

OBJECTIFS SCIENTIFIQUES

Aérosols et système climatique: effets direct, semi-direct & indirect.

Cycle de l' aérosol: Sources – Transport – Variabilité – Tendances.

– *Contenu intégré et AOD – Absorption – Taille – Forme - Nature à l ' échelle globale*



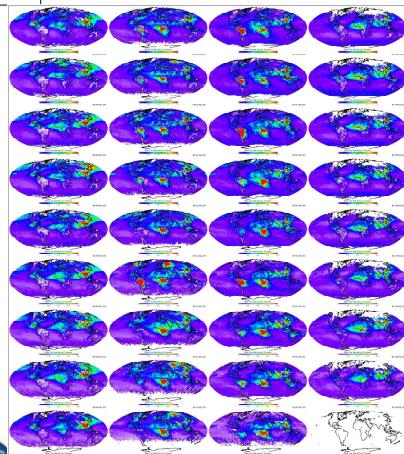
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Aerosols: Mode accumulation

Saison

MAM JJA SON DJF

Année



20 Aug 2005

Data:CNES-PARASOL
Processing:LDA-LSCE-ICARE

AOD_Fine

0. 0.5



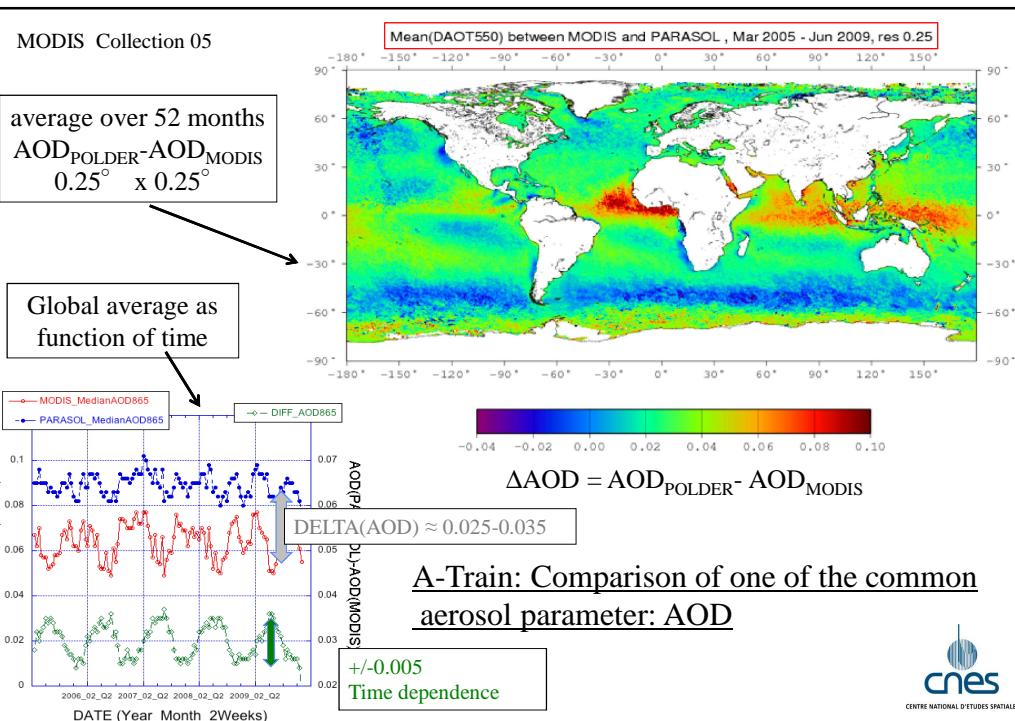
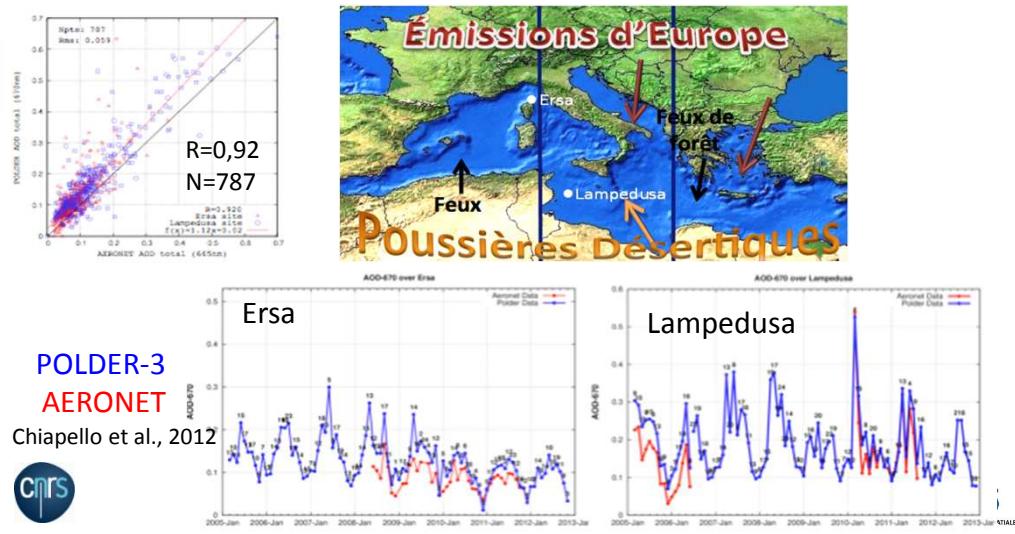
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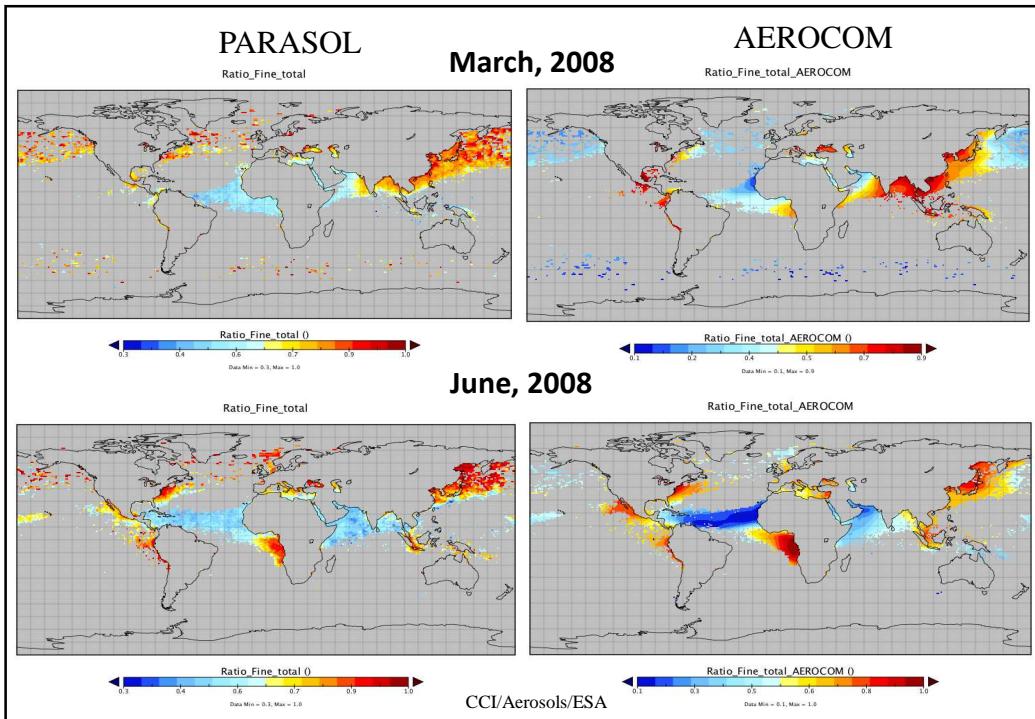
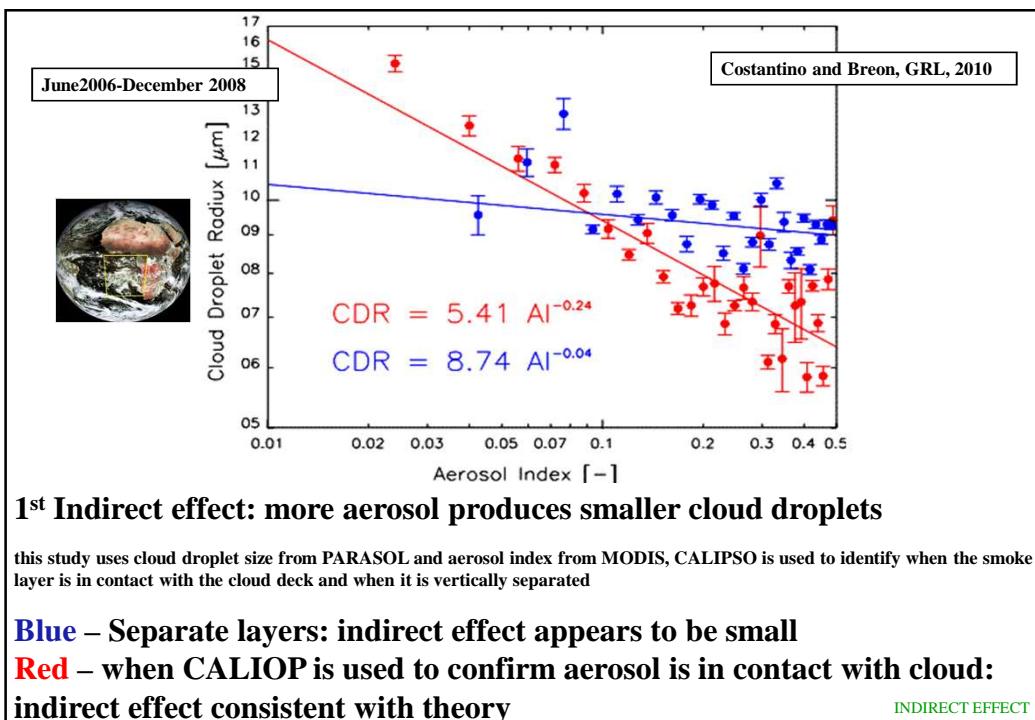
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ChArMEx: Analyse des produits aérosols POLDER-3 en Méditerranée

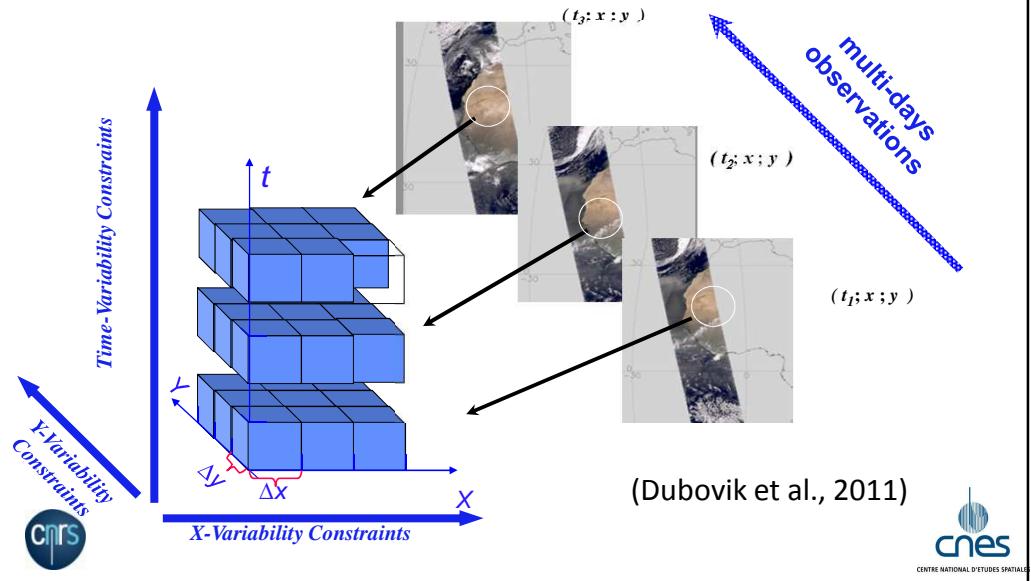
Comparaison des AOT totale 670 nm POLDER-3 et AERONET

Validation et variabilité de 2005 à 2012 sur les 2 super-sites ChArMEx

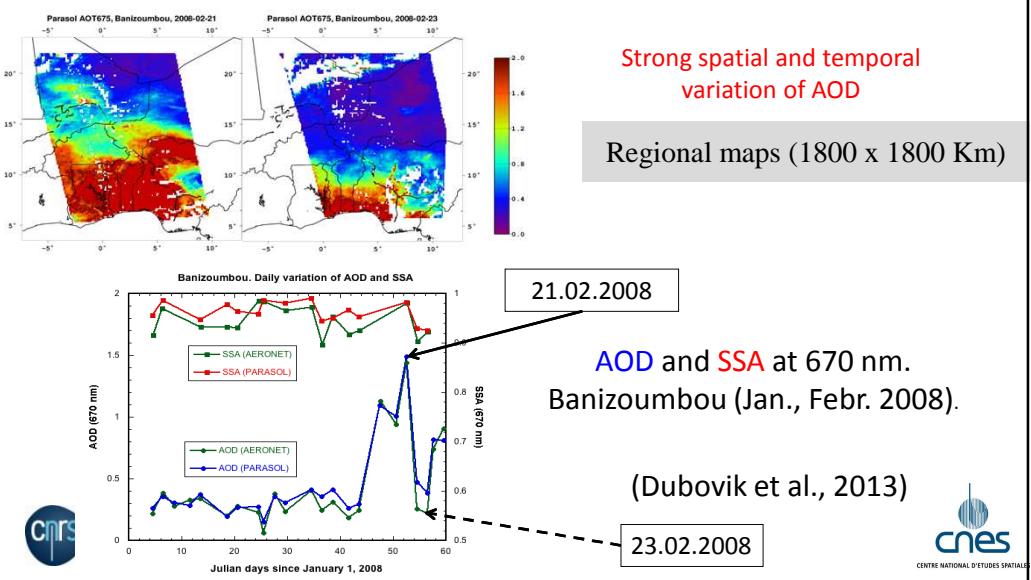




New Algorithm: The concept of multi-pixel retrieval

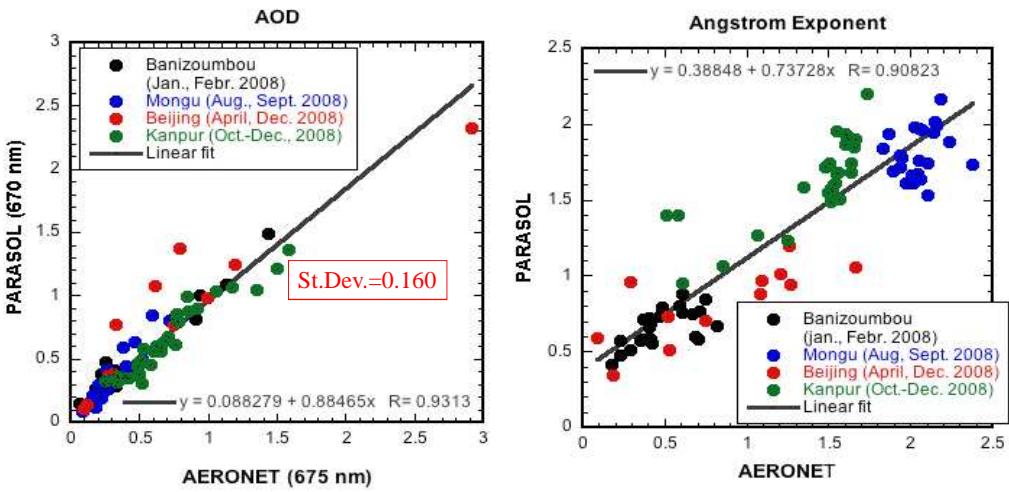


AEROSOL OVER LAND - INVERSION OF PARASOL OBSERVATIONS: GRASP (Generalized Retrieval of Aerosol and Surface Properties)

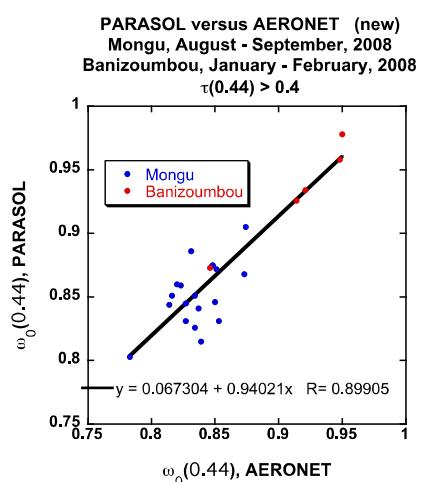
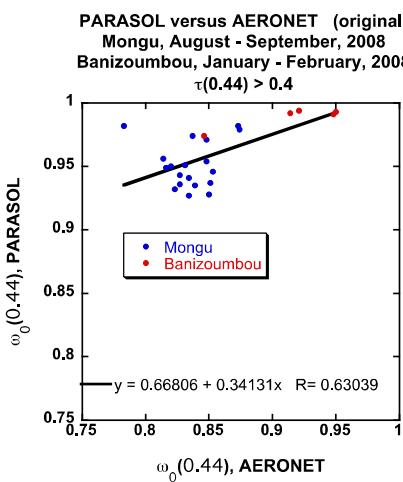


AOD & Angstrom Exponent.

POLDER/AERONET



SSA. POLDER/AERONET

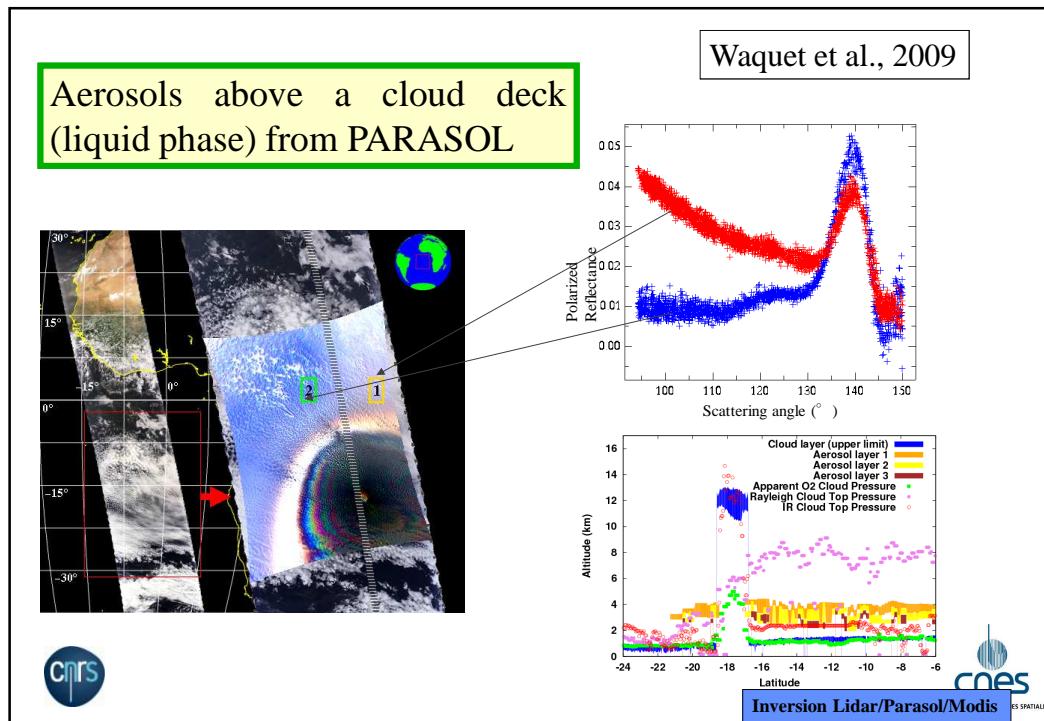
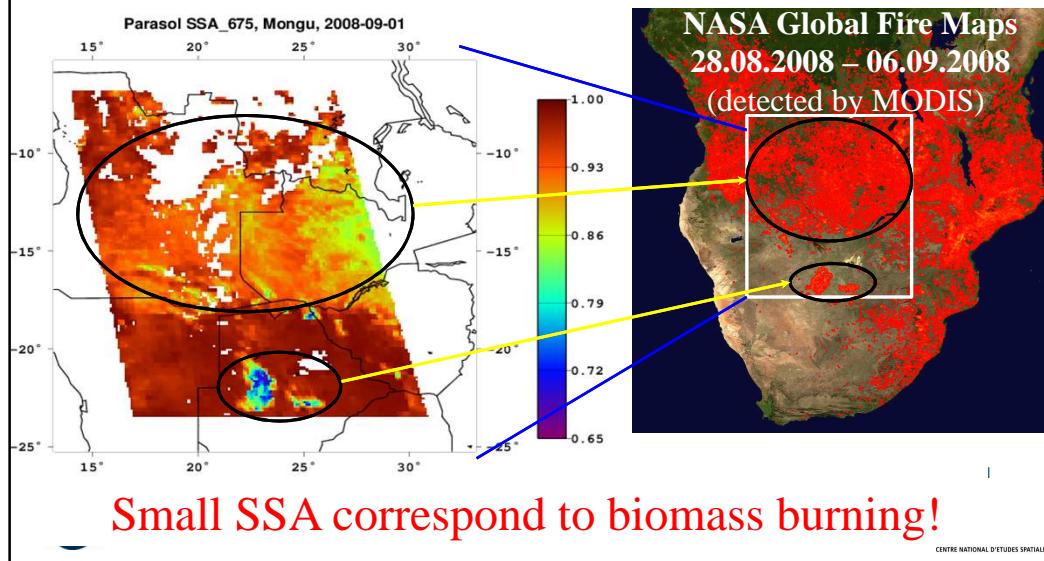


Version K

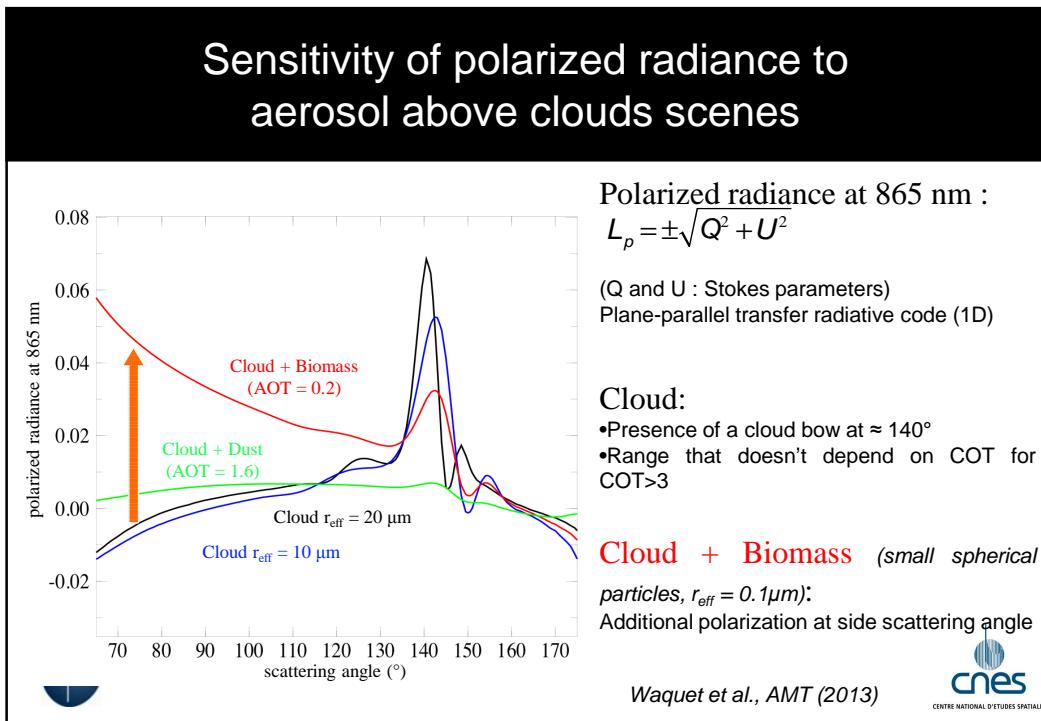
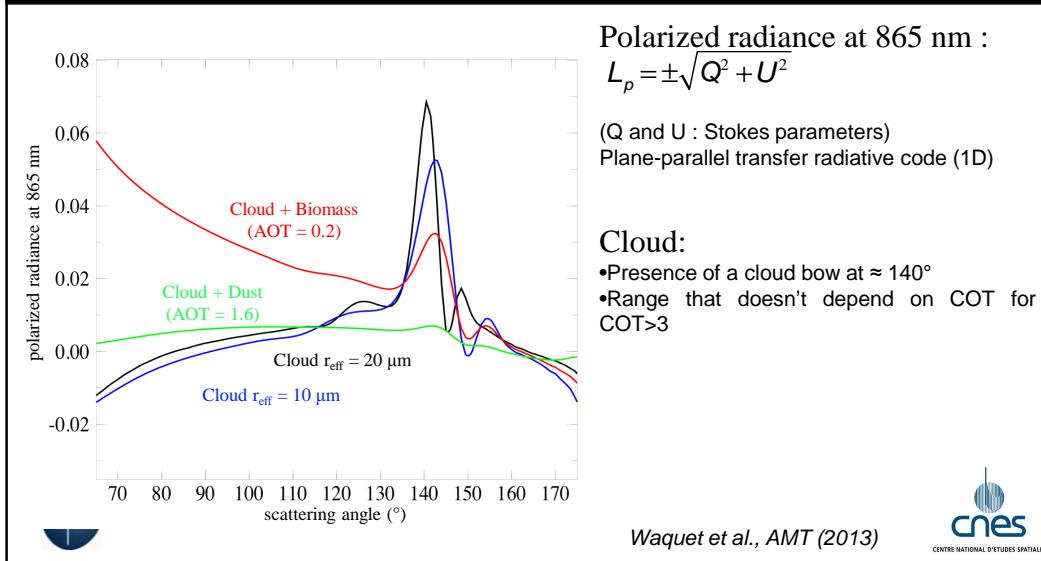


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Regional maps (1800 x 1800 km). Mongu, SSA 670 nm

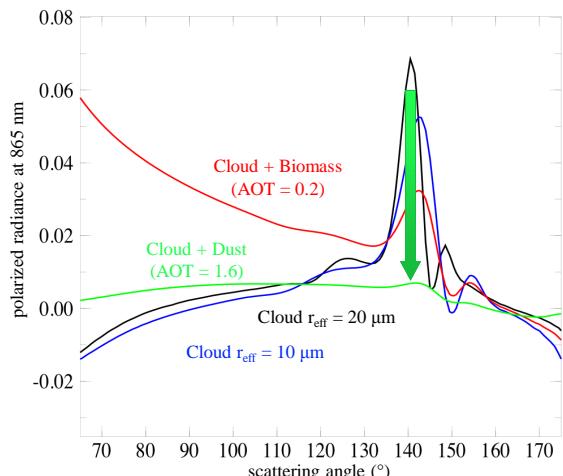


Sensitivity of polarized radiance to aerosol above clouds scenes



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Polarized radiance at 865 nm :



$$L_p = \pm \sqrt{Q^2 + U^2}$$

(Q and U : Stokes parameters)
Plane-parallel transfer radiative code (1D)

Cloud:

- Presence of a cloud bow at $\approx 140^\circ$
- Range that doesn't depend on COT for $\text{COT} > 3$

Cloud + Biomass (small spherical

particles, $r_{\text{eff}} = 0.1 \mu\text{m}$): Additional polarization at side scattering angle

Cloud + Dust (coarse non-spherical particles, $r_{\text{eff}} = 2.5 \mu\text{m}$): Reduction of the polarization in the cloud bow

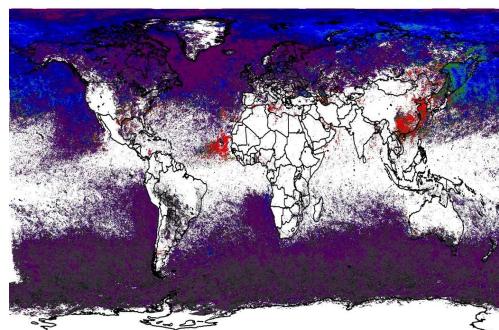
Waquet et al., AMT (2013)



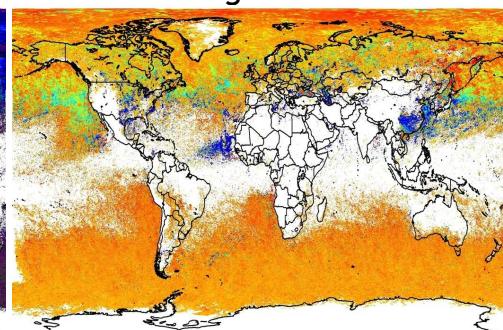
Global analysis (Spring 2008)

POLDER : Mean AOT at 865 nm and Ångström above cloud (March, April, May 2008)

AOT at 865



Ångström



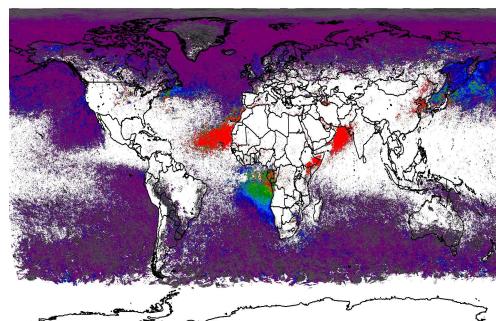
(Waquet et al., GRL, 2013)



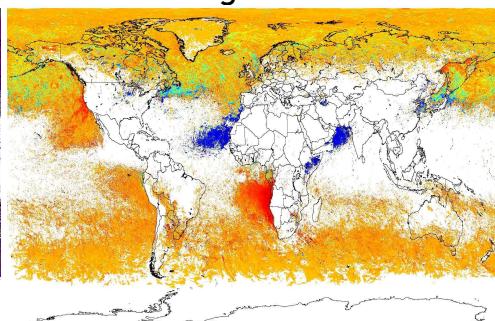
Global analysis (Summer 2008)

POLDER : Mean AOT at 865 nm and Ångström above cloud (June, July, August 2008)

AOT at 865



Ångström

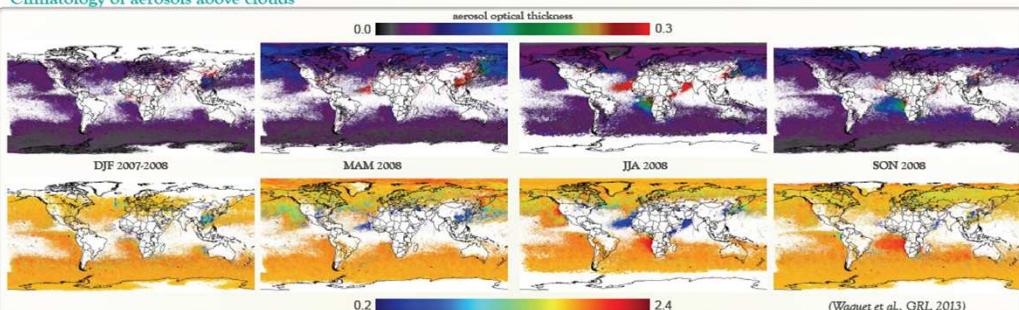


(Waquet et al., GRL, 2013)



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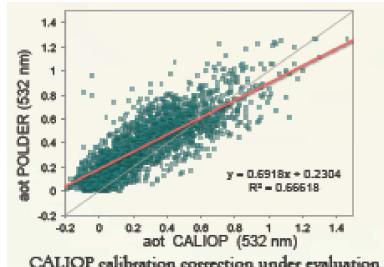
Climatology of aerosols above clouds



(Waquet et al., GRL, 2013)

Aerosols Above Clouds' (AAC) properties have been retrieved using multidirectional polarized measurements with collocated and simultaneous information about clouds from MODIS. As a matter of fact, the presence of aerosols in cloudy scenes affects the polarized signal reflected by the cloud. On the maps hereinabove, the Aerosol Optical Thickness (AOT) and the Ångström Exponent (AE - i.e. a parameter related to the particles' size) are displayed and show the major features of their seasonal and spatial variability. Fine mode aerosols (i.e. radius lower than 0.6 µm – AE larger than 1.2) are dominated by anthropogenic contribution, as for instance, biomass burning and pollution particles. Large values of AE (red color) are characteristic of biomass burning aerosols. On the opposite, mineral dust particles (coarse mode) are associated with much more lower AE (i.e. around 0.3 – dark blue color).

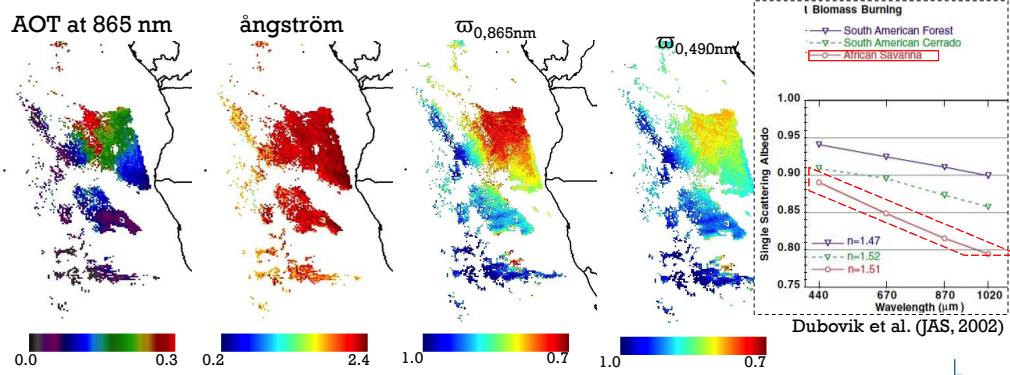
(Waquet et al., 2013)
Peers et al., 2014



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Aerosol absorption above clouds

Thanks to the information about aerosol above clouds scattering, the **total radiances at 490 and 865 nm** from POLDER will lead to the evaluation of the aerosols absorption.

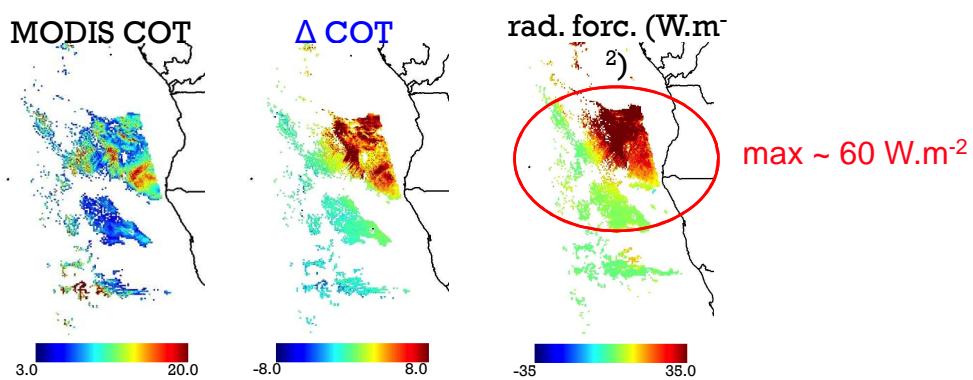


Case study : biomass burning aerosols above clouds off the coast of Namibia.
(04/08/2008 – preliminary results) (Peers et al. 2014 in prep)



Aerosol above clouds radiative forcing

The method will also provide an estimation of the error upon the retrieved cloud optical thickness (ΔCOT) and the estimate of the radiative forcing (rad. forc.)



Case study : biomass burning aerosols above clouds off the coast of Namibia. (04/08/2008 -
preliminary results)

(Peers et al. 2014 in prep)

