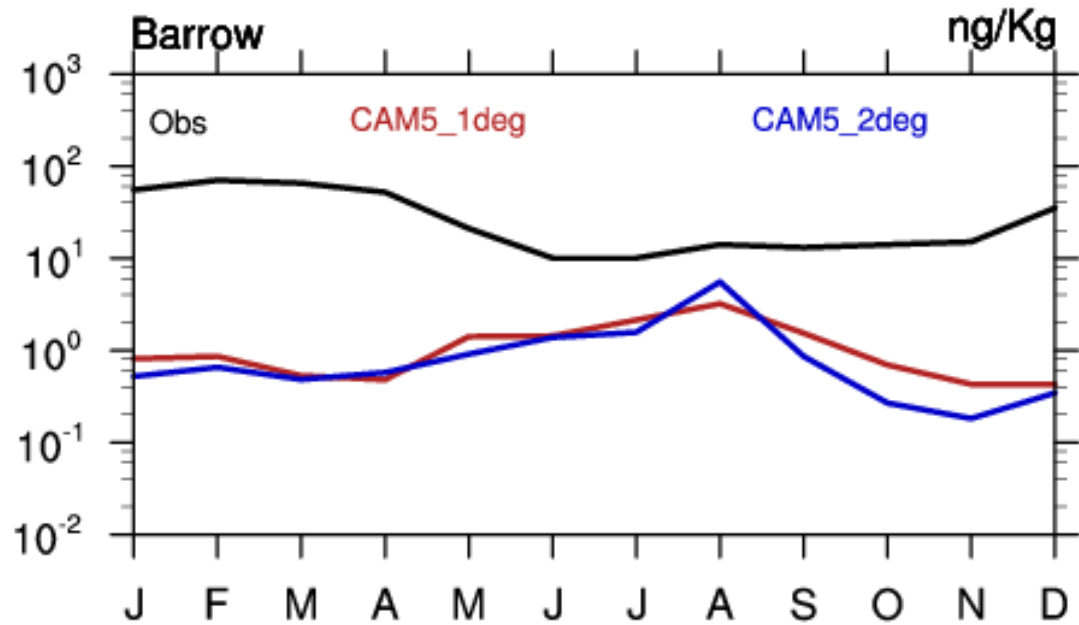


Seasonal cycle plots

BC

Barrow

Zeppelin



To-dos

- More diagnostics (number concentration, size distribution, Taylor diagram, budget for aerosol number, etc.)
- Obtain consent from owners of the observational datasets
- Compatibility with MAM7 and BAM (and perhaps also sectional aerosols?)
- Merge with chemistry (trace gases) diagnostics and eventually merge into the AMWG diagnostics package

We appreciate your input!!