LMDzT Global Circulation Model

Nudged to ECMWF winds
Resolution 96x72 and 160x98

+INCA-module Interaction of Chemistry and Aerosol

http://www.ipsl.jussieu.fr/~dhaer/inca/

- CH4 chemistry

- Modal aerosol scheme (currently 5 aerosol modes)

All aerosol species, dynamic size, humidity growth after Gerber,
optical calculations using wet diameter, ageing of BC/POM,
10m ECMWF 1x1wind drives dust and sea salt source

Sulphate following Boucher and Reddy
(DMS after Kettel, SO_2 Edgar 3.2 for 1995)

http://www.ipsl.jussieu.fr/poles/Modelisation/NotesScience/note23.html

INCA Aerosol Module

Dust / **Sulphate** / **Black Carbon** / **Organic Matter** / **Sea Salt** / **Nitrate** / **Ammonium**

Modal approach: one **N**(umber) and x **M**(ass) tracer per aerosol mode

	Insoluble Modes	**Soluble Modes**
SuperCoarse		$\Rightarrow$ N_{SS}, M_{SS}
Coarse	N_{CI} M_D M_{NO3}	$\Rightarrow$ N_{CS} M_{SO4} M_{MSA} M_{SS} M_{NO3} M_{NH4}

$\Uparrow$

Accumulation	N_{AI} M_{BC} M_{POM}	N_{AS}, M_{SO4} M_{MSA} M_{BC}, M_{POM}, M_{SS} M_{NO3} M_{NH4}

$\Uparrow$

Aitken	$N_{BC/OC}$, M_{BC}, M_{OC}	$\Rightarrow N_T$, M_{SO4}, M_{BC}, M_{OC}

$\Uparrow$

Planned using M7

Nucleation		N_{SO4}, M_{SO4}

Schulz/Balkanski/Textor/Hauglustaine LSCE , Status 05/2003

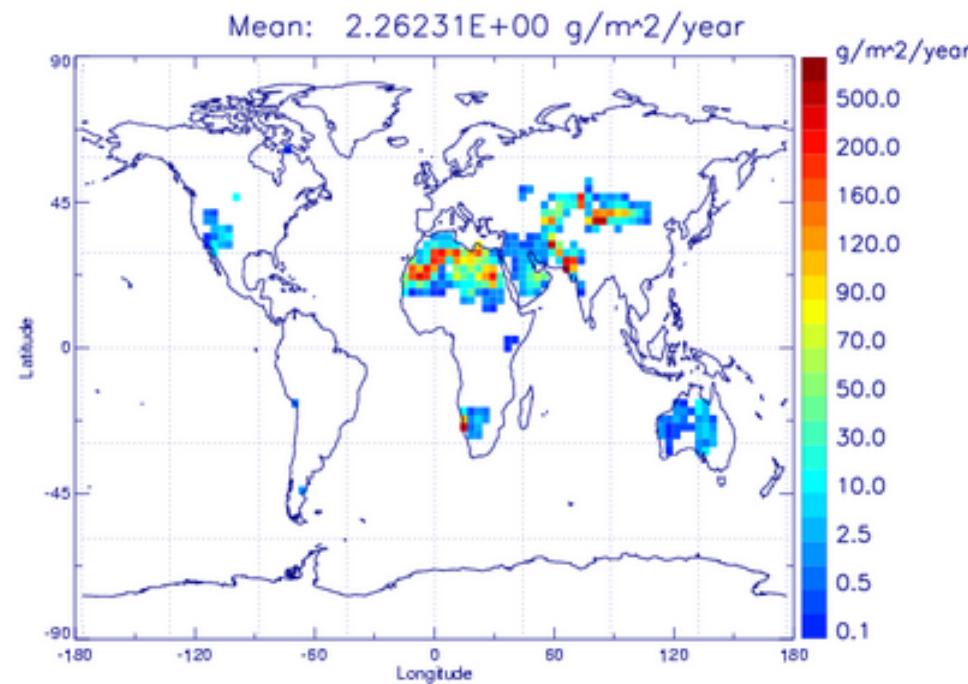# LMDz-INCA Dust Source
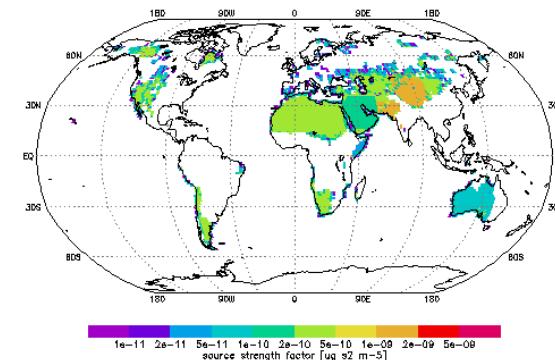
$$\text{Flux} = \text{rhv} * (u_{10m} - \text{wth}) * u_{10m}^2$$
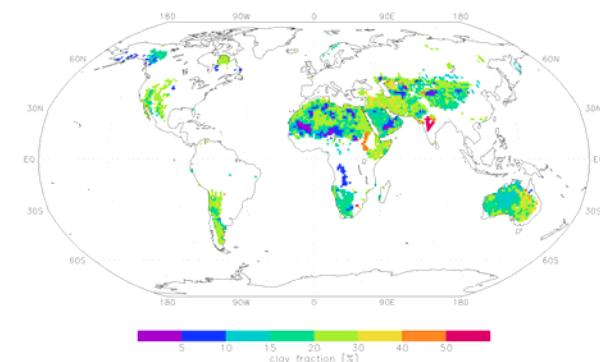
where soil is dry (f (cly))

based on Claquin 1999 ; FAO soil map
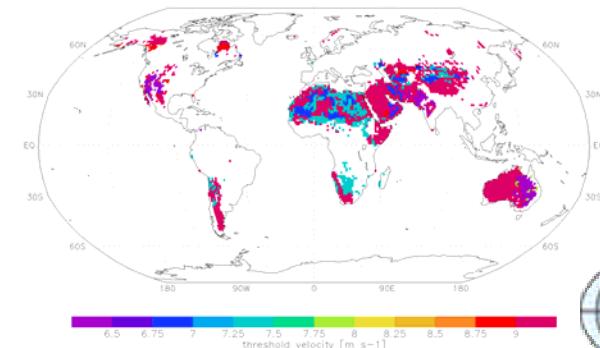adjusted using TOMS and Marticorena et al.

Source Strength Factor (rhv)
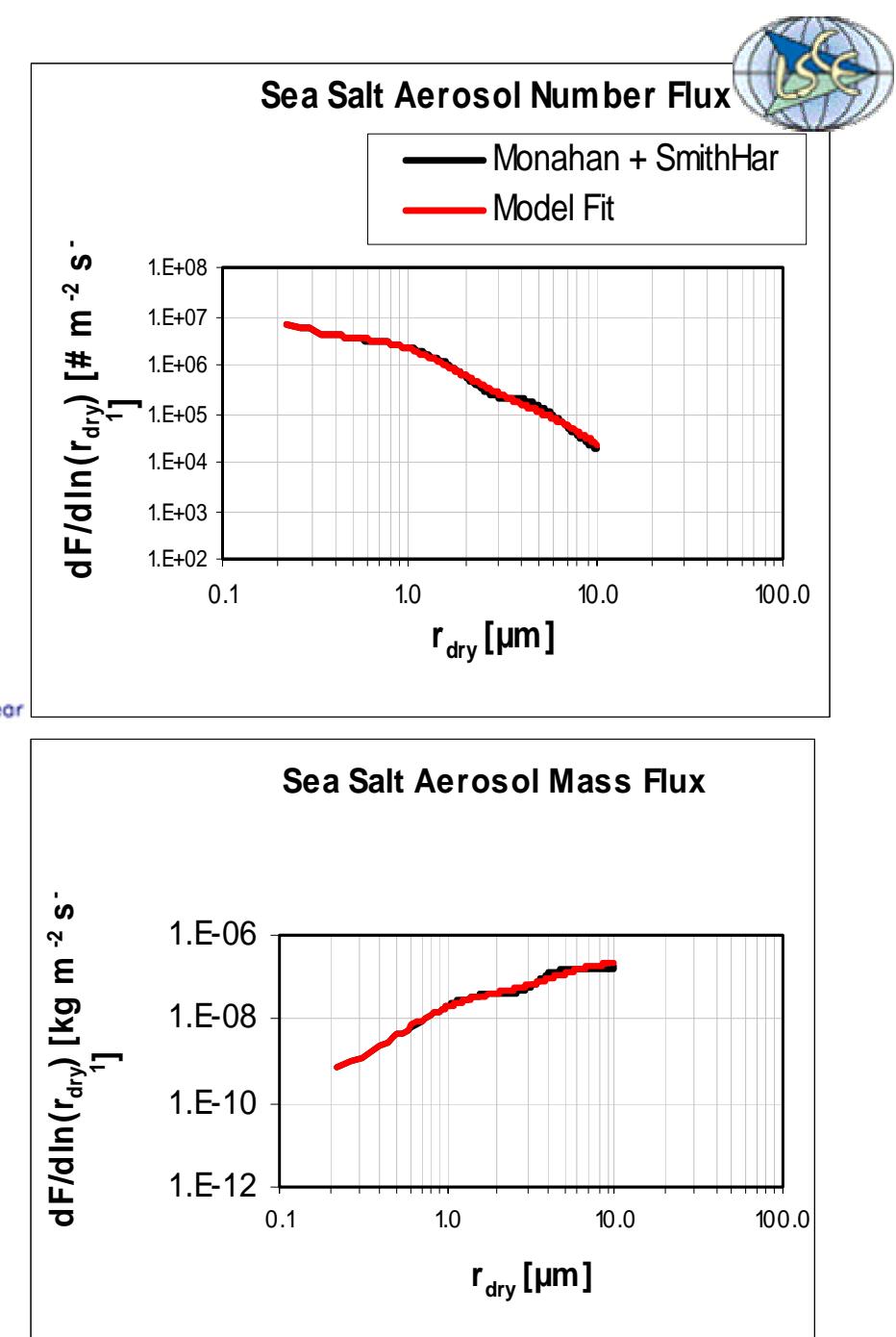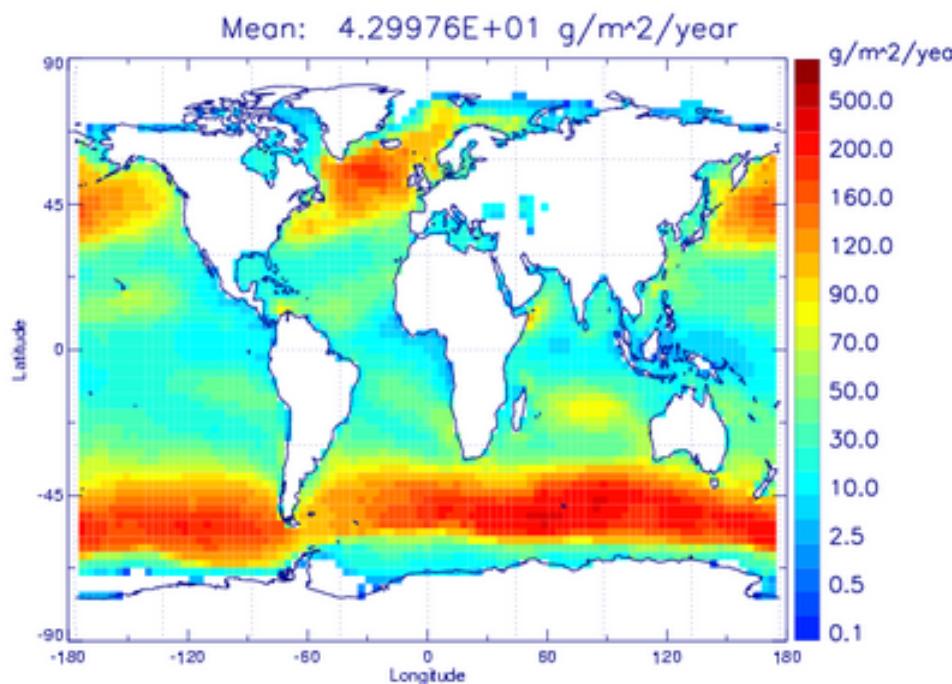

Clay Content (cly)

Threshold Velocity (wth)
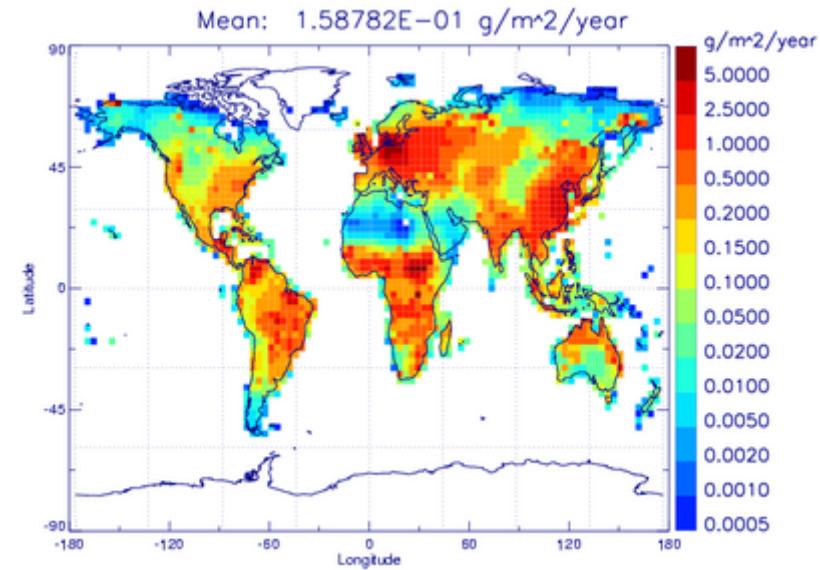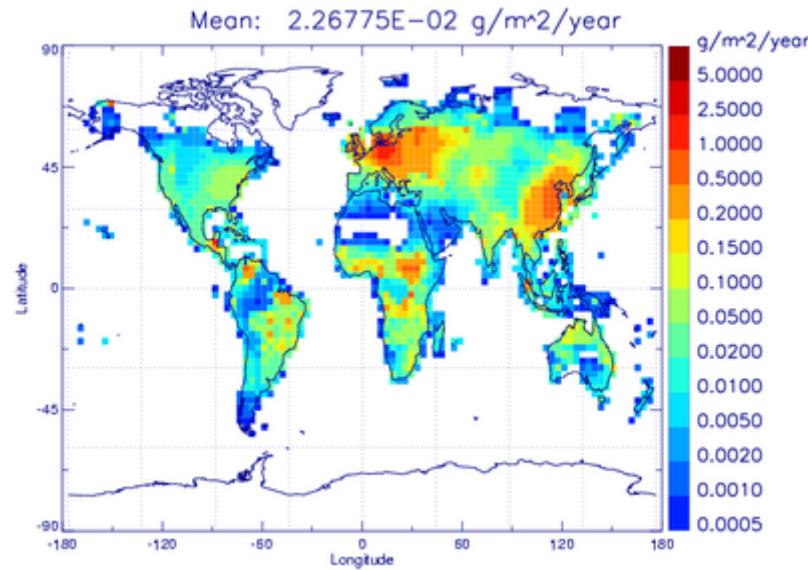

Mean: 2.26231E+00 g/m^2/year

LMDz-INCA
Sea Salt Source

Fit of three lognormal distributions
to empirical functions Mass, Number = f (u_{10m})

based on Guelle et al. 2001, JGR
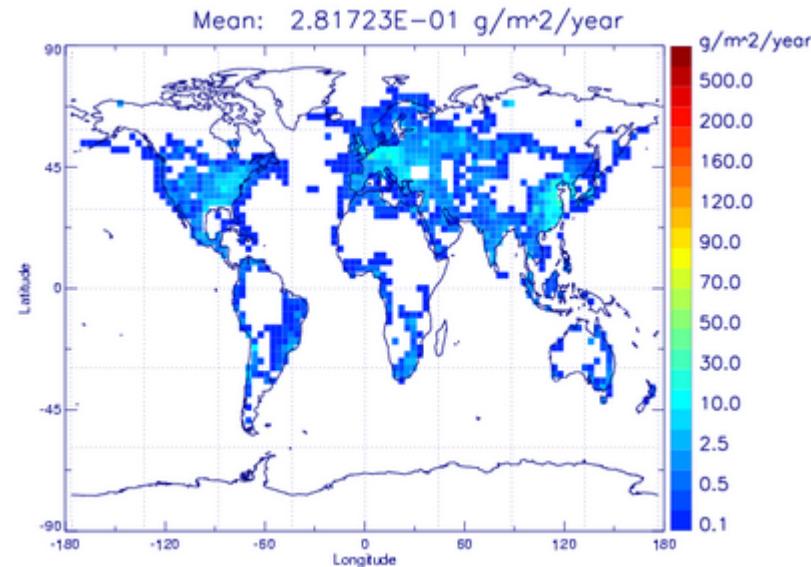using   Monahan 86   plus   Smith and
Harrison 98 source functions

Mean: 4.29976E+01 g/m^2/year

Sea Salt Aerosol Number Flux

Sea Salt Aerosol Mass Flux

Emissions (BC Liousse et al / POM Generoso et al; ACP 2003;
Black Carbon   *Particulate Organic Matter*

SO2 emissions   *DMS emissions Kettel et al.*