Global distributions of cloud droplet number concentrations and cloud albedo effects from AeroCom models of a range of complexity

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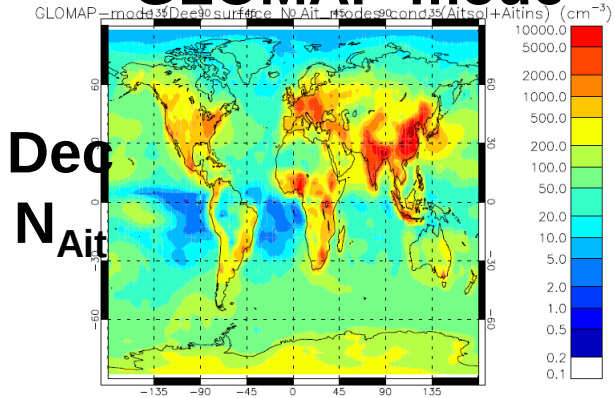
- Follow-on study from Mann et al. (2013) intercomparison of simulated number conc'ns and 3D-varying size distributions among 12 global aerosol microphysics models.
- Calculate 3D monthly-mean cloud droplet number concentration for 12 models.

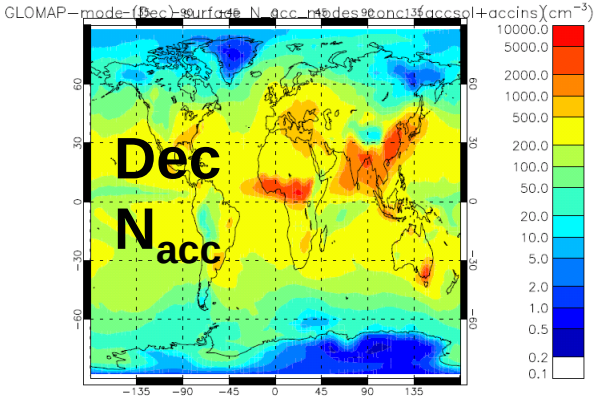
Model	Scheme type	Classes	Tracers	Host model	Resolution	Reference
CAM5-MAM3	modal (2m)	3	15	GCM (free)	1.9° x 2.5° x L30	Liu et al. (2012)
HadGEM3-UKCA	modal (2m)	5	20	GCM (nudg)	1.3° x 1.9° x L63	Mann et al., (in prep.)
TM5	modal (2m)	7	25	CTM	2.0° x 3.0° x L34	Aan de Brugh et al. (2011)
GLOMAP-mode	modal (2m)	7	26	CTM	2.8° x 2.8° x L31	Mann et al. (2012)
EMAC	modal (2m)	7	41	GCM (nudg)	2.8° x 2.8° x L19	Pringle et al. (2010)
ECHAM5-HAM2	modal (2m)	7	29*	GCM (nudg)	1.9° x 1.9° x L31	Zhang et al. (2012)
GISS-MATRIX	modal** (2m)	16	60	GCM (nudg)	2.0° x 2.5° x L40	Bauer et al. (2008)
CanAM4-PAM	pcwise-lgnrml (2m)	7	20	GCM (free)	3.7° x 3.7° x L35	Von Salzen (2006)
GEOS-Chem-APM	sectional (1m)	100	100	CTM	2.0° x 2.5° x L47	Yu & Luo (2009)
ECHAM5-SALSA	sectional (2m)	20	65	GCM (nudg)	1.9° x 1.9° x L31	Bergman et al. (2012)
GISS-TOMAS	sectional (2m)	12	72	GCM (free)	4.0° x 5.0° x L09	Lee & Adams (2010)
GLOMAP-bin	sectional (2m)	40	160	CTM	2.8° x 2.8° x L31	Spracklen et al. (2005a,2011)

- The “all-aerosol-tracer” datasets submitted by the models allow the CDNC to be derived, intercompared and evaluated against observations.
- Derive CDNC by applying the Nenes & Seinfeld (2003) activation parameterization (including modifications from Fountoukis & Nenes, 2004).
- Prescribe updraft velocity (constant= 0.15/0.30 ms^{-1} for ocean/land)
- Translate CDNC distributions for each model into a present-day cloud albedo radiative effect using an offline version of the radiative transfer model (Edwards & Slingo, 1996) used in the HadGEM climate model.
- Same approach in several studies (e.g. Spracklen et al., 2011; Schmidt et al., 2012; Rap et a l., 2013) to quantify aerosol indirect effects
- Here we will apply the approach to each of the 12 global aerosol microphysics model simulations for A2-CTRL (and A2-PRE where available).

TOMCAT-GLOMAP-mode



TOMCAT-GLOMAP-mode



TOMCAT-GLOMAP-mode

Dec CDNC