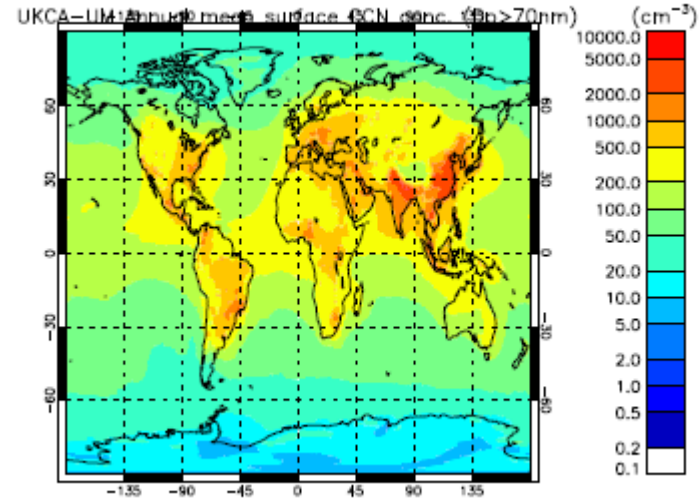
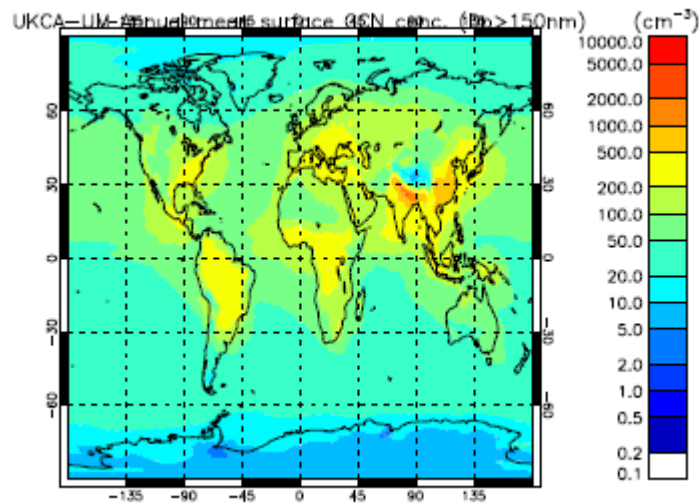
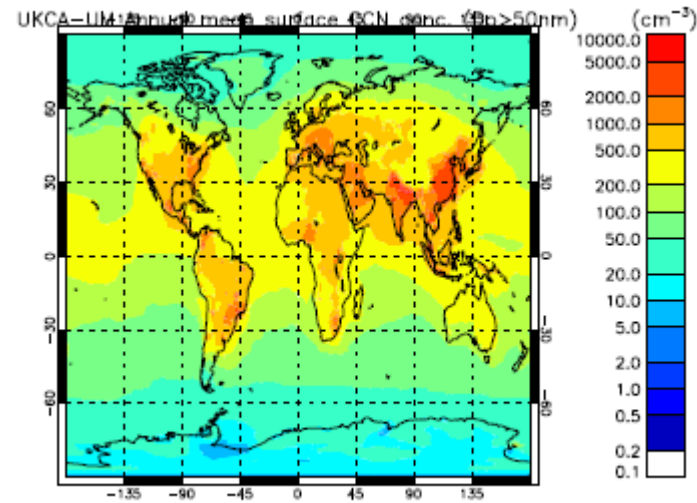
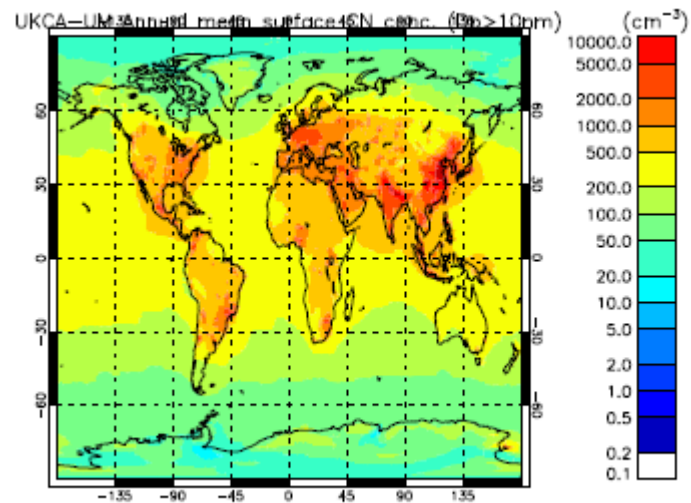
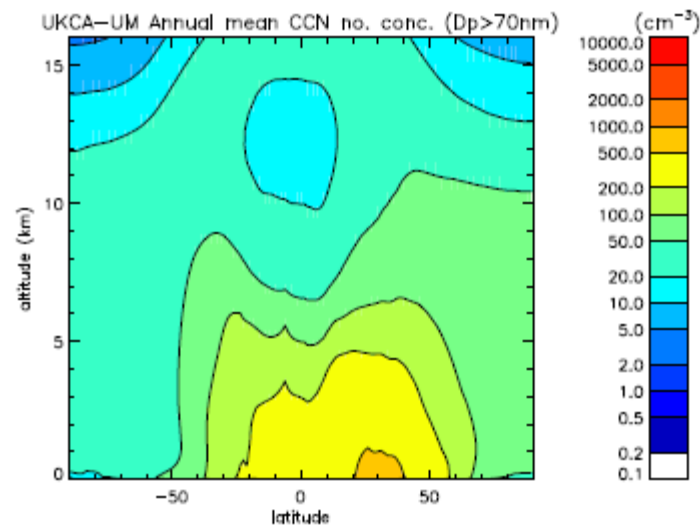
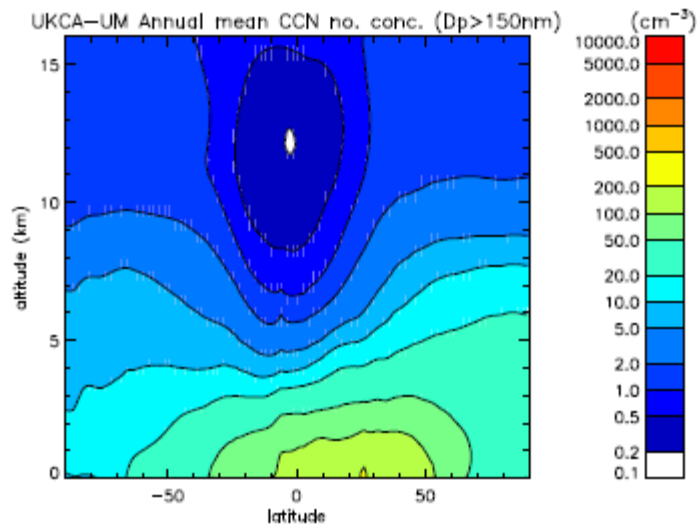
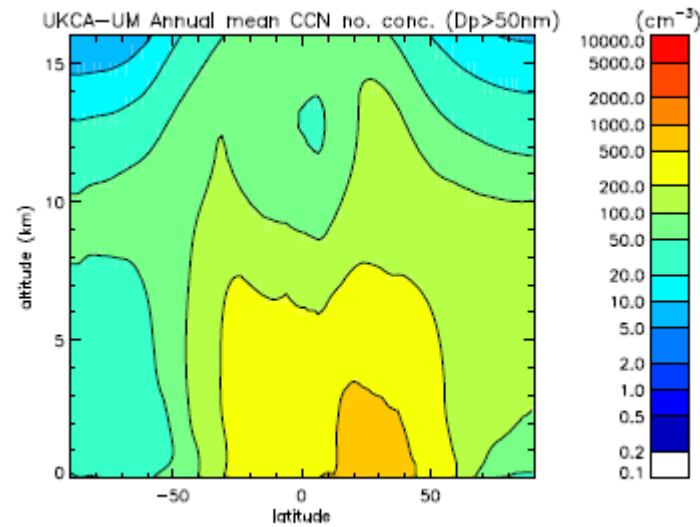
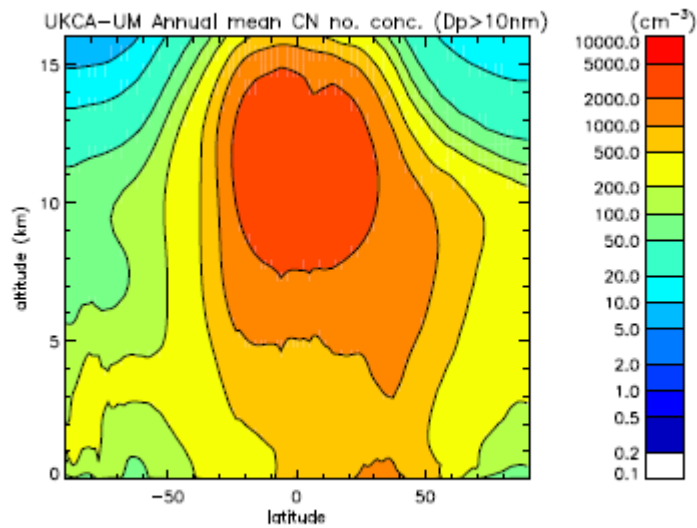


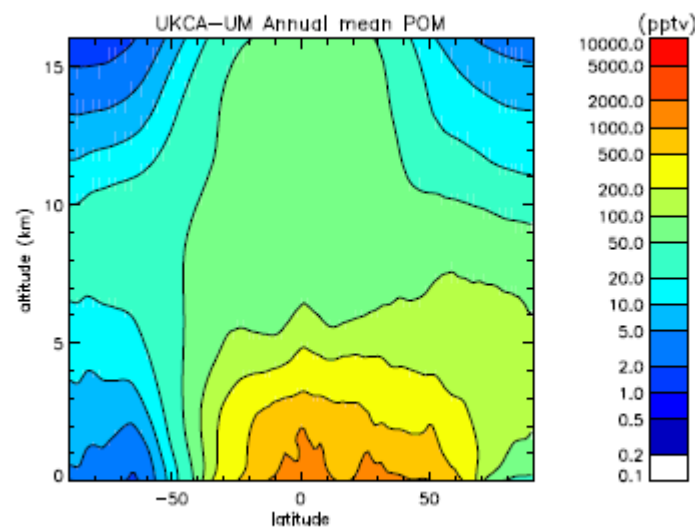
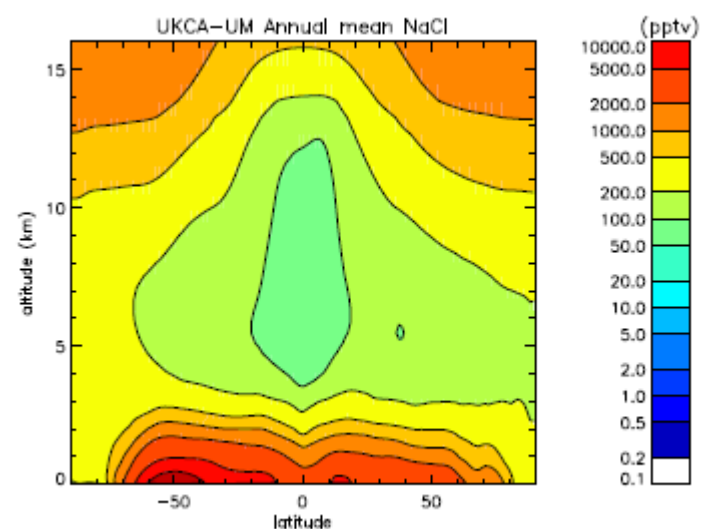
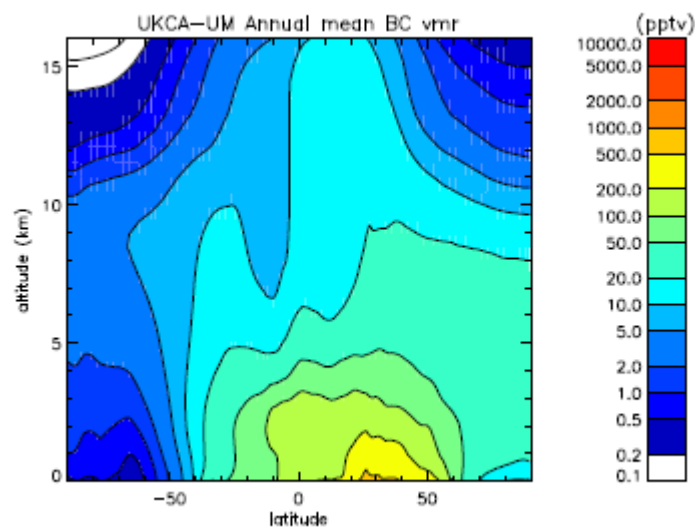
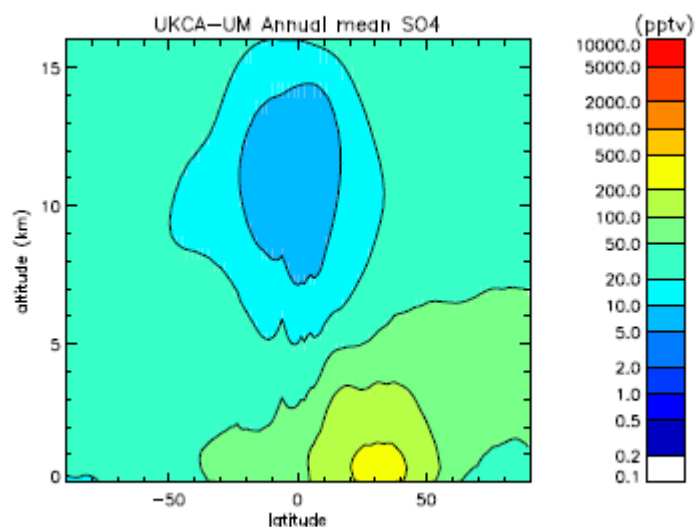
UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- standard plots (1) – number concentrations
Annual mean global surface maps of $N(D_p > 10)$, $N(D_p > 50)$, $N(D_p > 70)$, $N(D_p > 150 \text{ nm})$



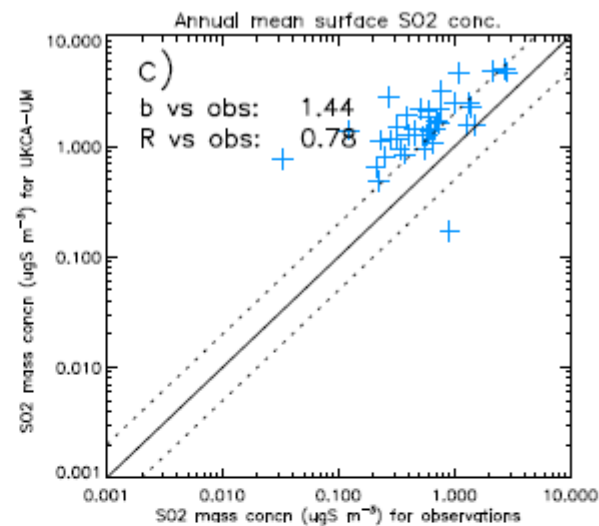
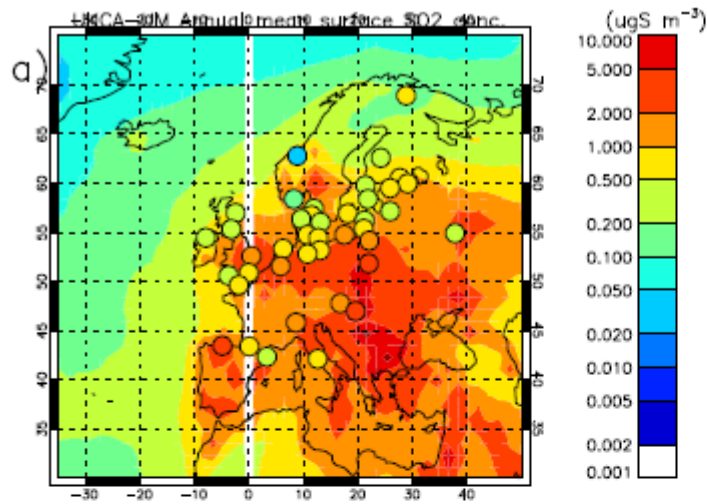
UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- standard plots (2) – number concentrations
Annual mean zonal-mean $N(D_p > 10)$, $N(D_p > 50)$, $N(D_p > 70)$ $N(D_p > 150\text{nm})$ vs latitude & altitude



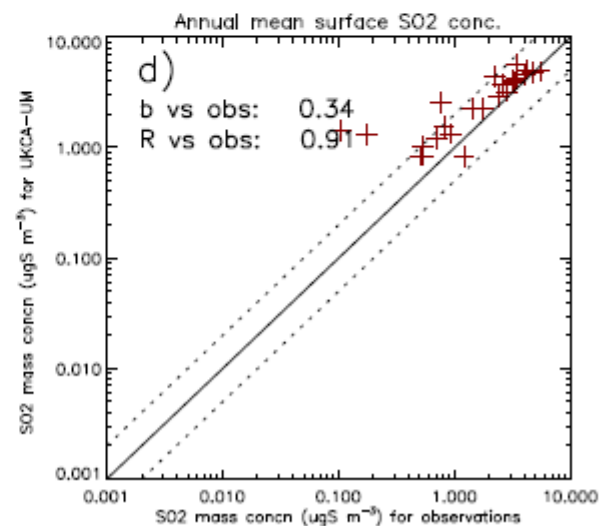
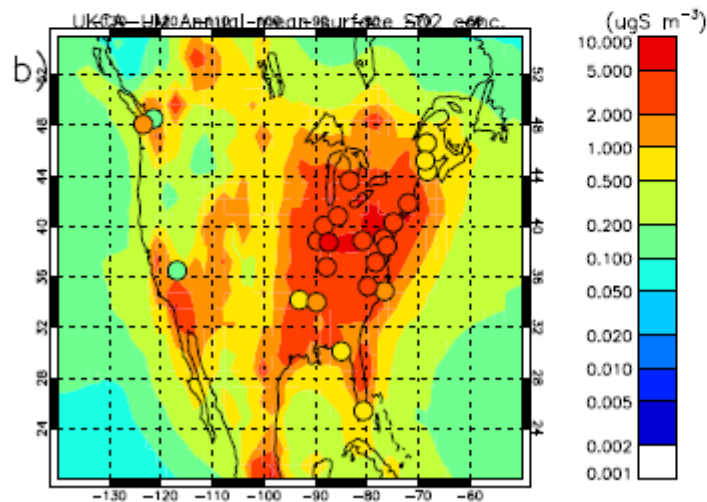
UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- standard plots (3) – speciated mass
Annual mean zonal-mean SO₄, BC, NaCl and POM vs latitude and altitude



UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- Evaluation vs SO₂ mass measurements
Europe (EMEP : Loevblad et al., 2004) & N. America (CASTNET network; Malm et al., 2002)

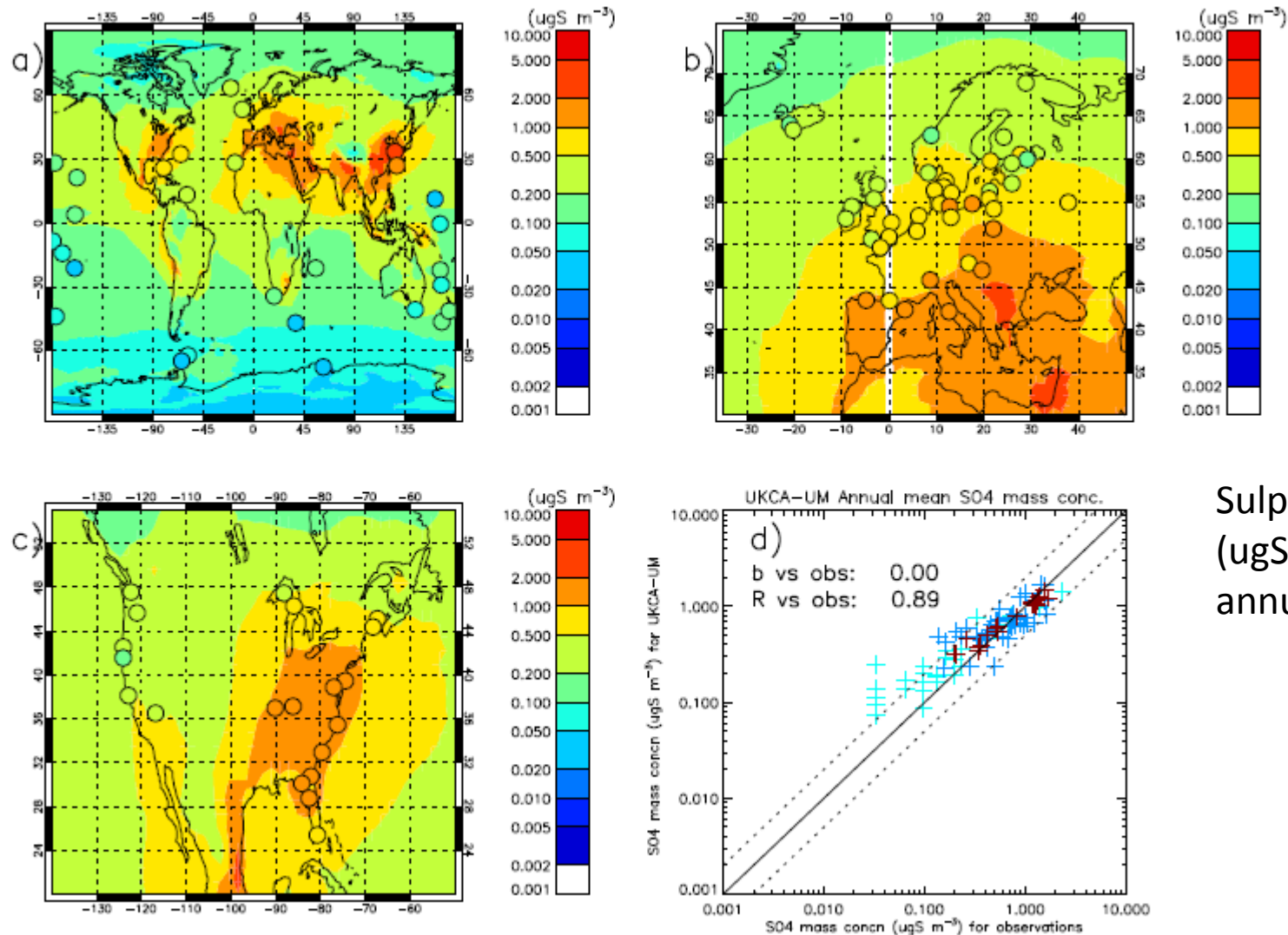


Sulphur dioxide
($\mu\text{gS/m}^3$)
Annual mean 2000



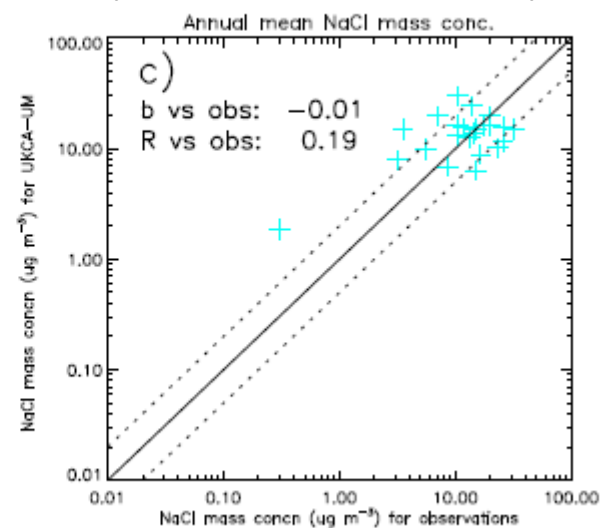
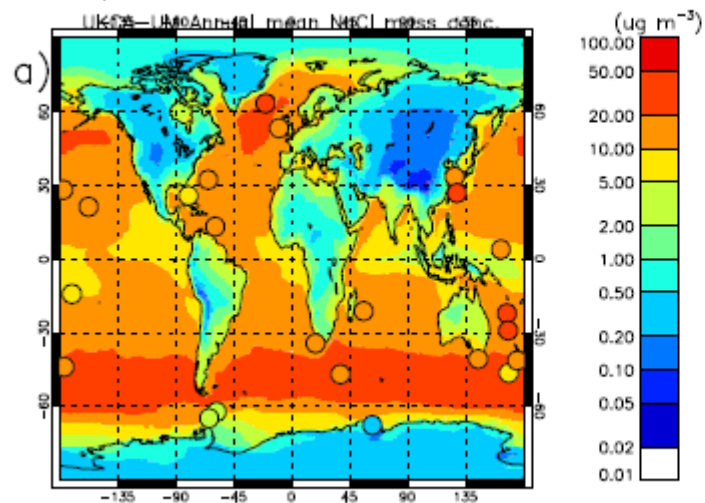
Sulphur dioxide
($\mu\text{gS/m}^3$)
Annual mean 2000

UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- Evaluation vs Sulphate mass measurements
 Europe (EMEP : Loevblad et al., 2004) & N. America (IMPROVE network; Malm et al., 2002)
 and from marine sites (U. Miami network, Savoie et al., 2001)

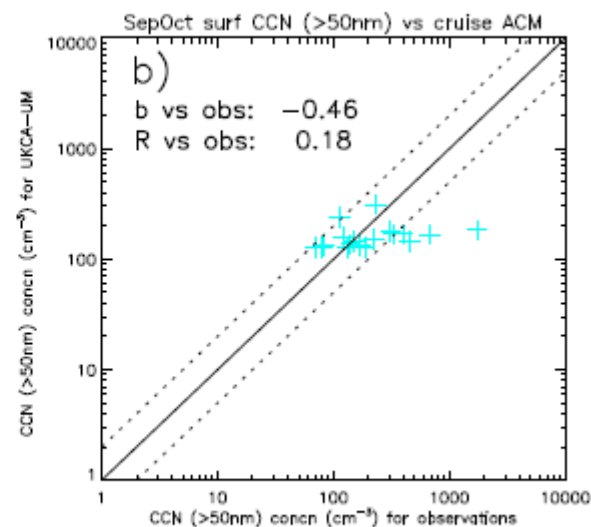
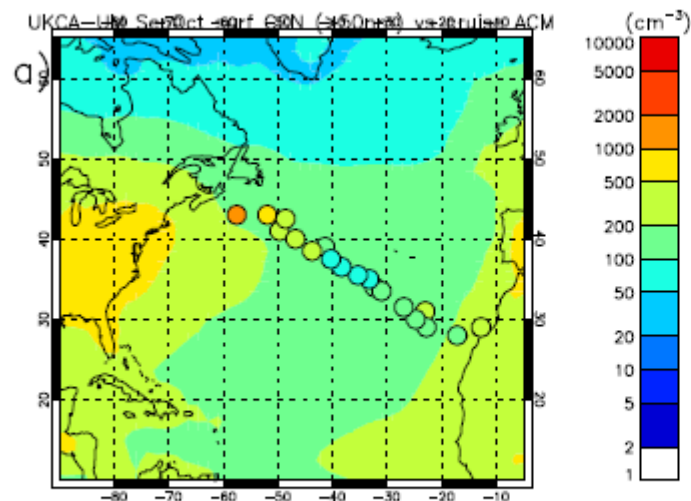


Sulphate
 ($\mu\text{gS/m}^3$)
 annual-mean

UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- Evaluation vs NaCl & CCN measurements
marine sites (U. Miami network, Savoie et al., 2001) & N. Atlantic cruise (Van Dingenen, 1995)

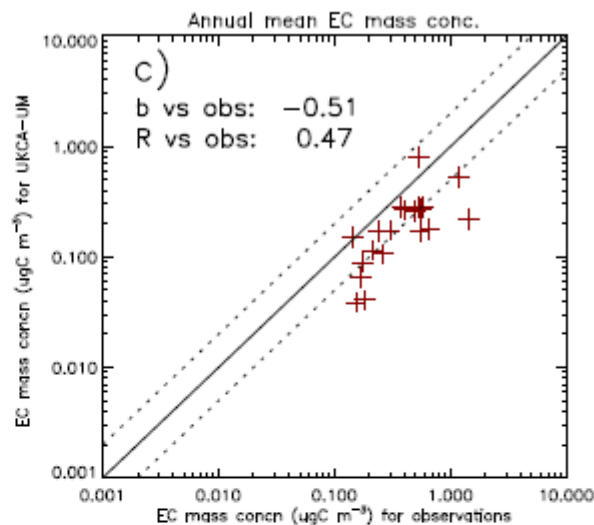
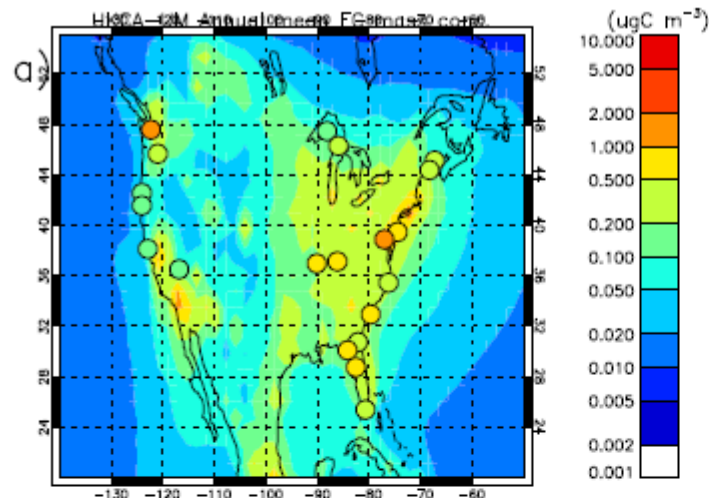


Sea-salt
($\mu\text{g}/\text{m}^3$)
multi-year
ann-mean

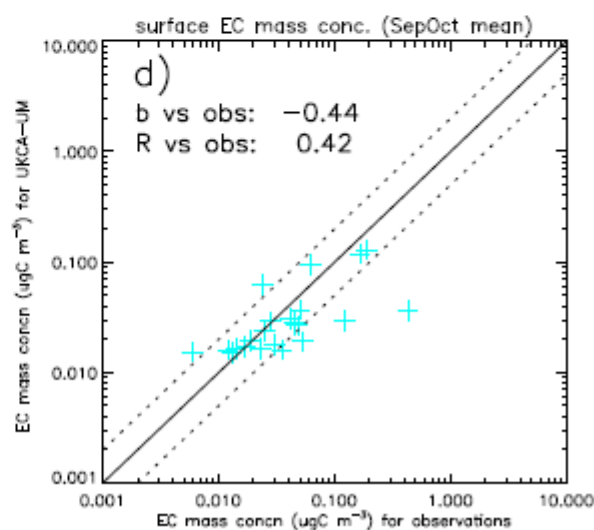
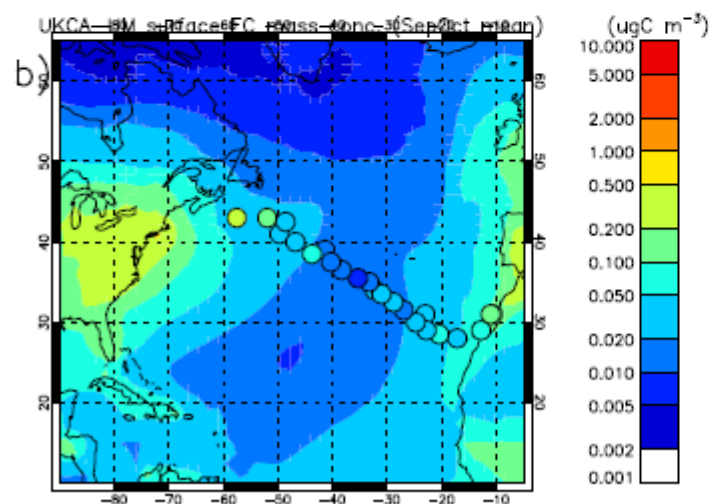


CCN
(particles/ cm^3)
Sep/Oct 1992

UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- Evaluation vs EC/BC mass measurements
N. America (IMPROVE network) and from N. Atlantic cruise (Van Dingenen, 1995)

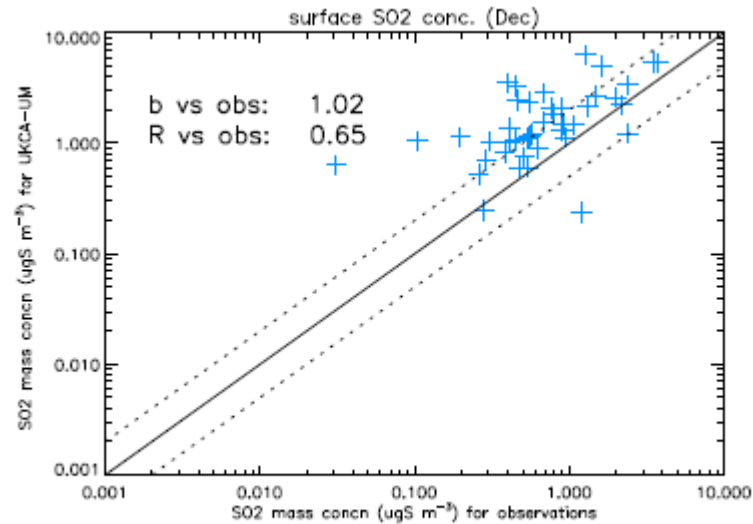
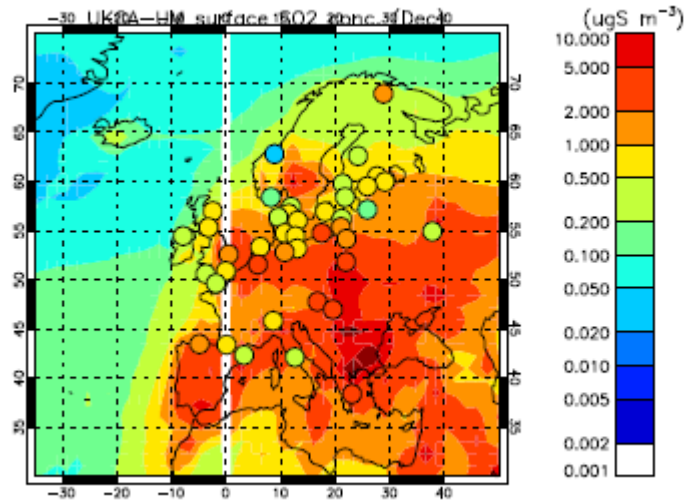


Elemental
Carbon
($\mu\text{gC/m}^3$)
ann-mean 2000

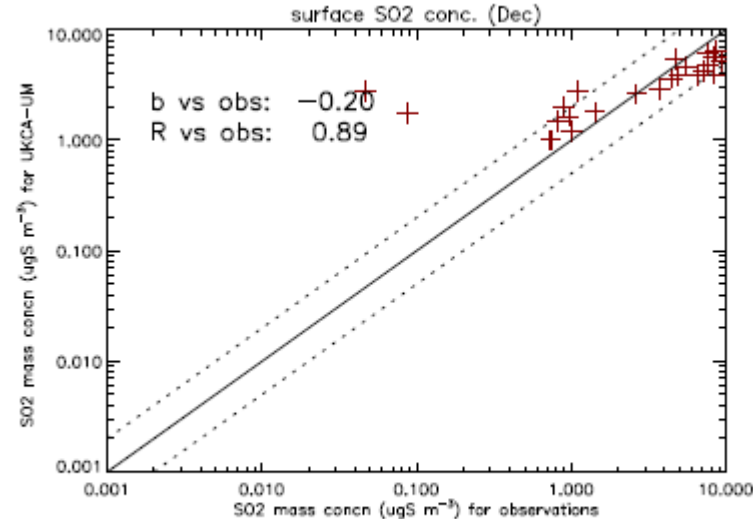
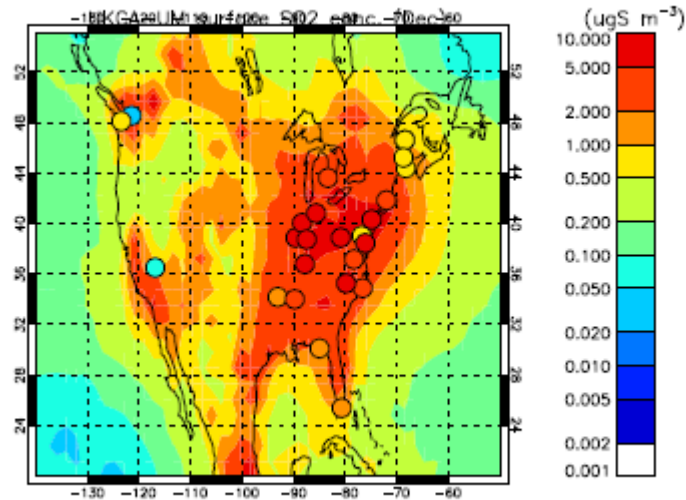


Black
Carbon
($\mu\text{gC/m}^3$)
Sep/Oct 1992

UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- Evaluation vs SO₂ mass measurements
Europe (EMEP : Loevblad et al., 2004) & N. America (CASTNET network; Malm et al., 2002)

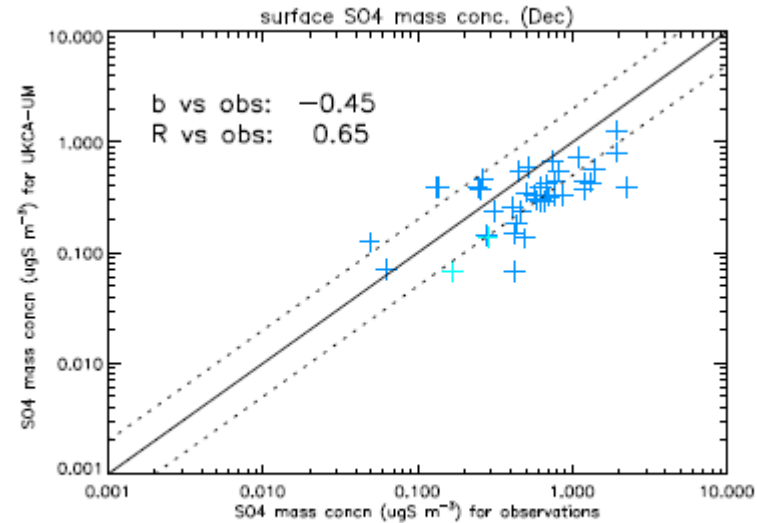
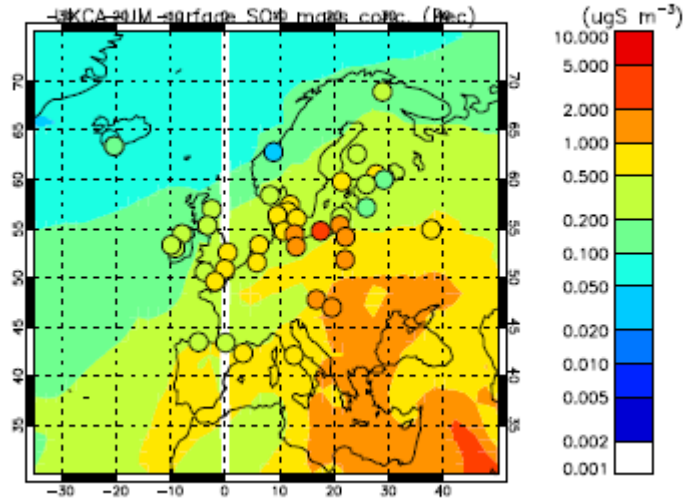


Sulphur
dioxide
($\mu\text{gS/m}^3$)
Dec 2000

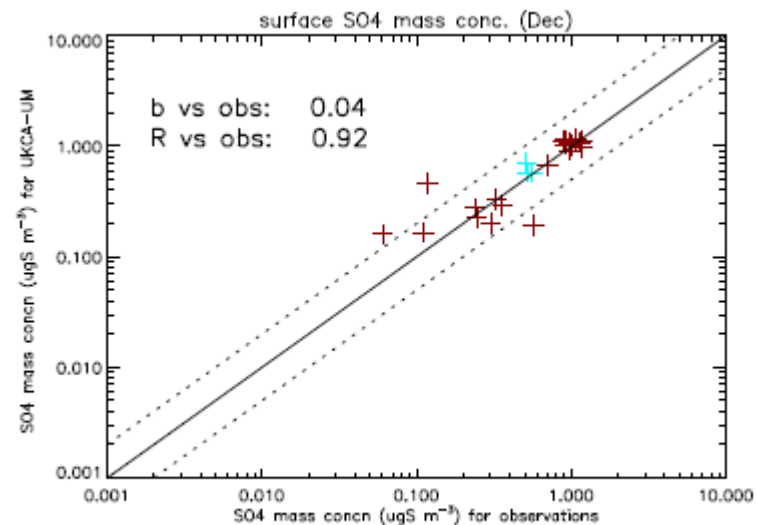
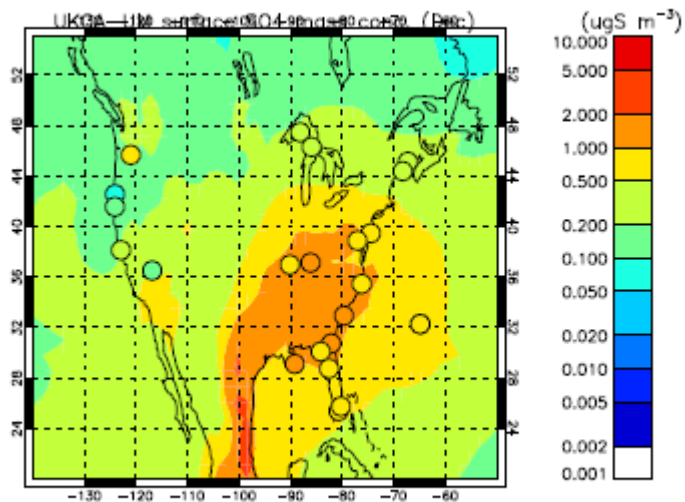


Sulphur
dioxide
($\mu\text{gS/m}^3$)
Dec 2000

UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- Evaluation vs Sulphate mass measurements
Europe (EMEP : Loevblad et al., 2004) & N. America (IMPROVE network; Malm et al., 2002)

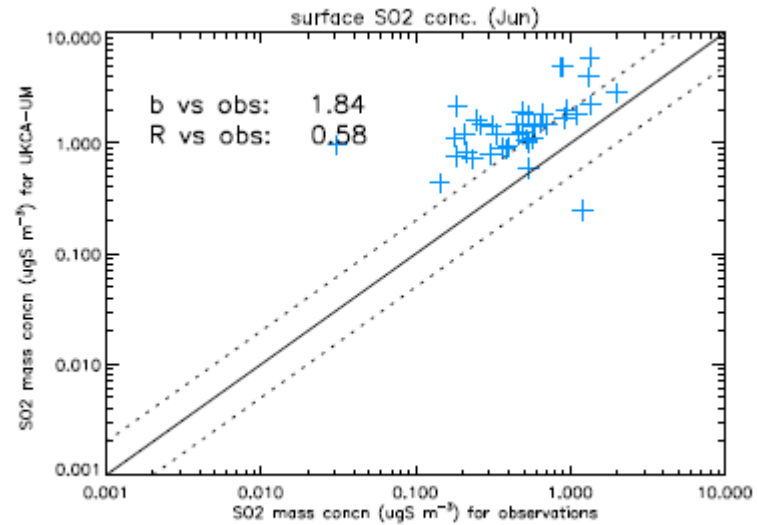
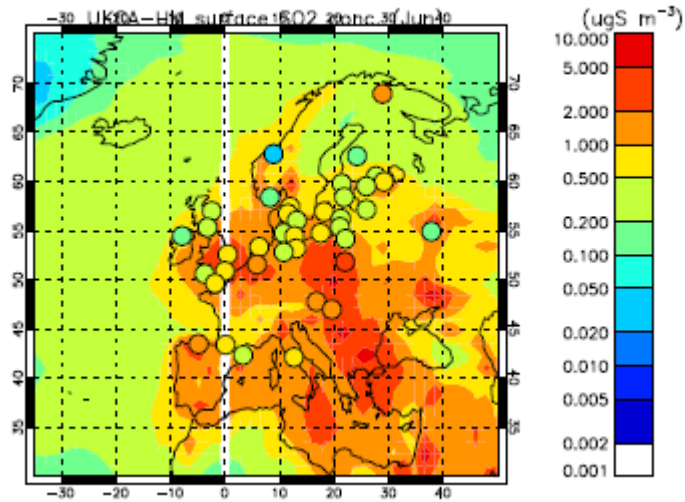


Sulphate
($\mu\text{gS/m}^3$)
Dec 2000

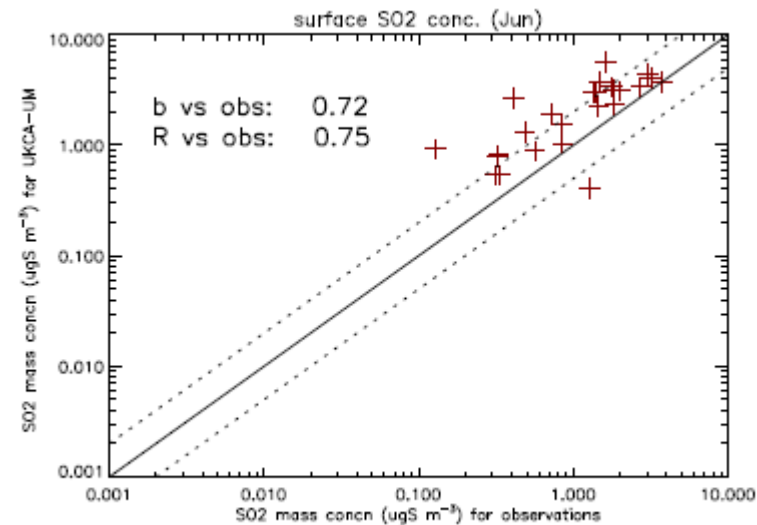
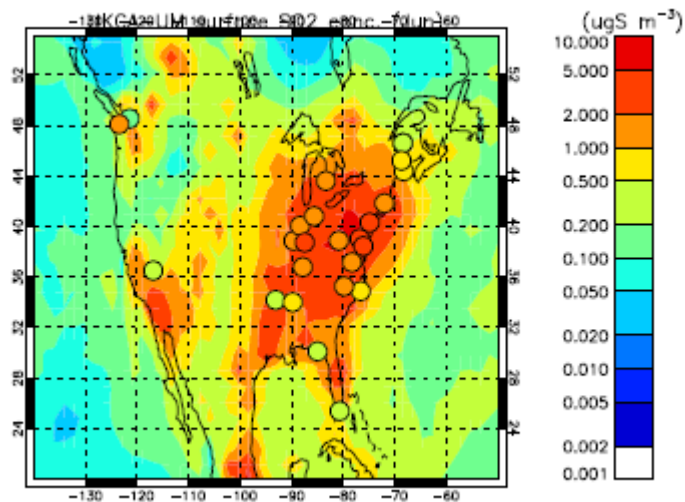


Sulphate
($\mu\text{gS/m}^3$)
Dec 2000

UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- Evaluation vs SO₂ mass measurements
Europe (EMEP : Loevblad et al., 2004) & N. America (CASTNET network; Malm et al., 2002)

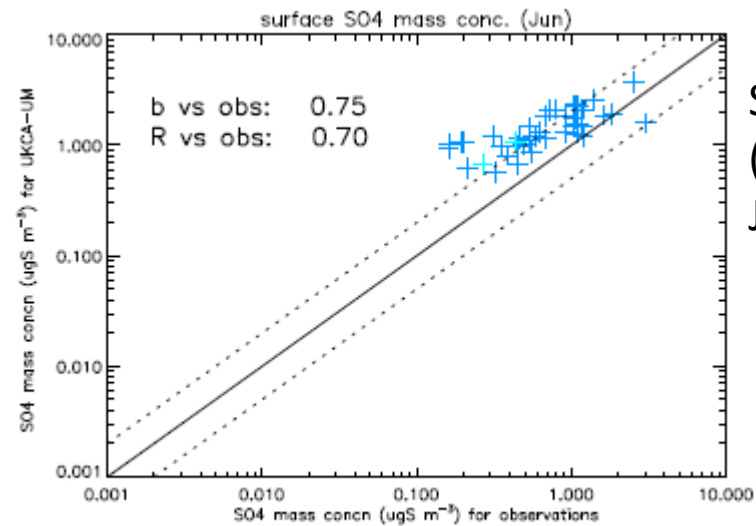
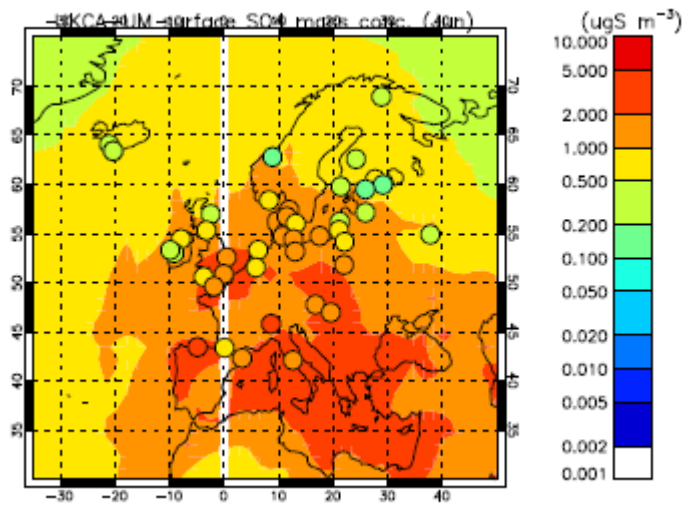


Sulphur
dioxide
($\mu\text{gS/m}^3$)
Jun 2000

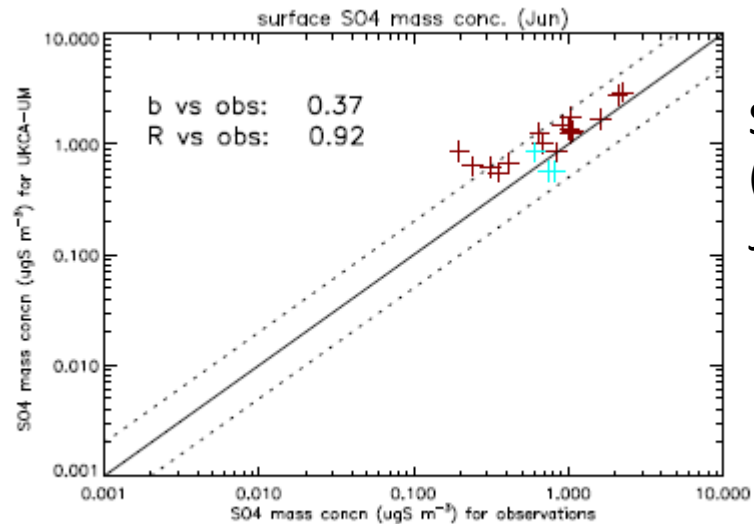
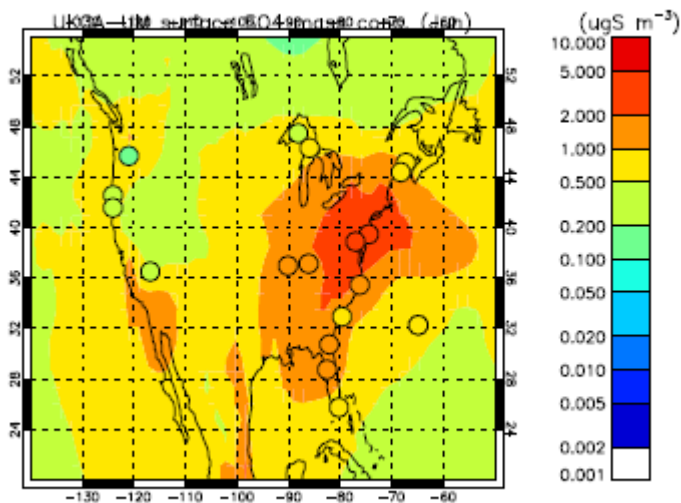


Sulphur
dioxide
($\mu\text{gS/m}^3$)
Jun 2000

UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- Evaluation vs Sulphate mass measurements Europe (EMEP: Loevblad et al., 2004) & N. America (IMPROVE network; Malm et al., 2002)

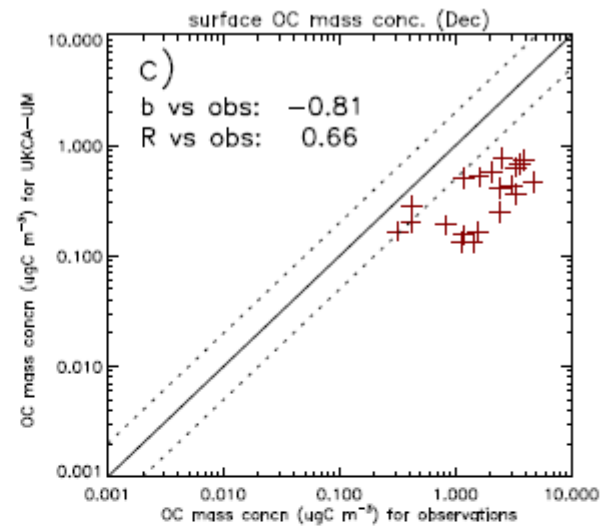
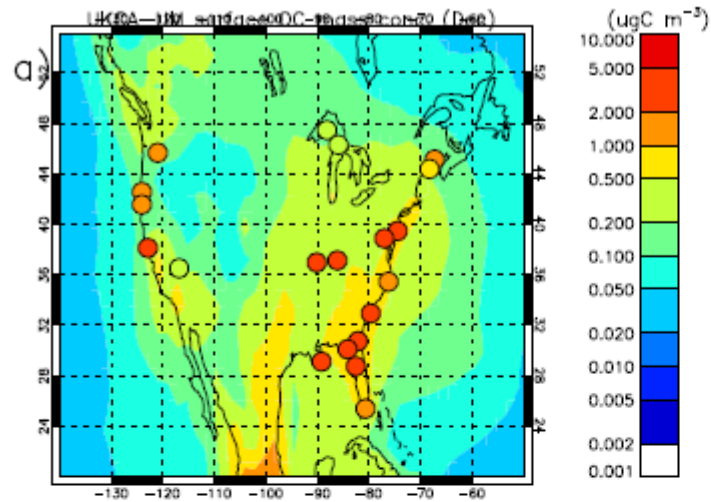


Sulphate
($\mu\text{gS/m}^3$)
Jun 2000

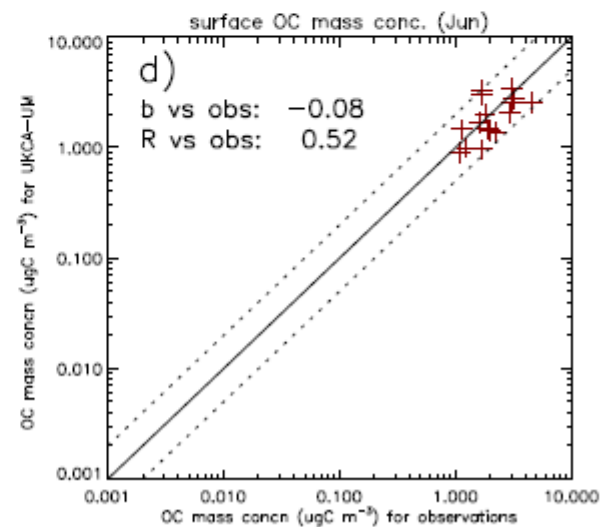
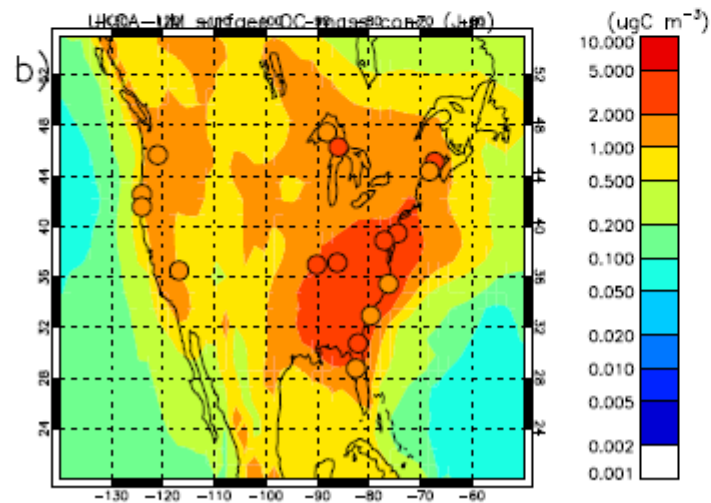


Sulphate
($\mu\text{gS/m}^3$)
Jun 2000

UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- Evaluation vs Organic Carbon measurements from North America (IMPROVE visibility network; Malm et al., 2002)

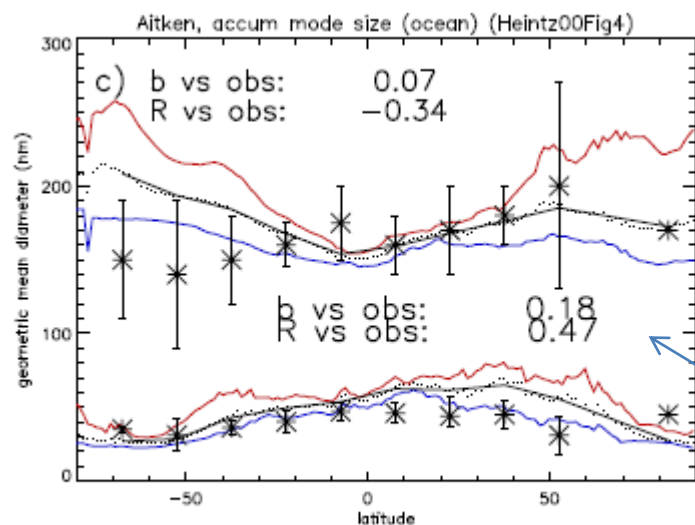
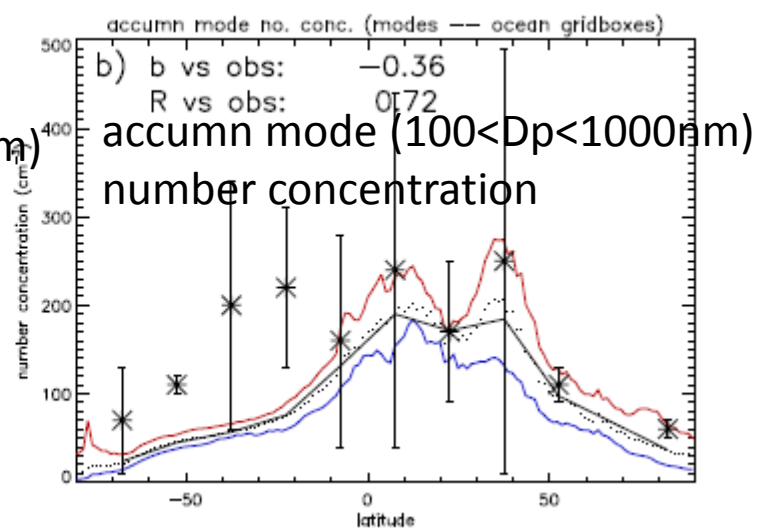
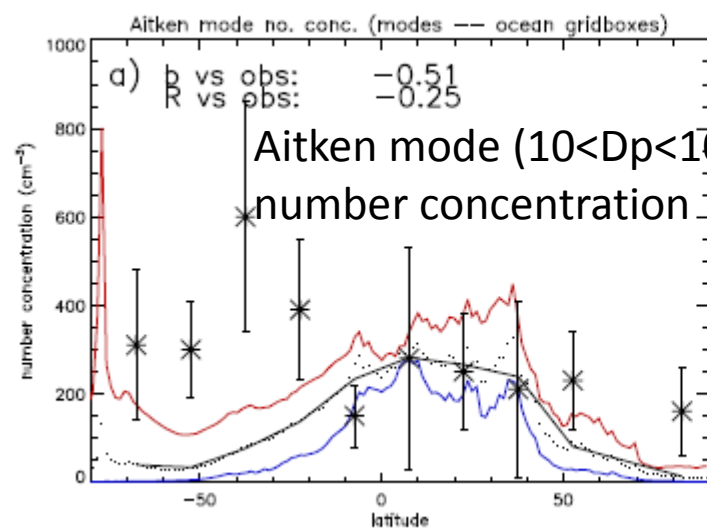


Organic Carbon
($\mu\text{gC/m}^3$)
December 2000



Organic Carbon
($\mu\text{gC/m}^3$)
June 2000

UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- Evaluation vs 20 years of cruise size-distbn observations from multiple campaigns (Heintzenberg et al., 2000)

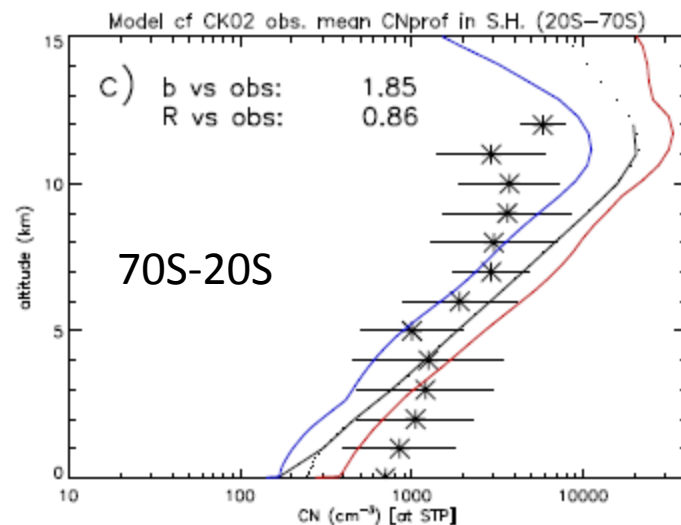
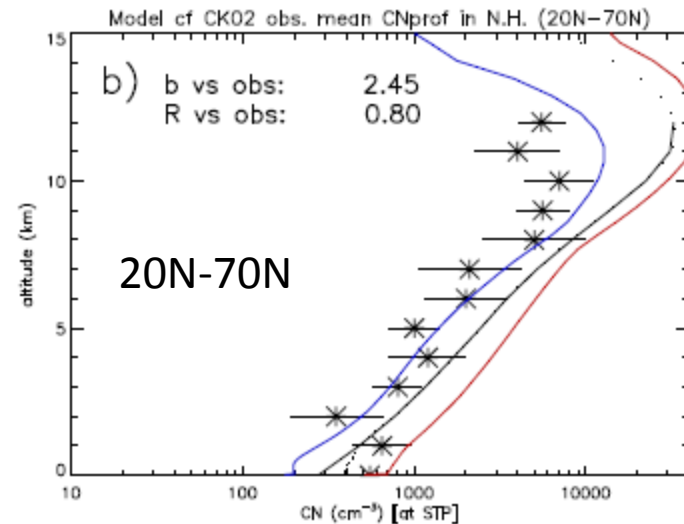
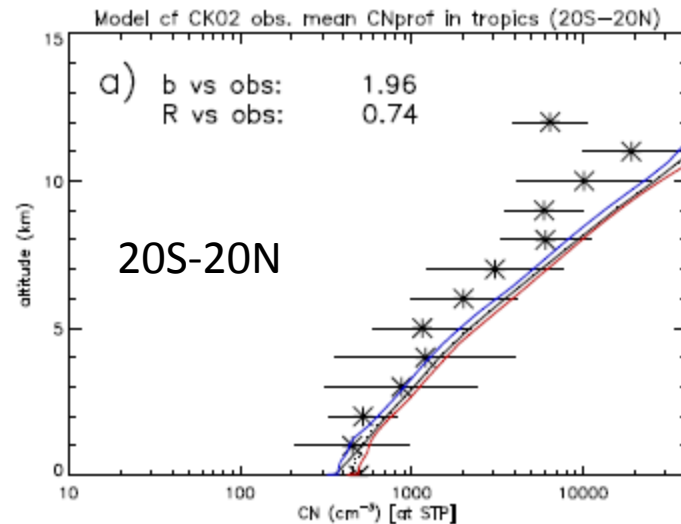


Asterisks are observations over all cruises in the various campaigns

Black line in model annual-mean
Blue/red : min/max monthly-mean

Geometric mean radius
for Aitken & accum modes

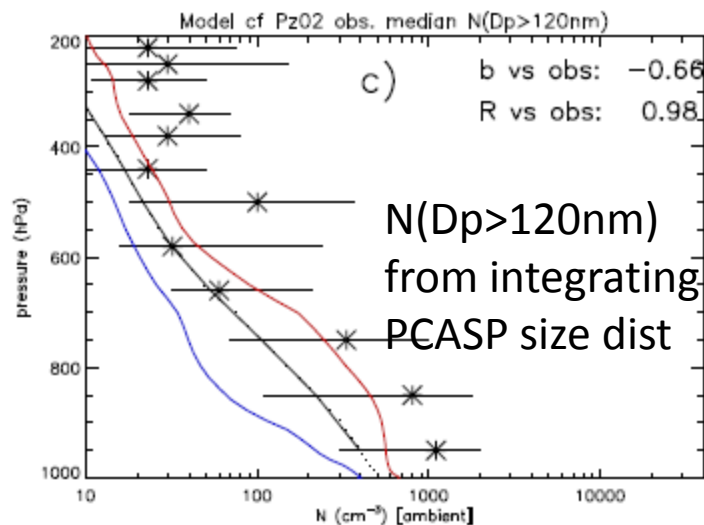
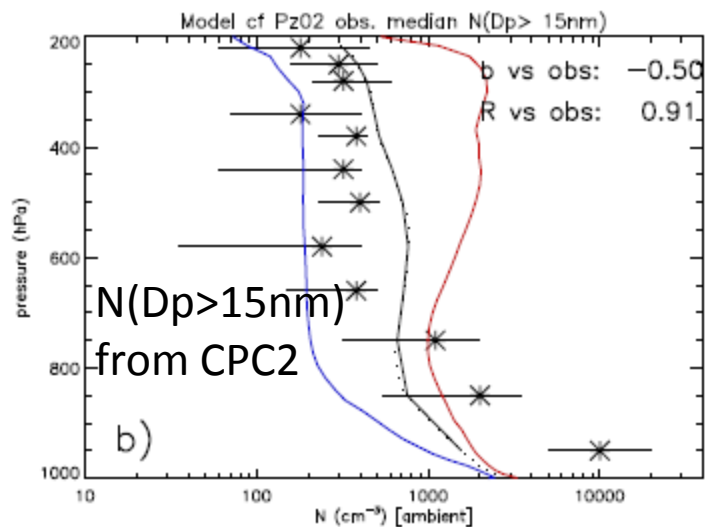
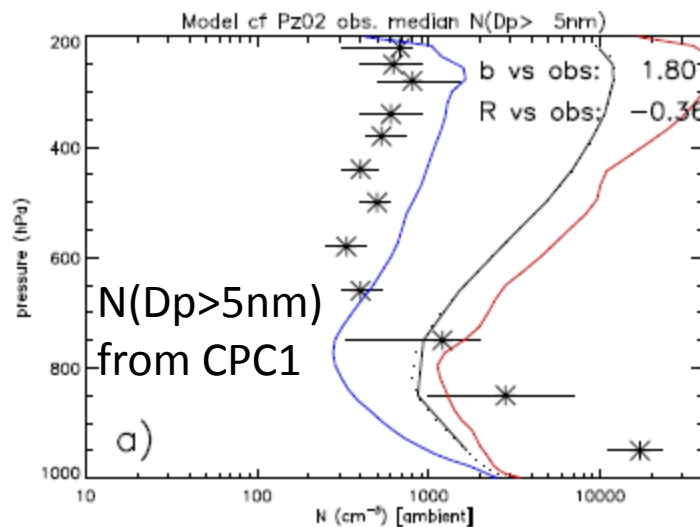
UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- Evaluation vs aircraft-borne CN concentration observations from multiple campaigns (Clarke & Kapustin, 2002)



Asterisks are observations over all representative flights in the Pacific and Southern Ocean

Black line in model annual-mean
Blue/red : min/max monthly-mean

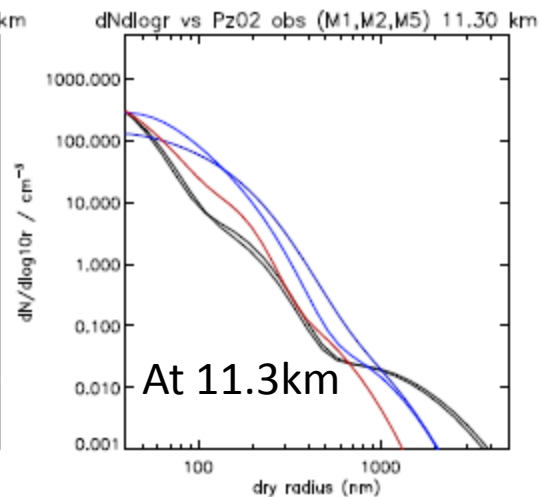
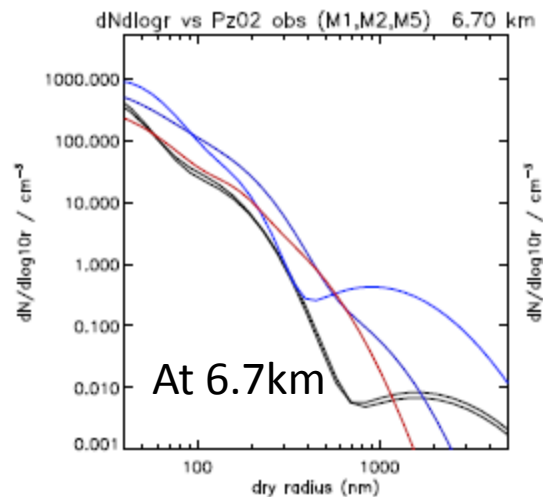
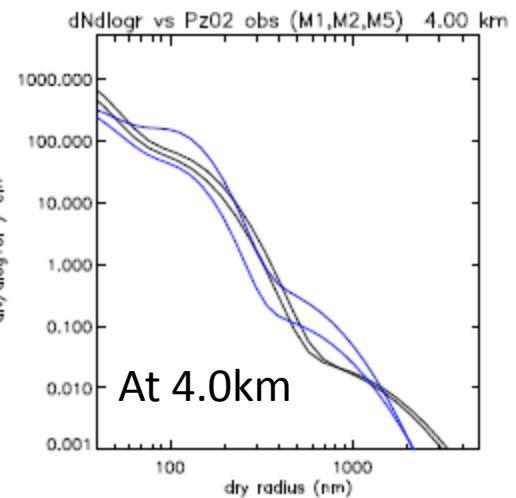
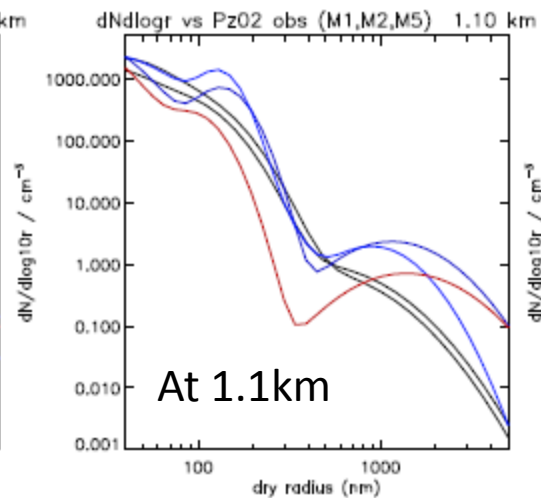
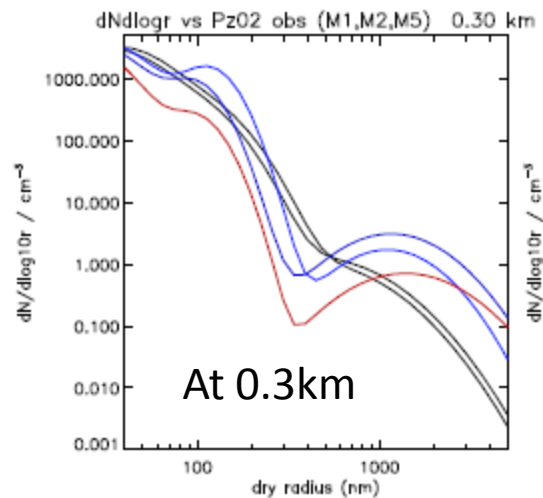
UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- Evaluation vs aircraft-borne number concn observations from LACE-98 (Petzold et al., 2002)



Asterisks are observations over all representative flights in the LACE-98 campaign over summertime Germany (compiled by Lauer et al, 2005)

Black line in model annual-mean
Blue/red : min/max monthly-mean

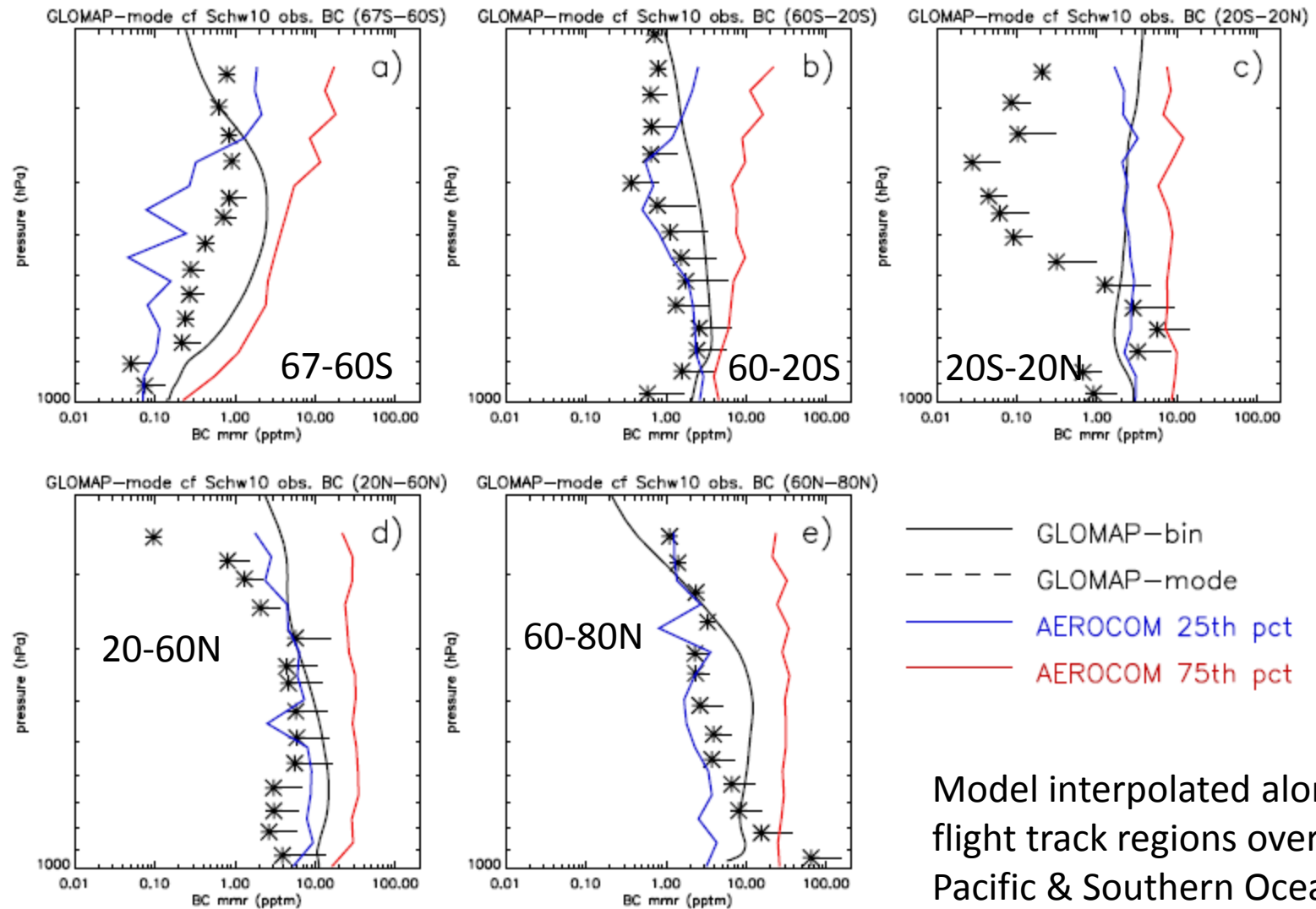
UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- Evaluation vs aircraft-borne size distribution observations from LACE-98 (Petzold et al., 2002)



Blue and red are observations from different flights in the LACE-98 campaign over summertime Germany

Black lines are model July & Aug monthly-means

UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- Evaluation vs aircraft-borne BC observations from SP2 during HIPPO-1 (Schwarz et al., 2010)



UM-UKCA v8.4 GA4 CheST+GLOMAP (xkawa) --- Evaluation vs global CCN observations dataset compiled by Spracklen et al. (2011)

