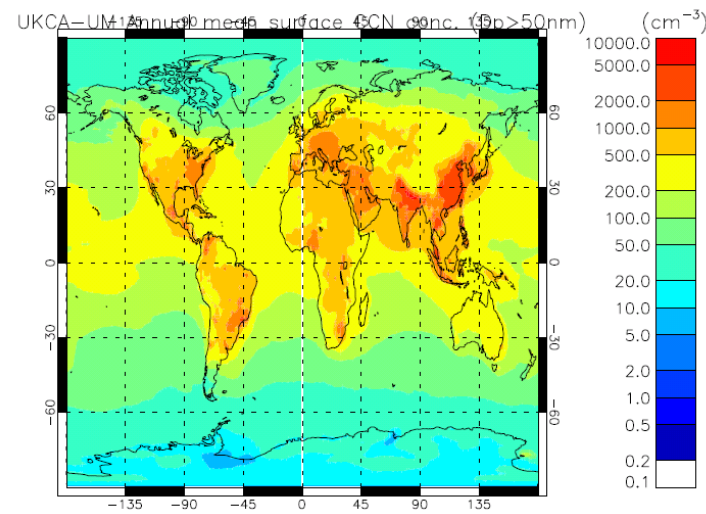
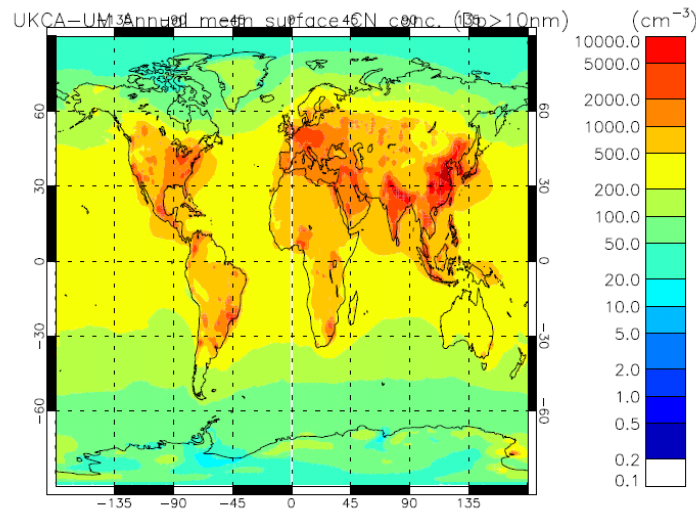
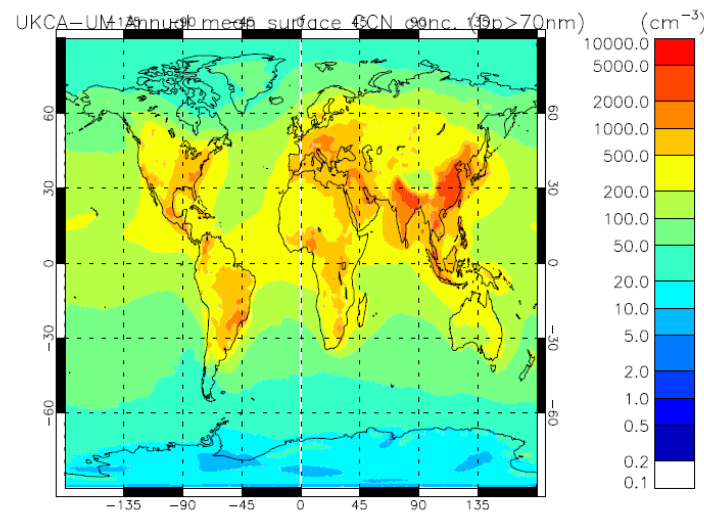
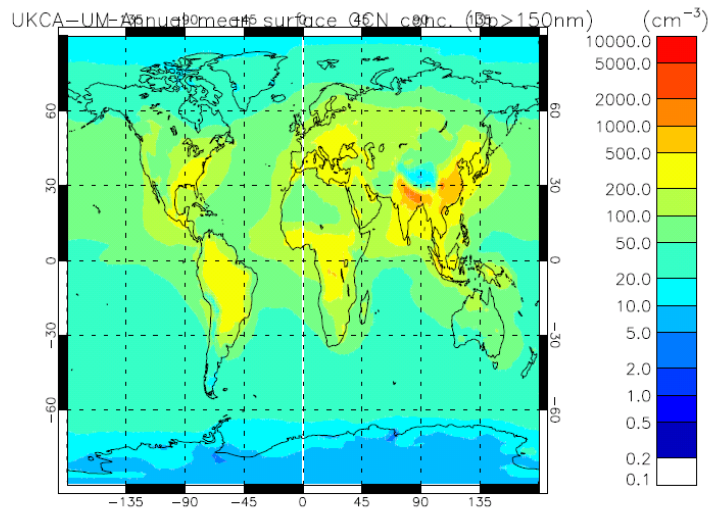


UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2: xkjgj): standard plots (1): number concentrations

Annual mean global surface maps of $N(D_p > 10)$, $N(D_p > 50)$, $N(D_p > 70)$, $N(D_p > 150 \text{ nm})$

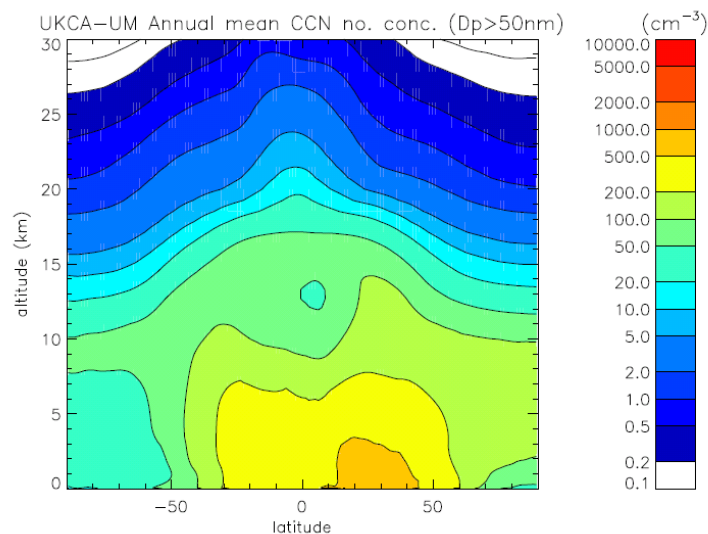
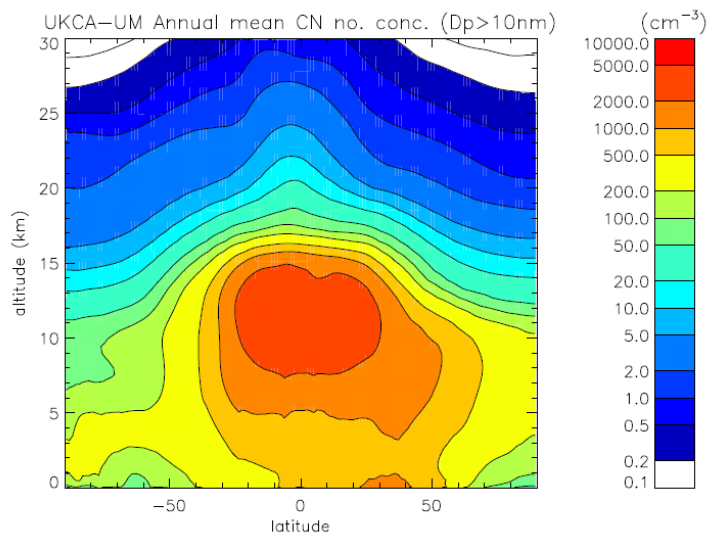


For year
1999 from
15-year run
1984-1999

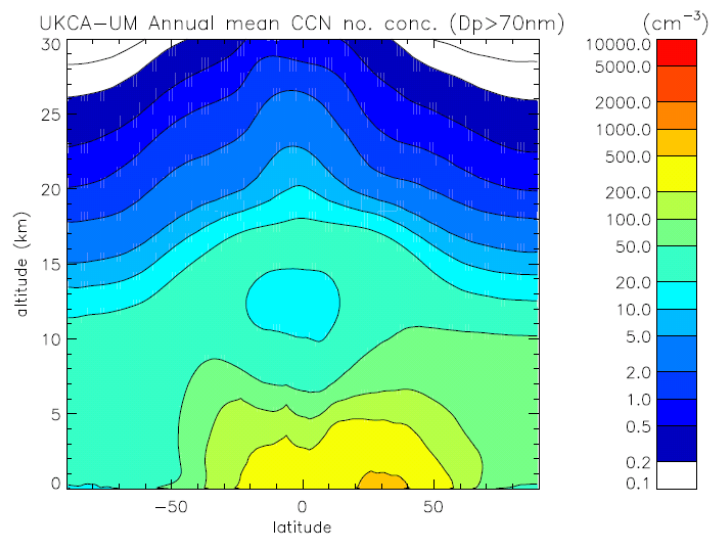
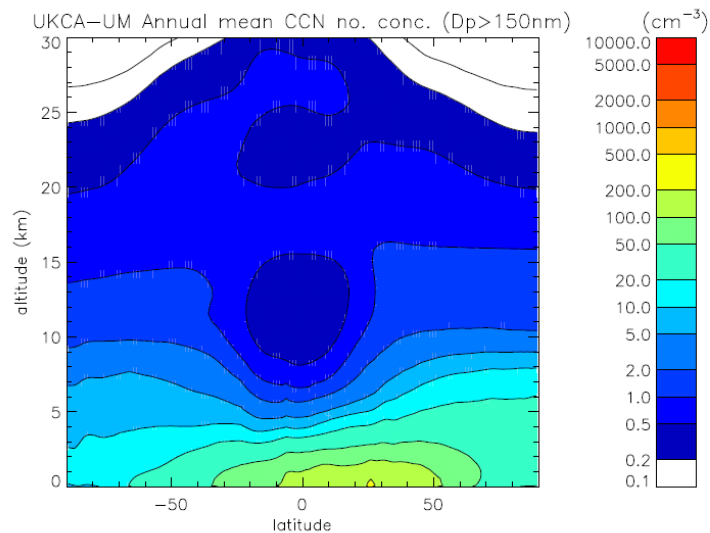


UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2: xkjgj): standard plots (2): number concentrations

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

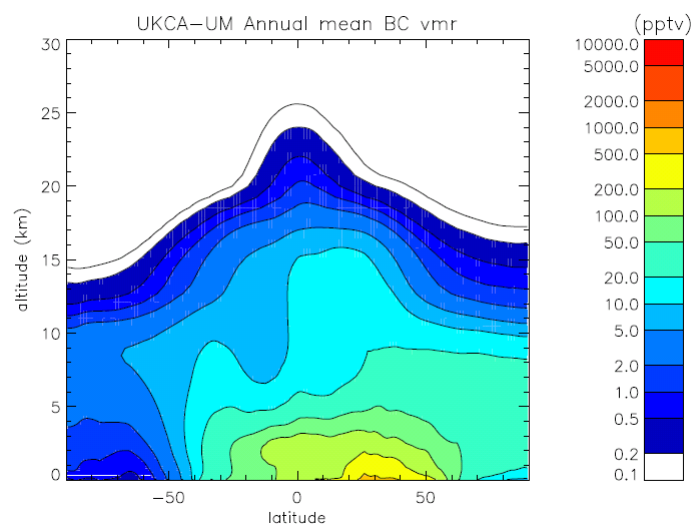
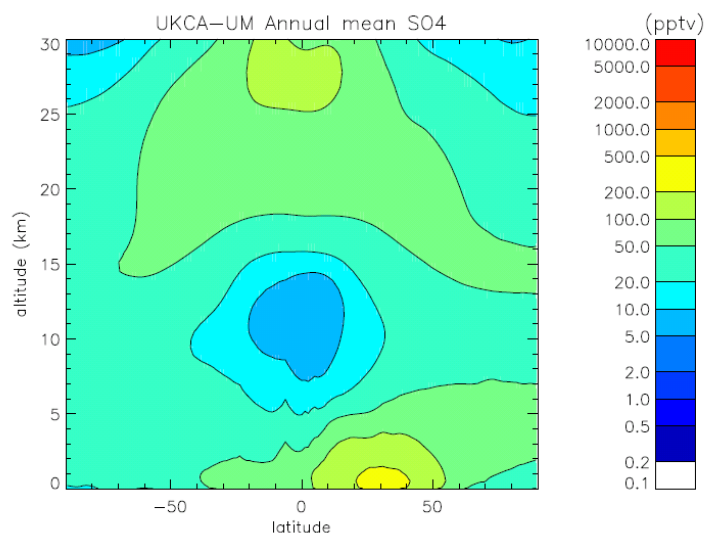


For year
1999 from
15-year run
1984-1999

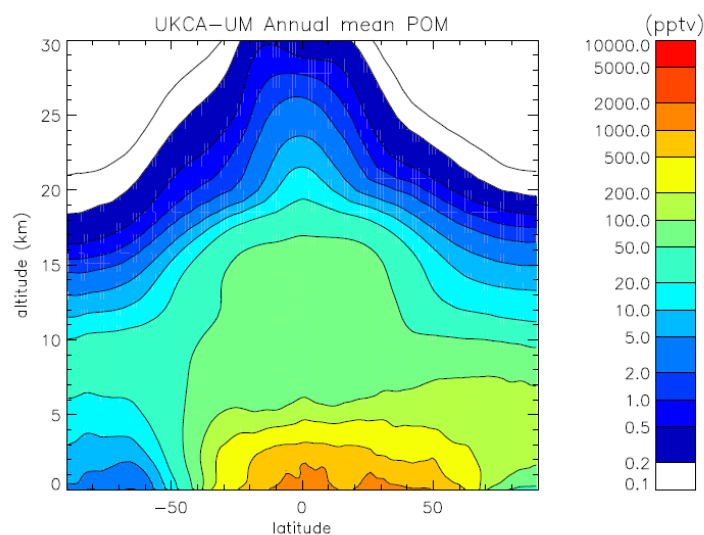
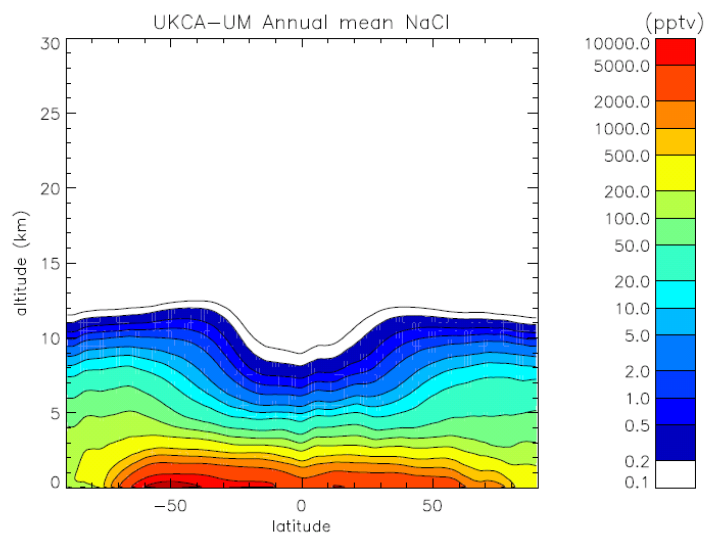


UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2: xkjgj): standard plots (3): speciated mass

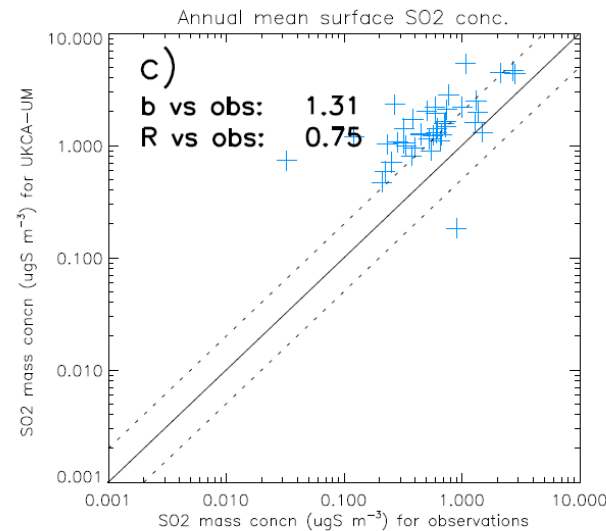
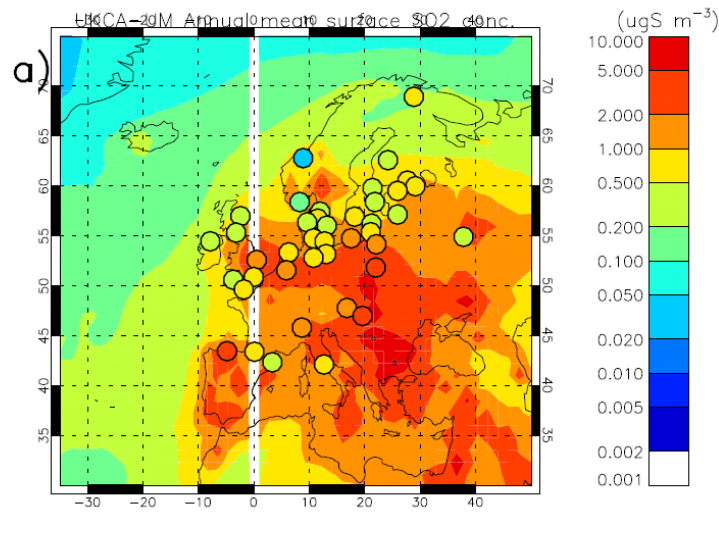
Annual mean zonal-mean SO₄, BC, NaCl and POM vs latitude and altitude



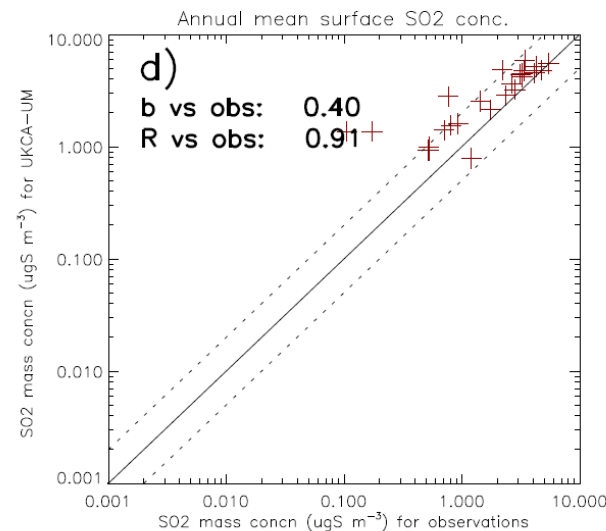
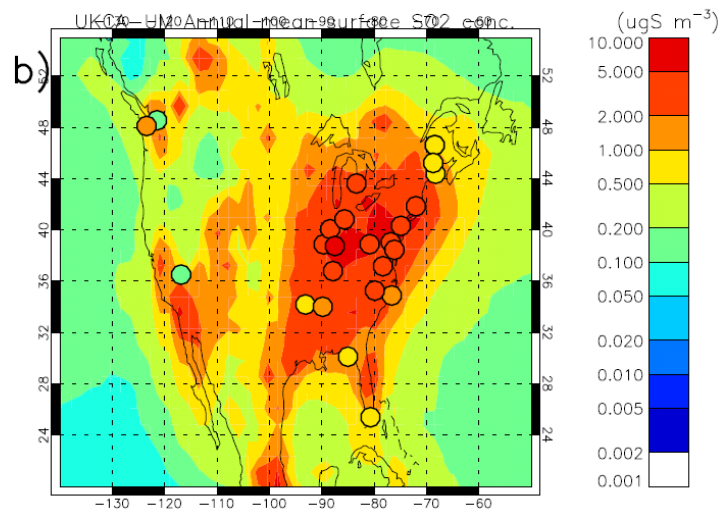
For year
1999 from
15-year run
1984-1999



UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2: xkjgj): Evaluation vs SO₂ mass measurements Europe (EMEP : Loevblad et al., 2004) & N. America (CASTNET network; Malm et al., 2002)

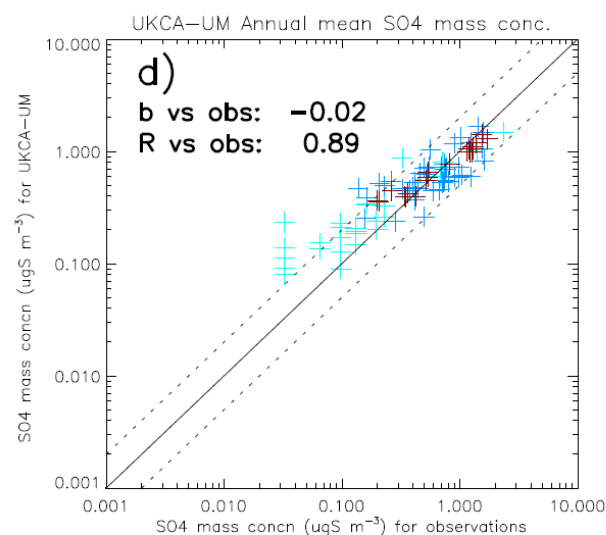
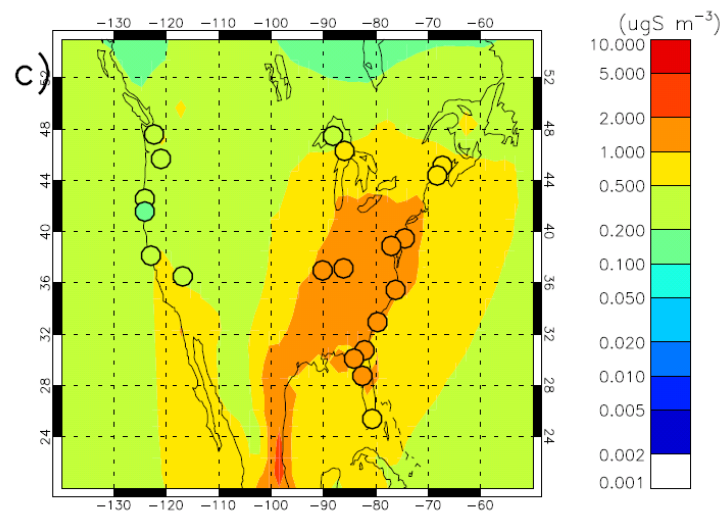
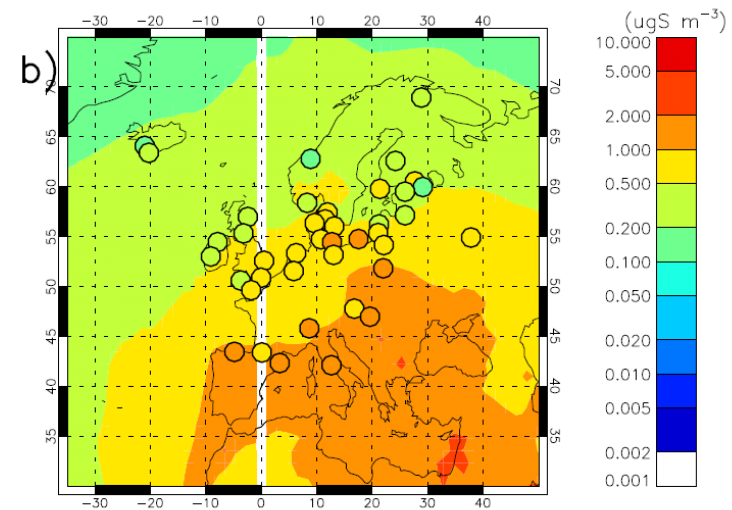
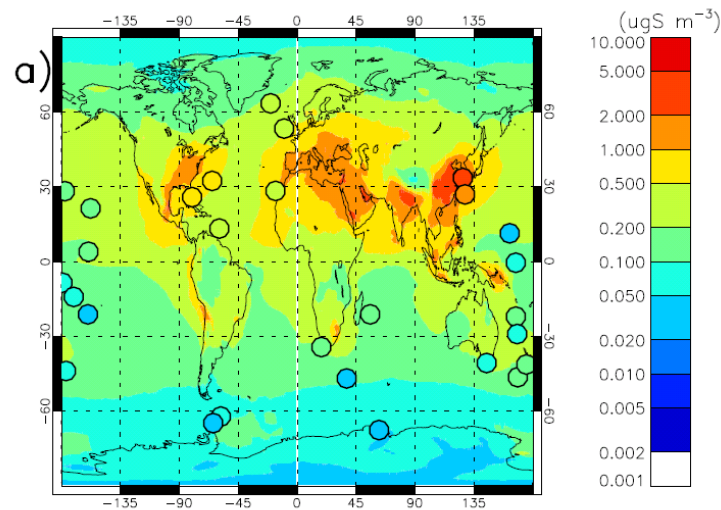


Sulphur
dioxide
($\mu\text{gS/m}^3$)
Annual mean 1999
cf obs from 2000



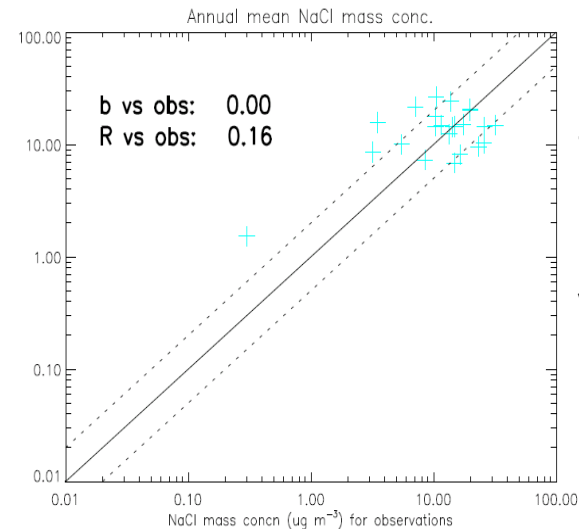
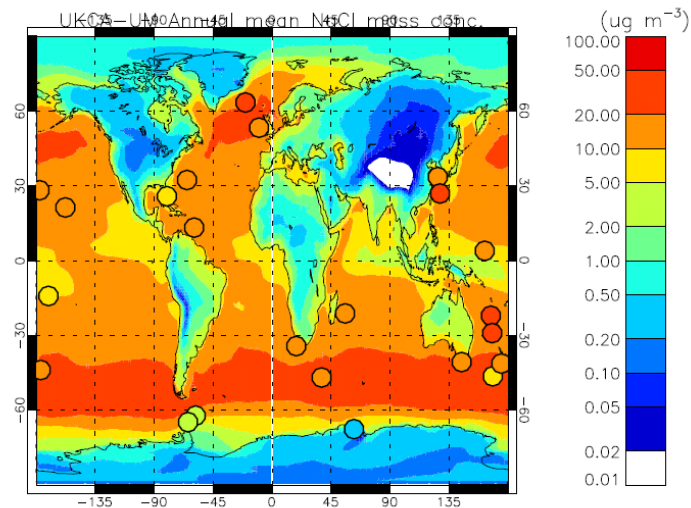
Sulphur
dioxide
($\mu\text{gS/m}^3$)
Annual mean 1999
cf obs from 2000

UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2: xkjgj): Evaluation vs sulphate mass concentrat'ns
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)

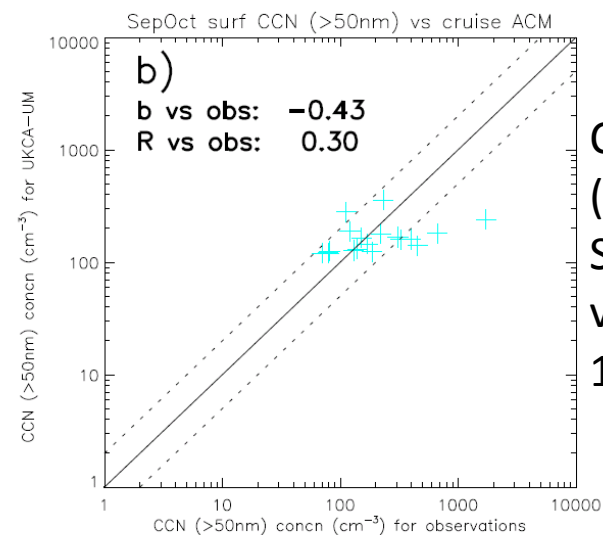
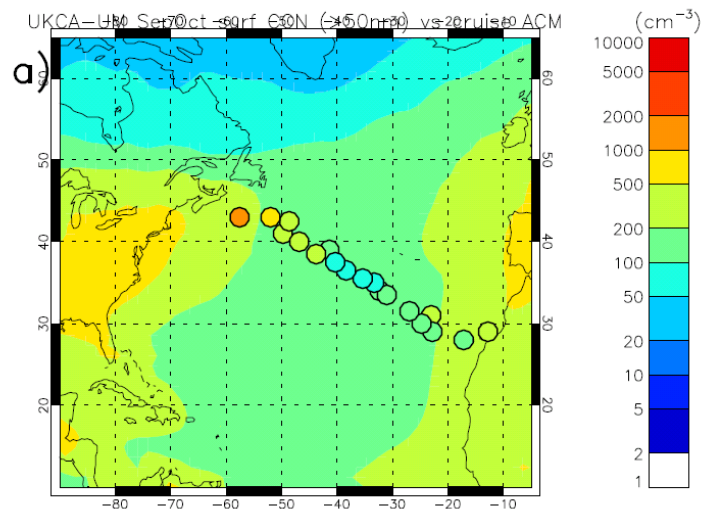


Sulphate
($\mu\text{gS/m}^3$)
annual-mean 1999
cf climatological
marine obs (a) and
from 2000 over
Europe (EMEP, b)
and N. America
(IMPROVE, c)

UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2: xkjgj): Evaluation vs NaCl & CCN measurements marine sites (U. Miami network, Savoie et al., 2001) & N. Atlantic cruise (Van Dingenen, 1995)

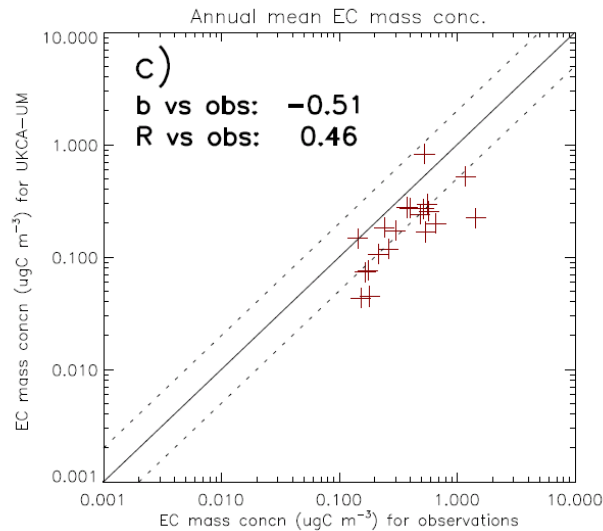
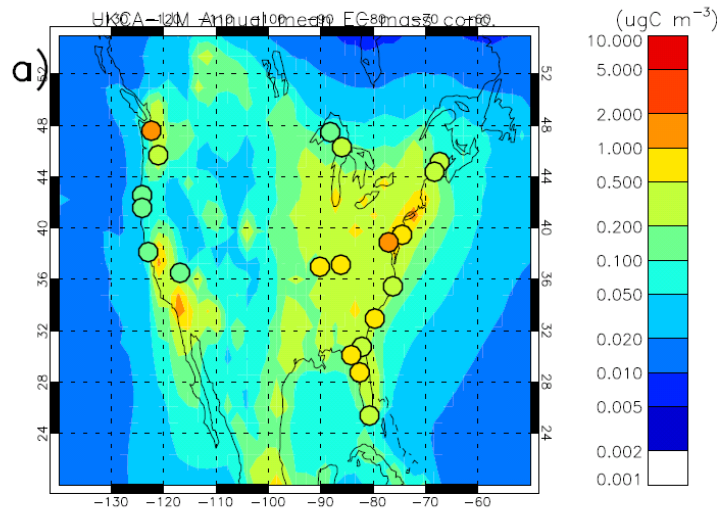


Sea-salt
($\mu\text{g/m}^3$)
multi-year-obs
versus
1999-ann-mean

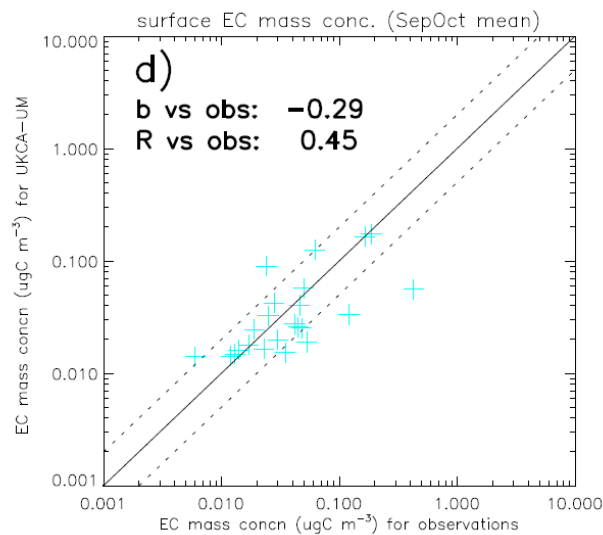
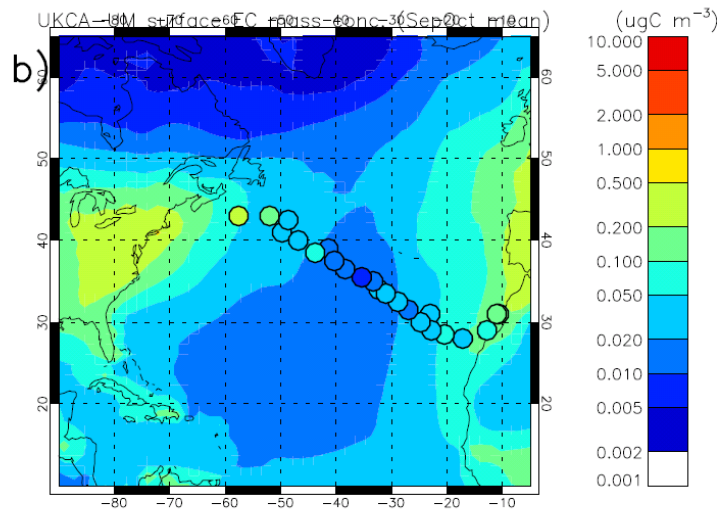


CCN
(particles/ cm^3)
Sep/Oct 92-obs
versus
1999-ann-mean

UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2:xkjgj): Evaluation vs EC/BC mass measurements N. America (IMPROVE network) and from N. Atlantic cruise (Van Dingenen, 1995)

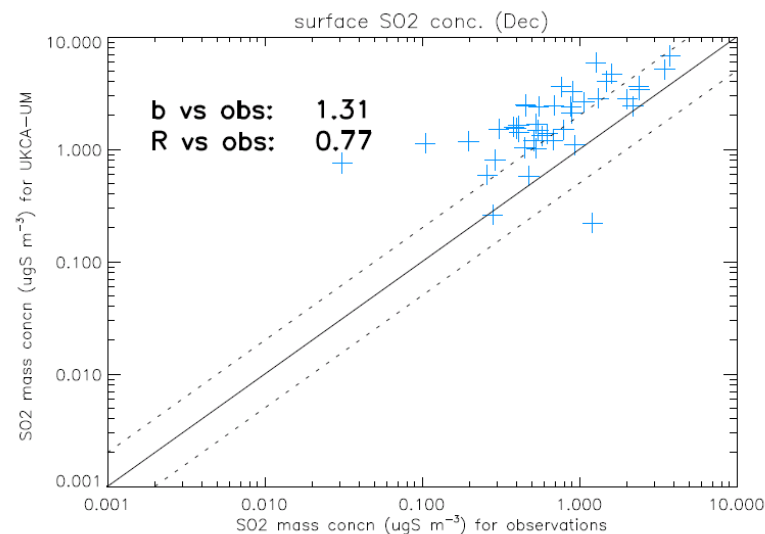
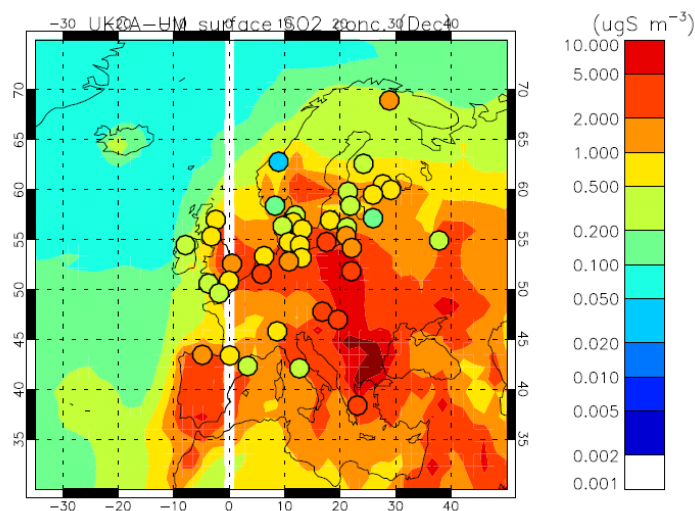


Elemental
Carbon
($\mu\text{gC/m}^3$)
obs are annual
mean for 2000
Model is 1999
annual-mean

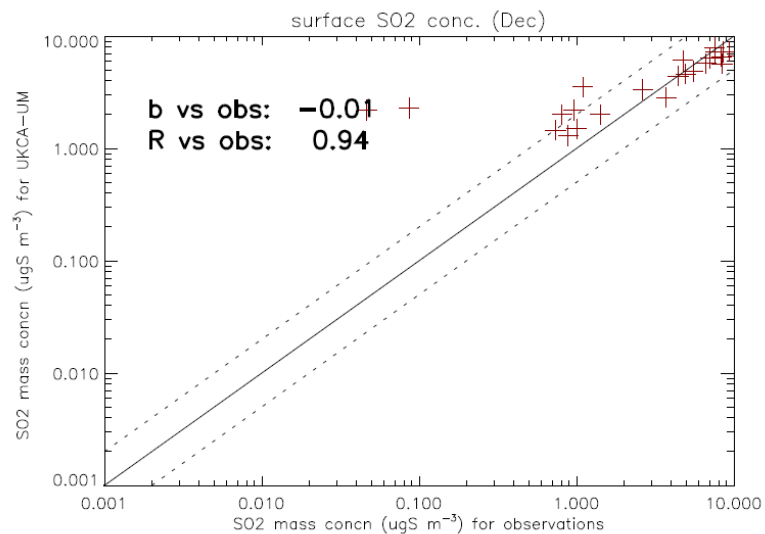
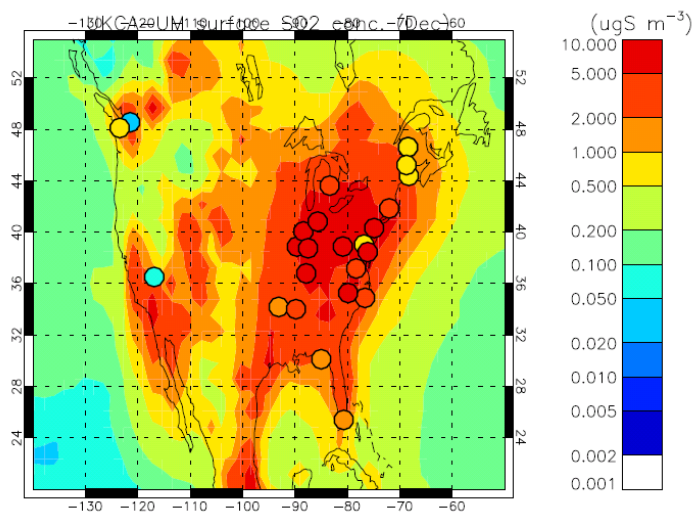


Black
Carbon
($\mu\text{gC/m}^3$)
obs were made
Sep/Oct 1992
Model is 1999
Sep-Oct mean

UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2: xkjgj) --- Evaluation vs SO₂ mass measurements Europe (EMEP : Loevblad et al., 2004) & N. America (CASTNET network; Malm et al., 2002)

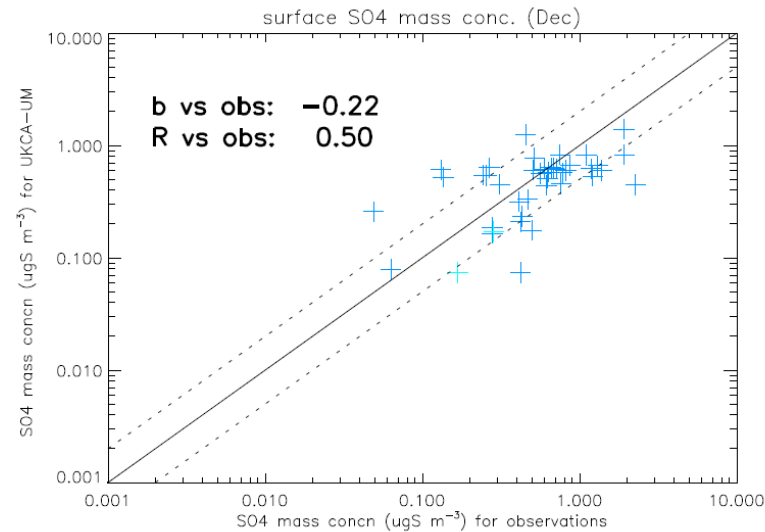
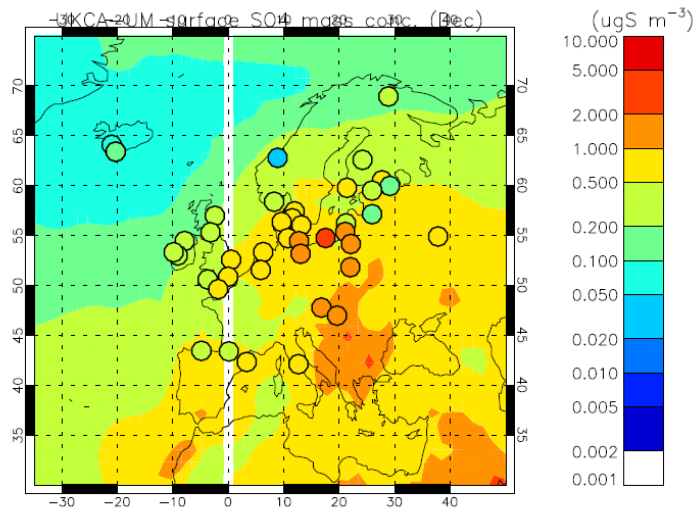


Sulphur dioxide ($\mu\text{gS/m}^3$)
Obs are Dec 2000.
Model is 1999 annual-mean

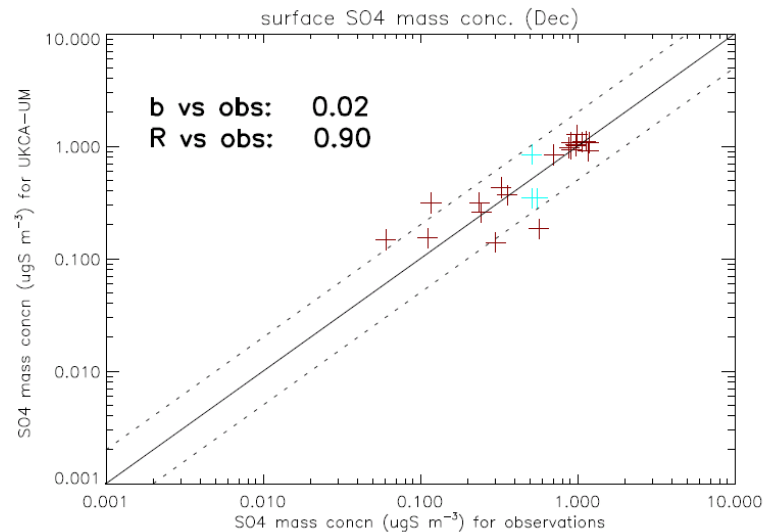
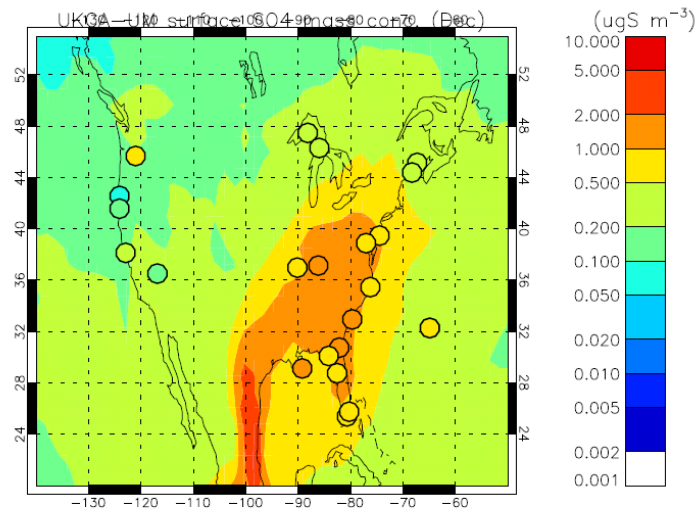


Sulphur dioxide ($\mu\text{gS/m}^3$)
Obs are Dec 2000.
Model is 1999 annual-mean

UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2: xkjgj): Evaluation vs Sulphate mass concentrat'ns Europe (EMEP : Loevblad et al., 2004) & N. America (IMPROVE network; Malm et al., 2002)

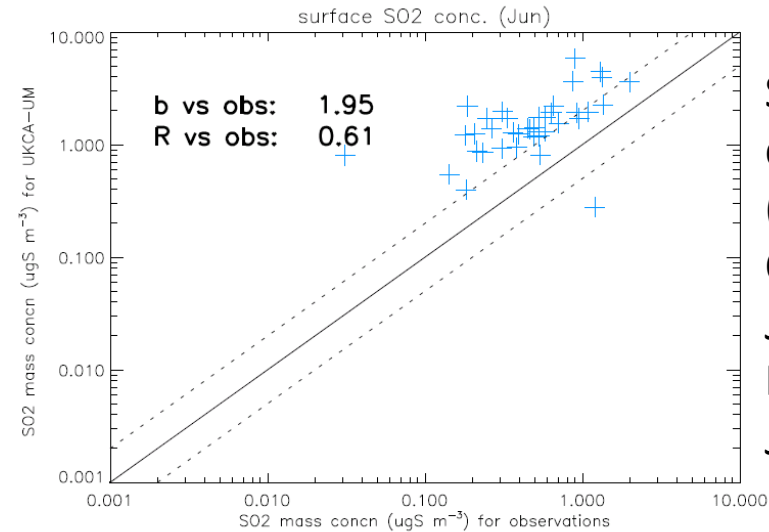
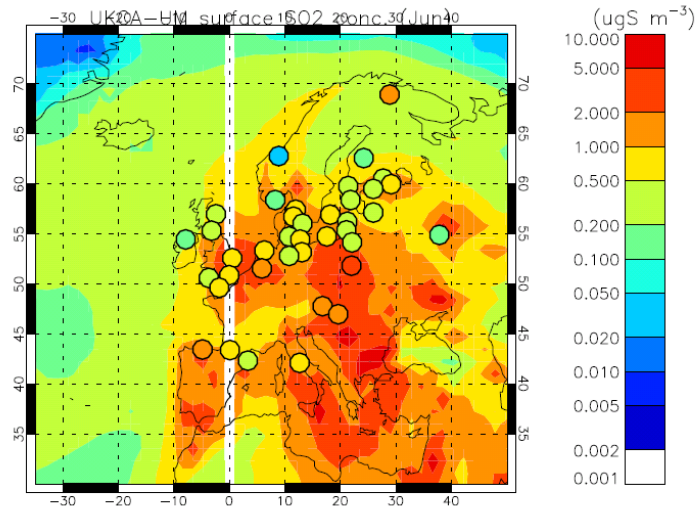


Sulphate
($\mu\text{gS/m}^3$)
Obs are
Dec 2000
Model is from
Dec 1999

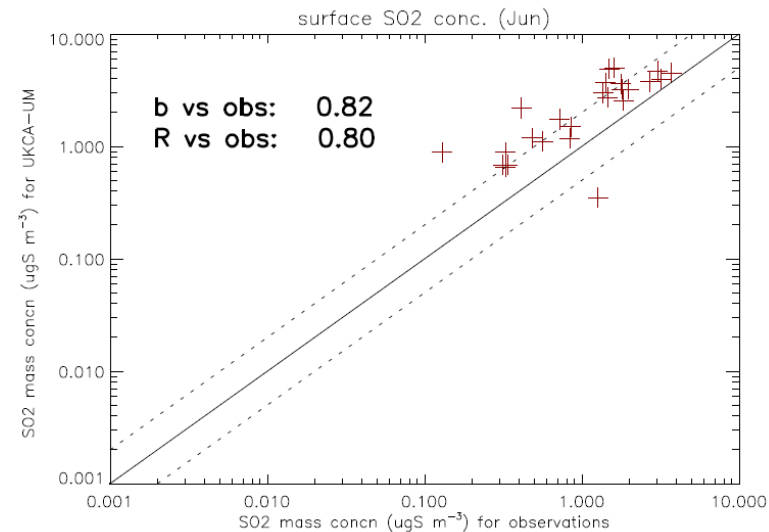
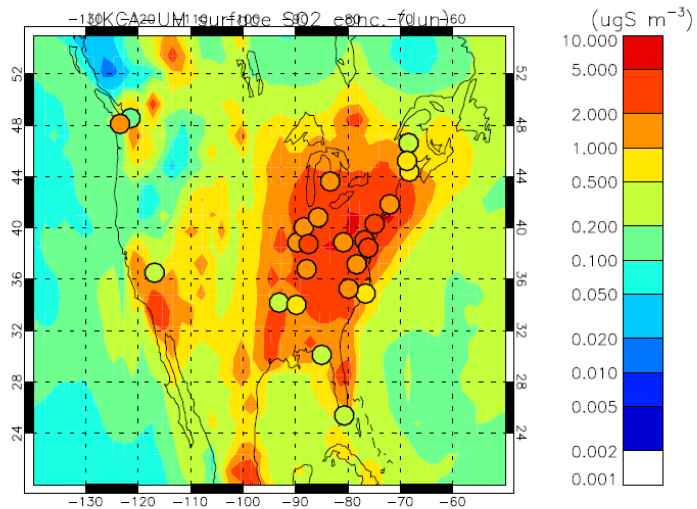


Sulphate
($\mu\text{gS/m}^3$)
Obs are
Dec 2000.
Model is from
Dec 1999

UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2: xkjgj): Evaluation vs SO₂ mass measurements Europe (EMEP : Loevblad et al., 2004) & N. America (CASTNET network; Malm et al., 2002)

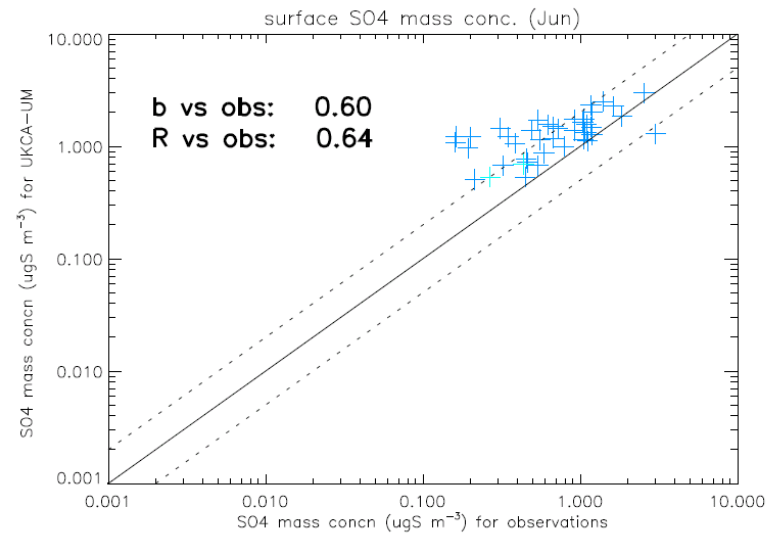
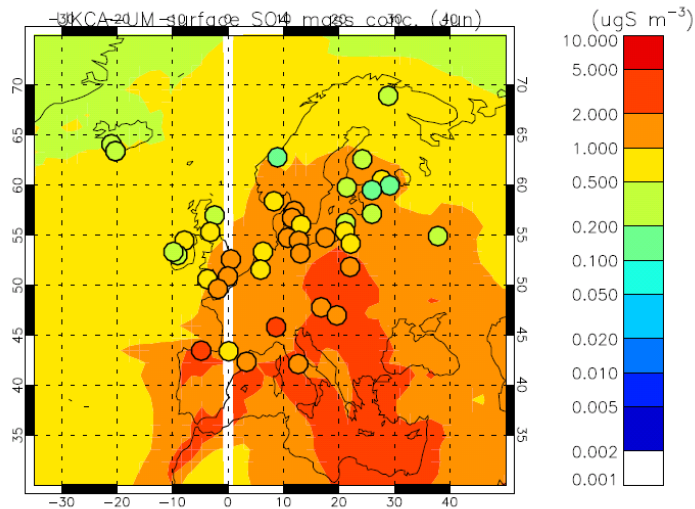


Sulphur dioxide ($\mu\text{gS/m}^3$)
Obs are Jun 2000.
Model is from Jun 1999

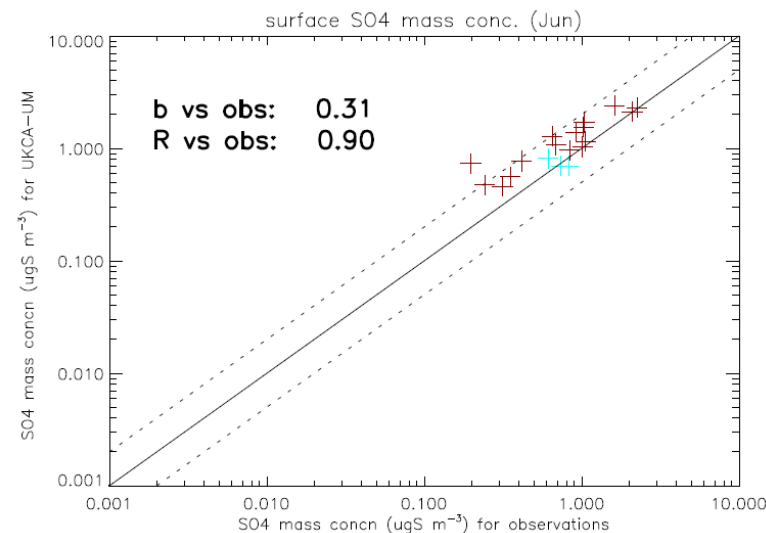
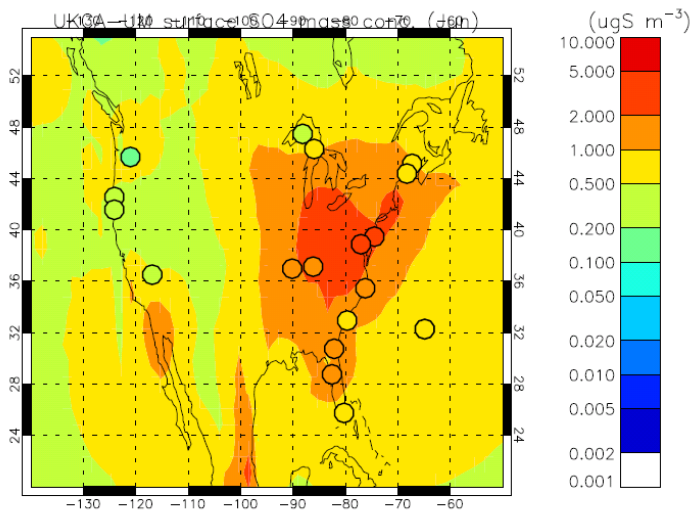


Sulphur dioxide ($\mu\text{gS/m}^3$)
Obs are Jun 2000.
Model is from Jun 1999

UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2: xkjgj): Evaluation vs Sulphate mass concentrat'ns Europe (EMEP: Loevblad et al., 2004) & N. America (IMPROVE network; Malm et al., 2002)

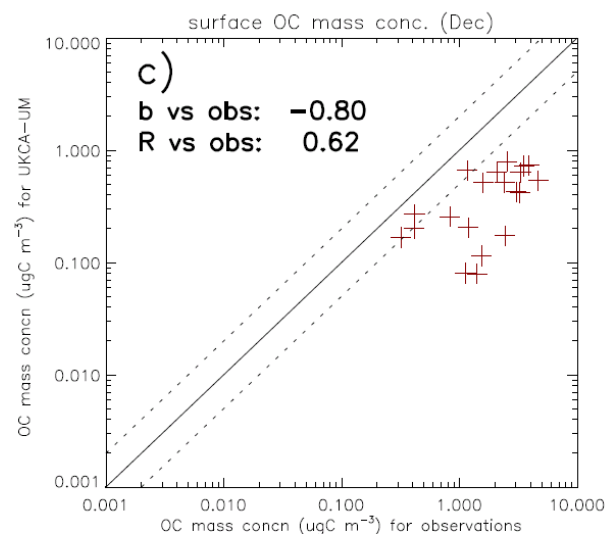
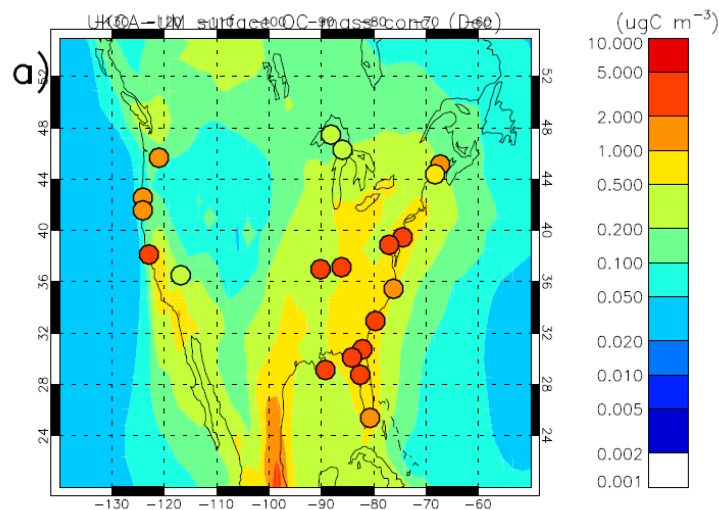


Sulphate
($\mu\text{gS/m}^3$)
Obs are
Jun 2000
Model is from
Jun 1999

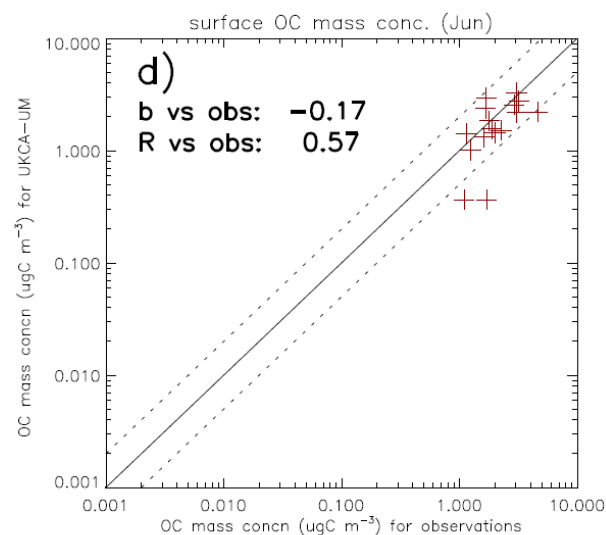
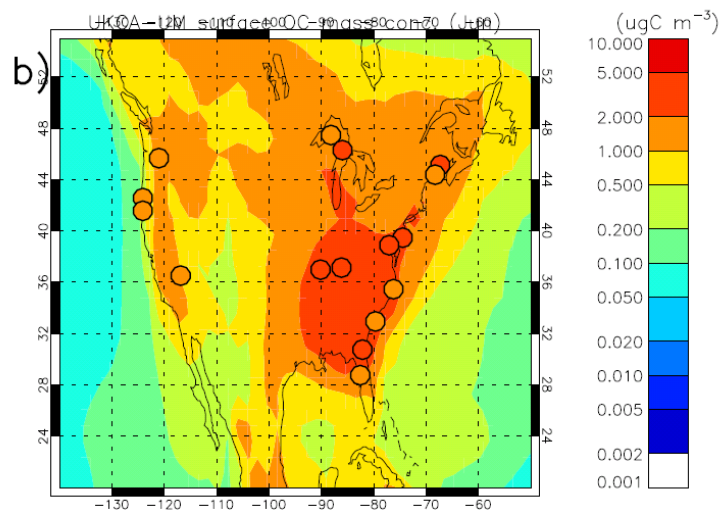


Sulphate
($\mu\text{gS/m}^3$)
Obs are
Jun 2000.
Model is from
Jun 1999

UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2: xkjgj): Evaluation vs Organic Carbon observations from North America (IMPROVE visibility network; Malm et al., 2002)

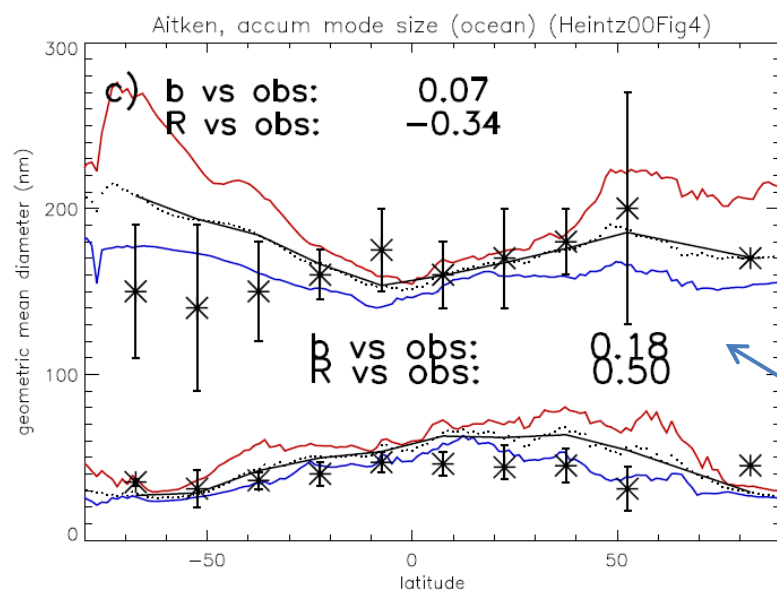
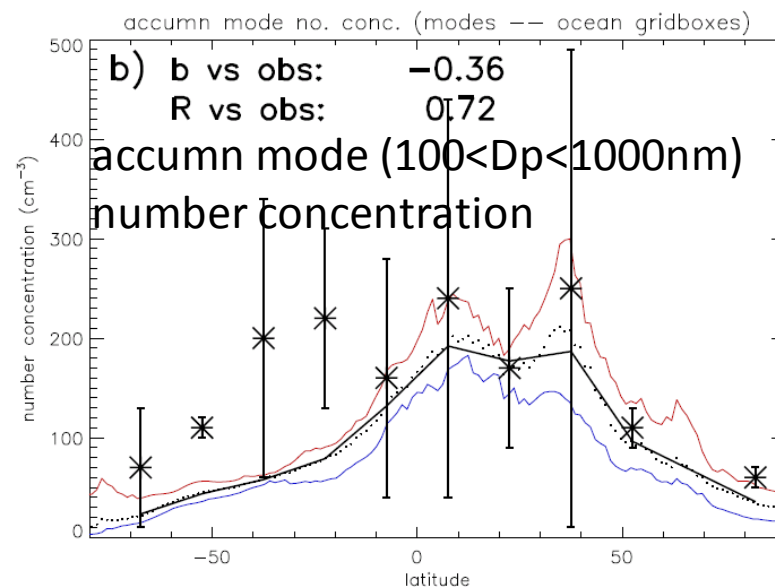
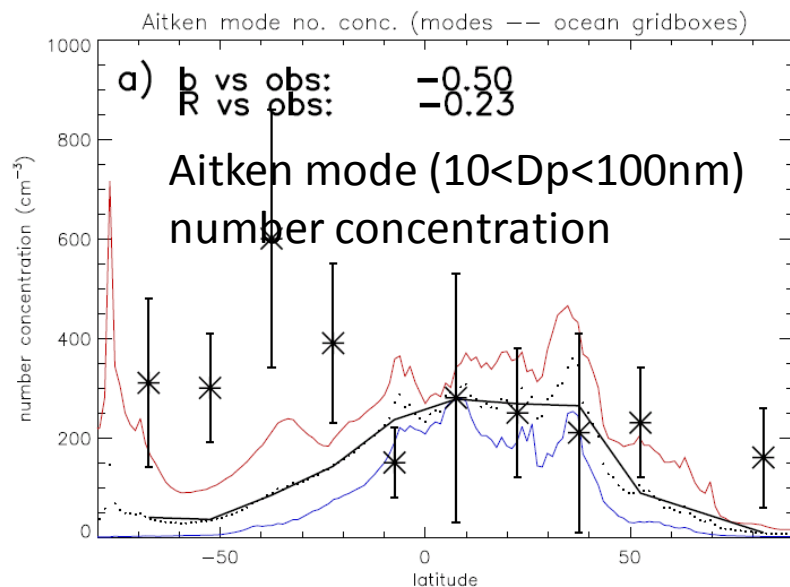


Organic Carbon ($\mu\text{gC/m}^3$)
Obs are Dec 2000
Model is from Dec 1999



Organic Carbon ($\mu\text{gC/m}^3$)
Obs are Jun 2000.
Model is from Jun 1999

UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2: xkjg): Evaluation vs 20 years of cruise size-distribn climatology of observations from multiple campaigns (Heintzenberg et al., 2000)



Asterisks are observations over all cruises in the various campaigns

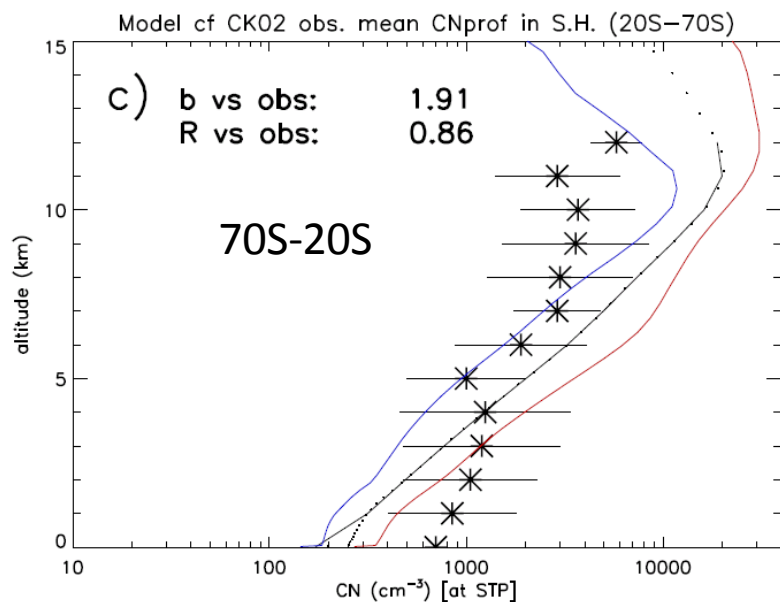
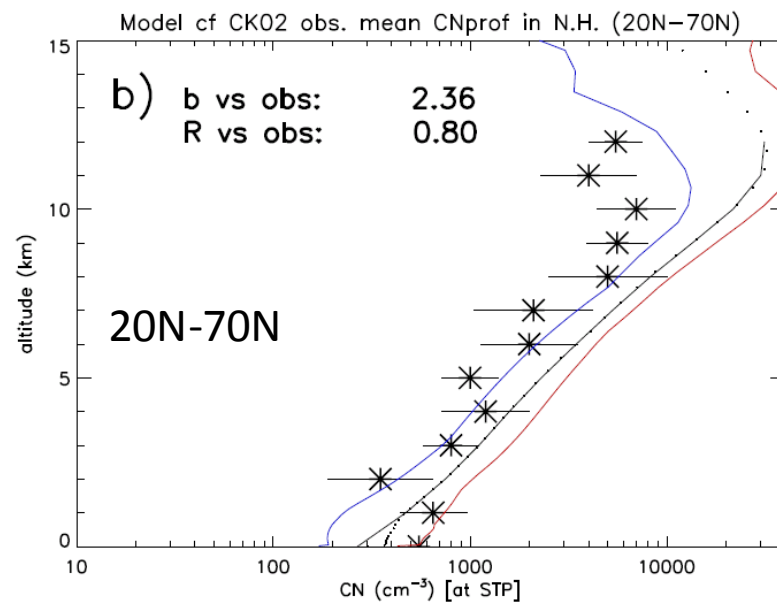
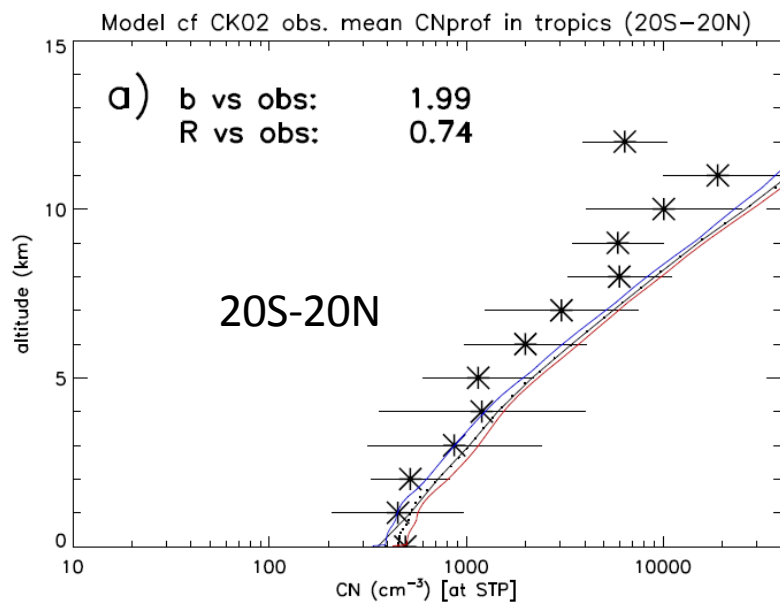
Model is for year 1999 of 15-yr run

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 (RC6.2: xkjgj): Evaluation vs aircraft-borne CN conc'ns observations from multiple campaigns (Clarke & Kapustin, 2002)

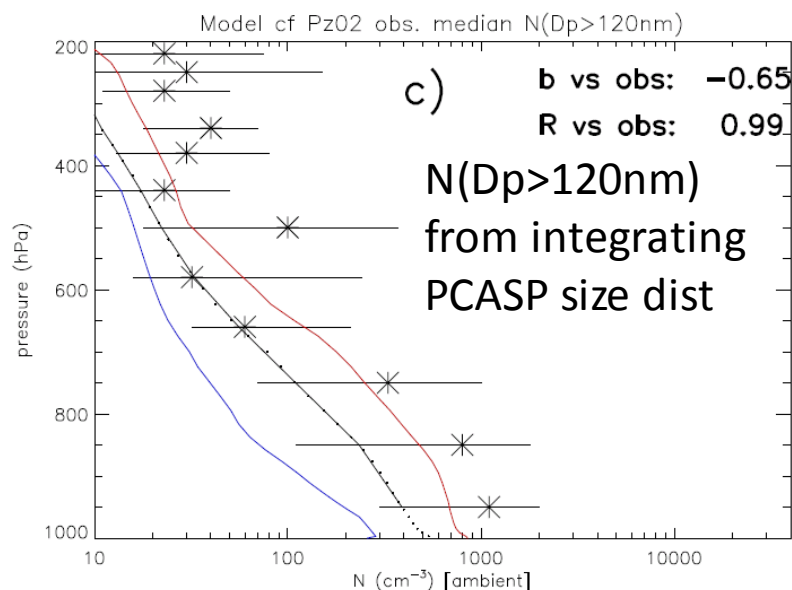
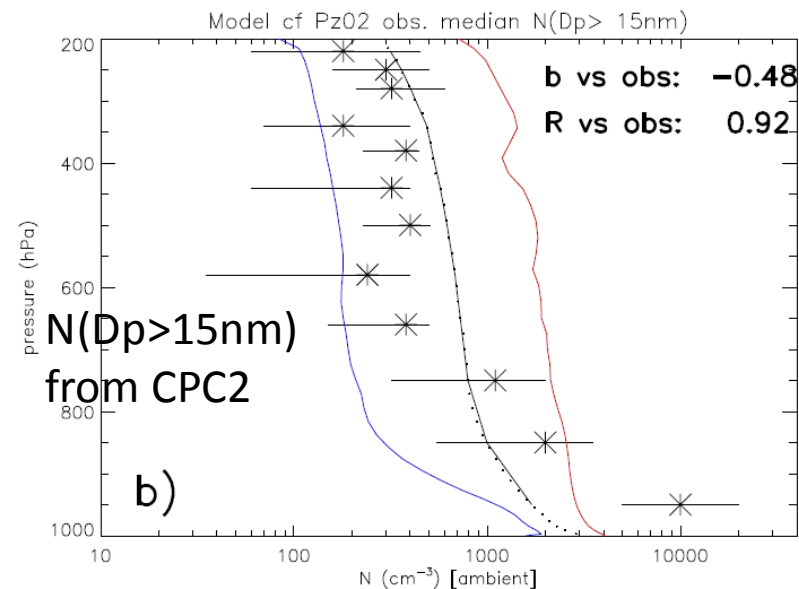
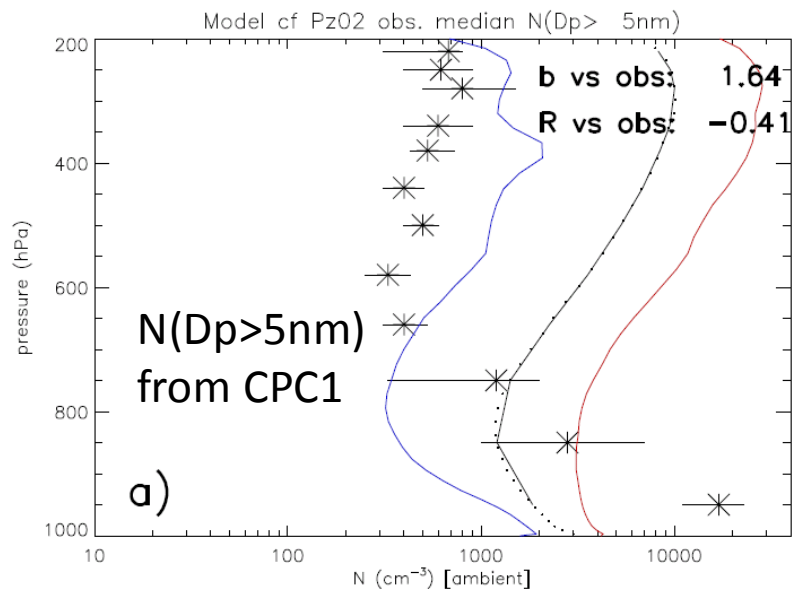


Asterisks are observations over all representative flights in the Pacific and Southern Ocean

Model is for year 1999 of 15-yr run

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

UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2: xkjj): Evaluation vs aircraft-borne number concn observations from LACE-98 (Petzold et al., 2002)

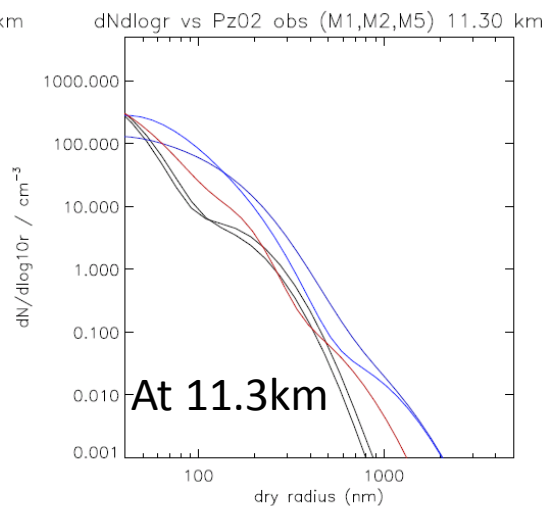
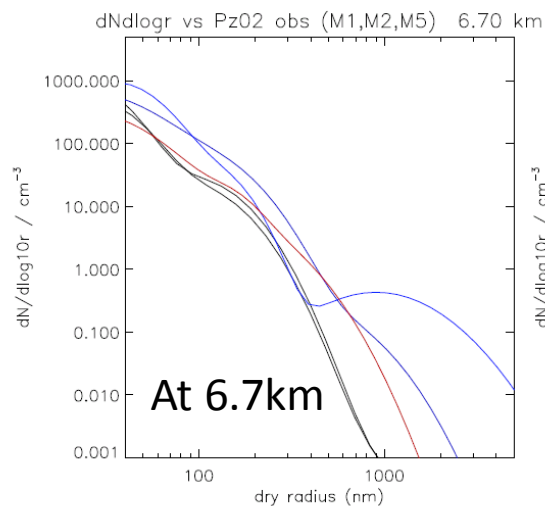
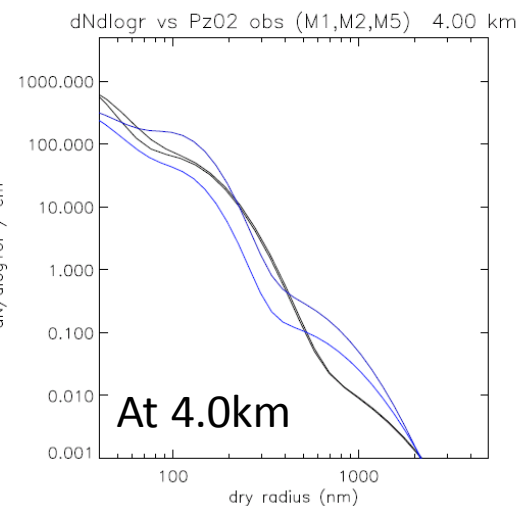
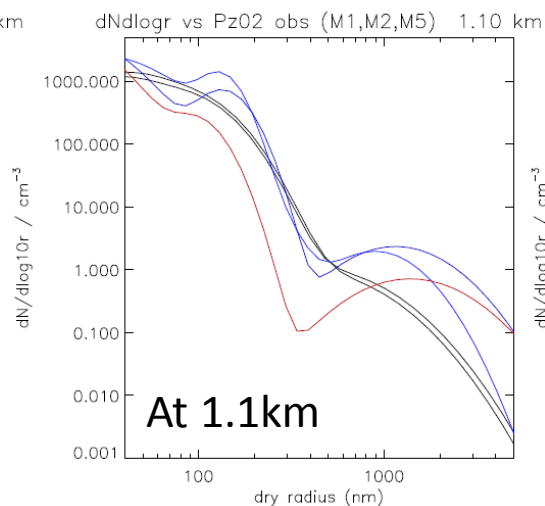
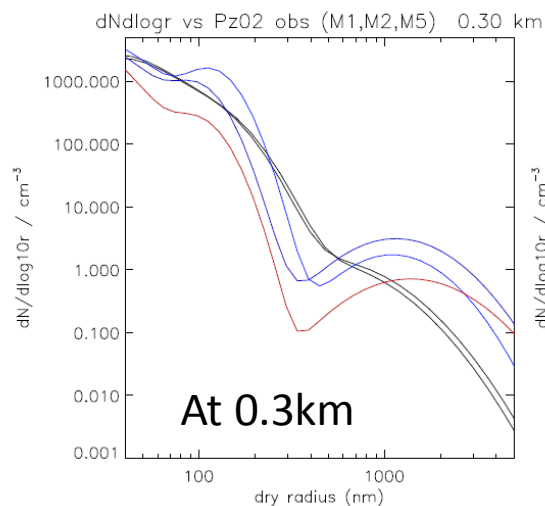


Asterisks are observations over all representative flights in the LACE-98 campaign over summertime Germany (compiled by Lauer et al, 2005)

Model is for year 1999 of 15-yr run

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

UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2: xkjj): Evaluation vs aircraft-borne size distrib'n observations from LACE-98 (Petzold et al., 2002)

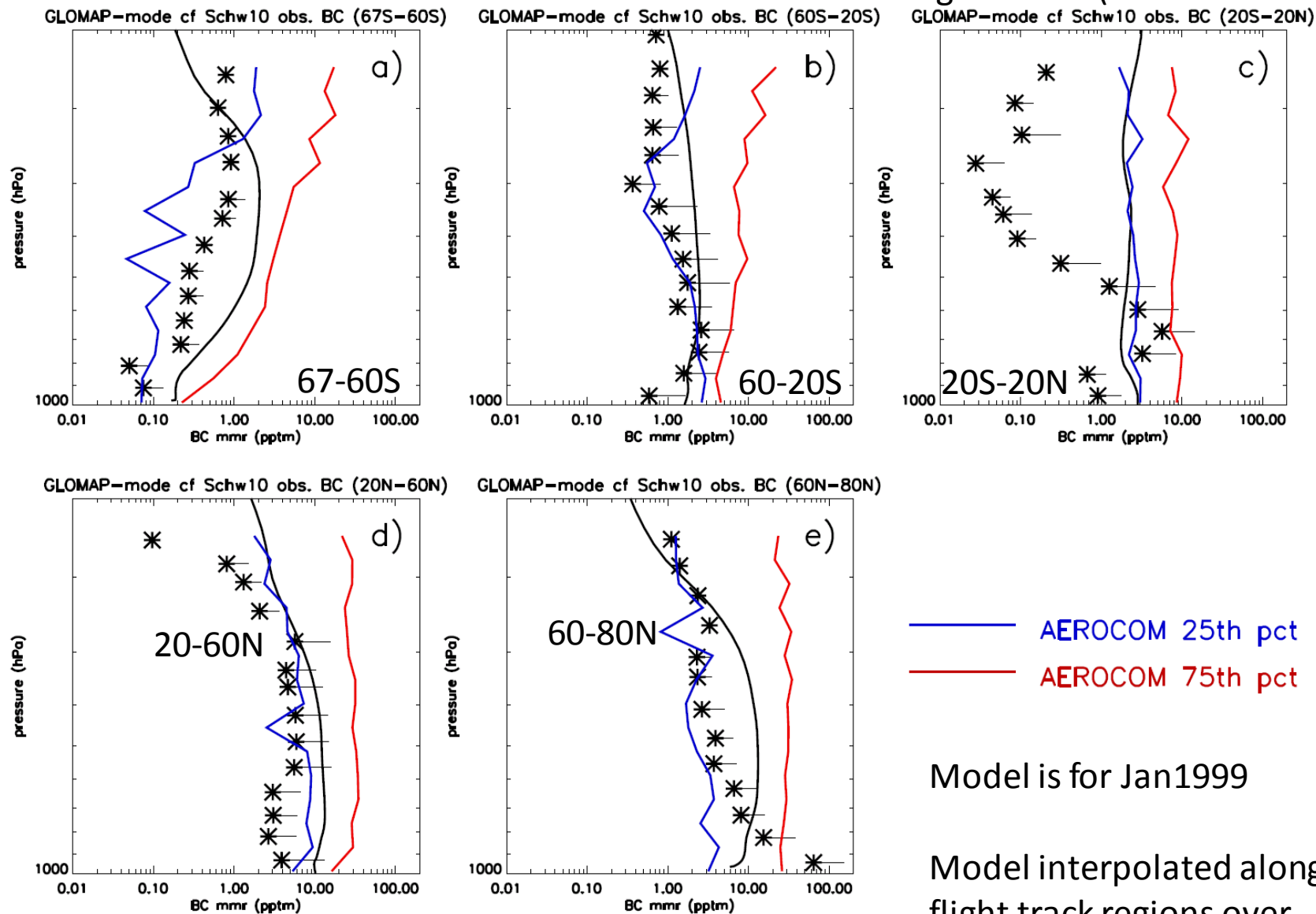


Blue and red are observations from different flights in the LACE-98 campaign over summertime Germany

Model is for year 1999 of 15-yr run

Black lines are model July & Aug monthly-means

UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2: xkjj): Evaluation vs aircraft-borne BC observ'ns from SP2 during HIPPO-1 (Schwarz et al., 2010)



UM-UKCA v8.4 GA4 CheST+GLOMAP (RC6.2: xkjj): Evaluation vs global CCN observations dataset compiled by Spracklen et al. (2011)

