Impact of Cross-platform Vicarious Calibration on the Deep Blue Aerosol Retrievals for Terra/MODIS

Prepared by Myeong-Jae Jeong (MJ)
Jan 6, 2011

Reference:
Jeong, M.-J., N.C. Hsu, E.J. Kwiatkowska, B.A. Franz, G. Meister, and C.E. Salustro (2010),
"Impacts of cross-platform vicarious calibration on the Deep Blue aerosol retrievals for moderate resolution imaging spectroradiometer aboard Terra",
IEEE Trans. Geosci. Remote Sens., Submitted/Under Review.

Collection 5.1 Terra-MODIS Deep Blue aerosol retrievals & Vicarious Calibration

- Temporal coverage: Mar 2000 – Dec 2007
- Spatial coverage: Arid- & semi-arid surfaces (e.g,. deserts)
- Vicarious calibration method (OBPG at GSFC; Kwiatkowska et al., 2008, *Appl. Opt.*) was applied to Band 8 (412nm)

TOA total radiance, I_t

$$I_t = \frac{1}{p_c M_{11}} I_m$$

$$p_c = \frac{1}{1 - m_{12}\left(Q_t \cos 2\alpha + U_t \sin 2\alpha\right)/I_m - m_{13}\left(-Q_t \sin 2\alpha + U_t \cos 2\alpha\right)/I_m}$$

(Meister et al., 2005, Appl. Opt.)

I_m : **TOA MODIS measured radiance**

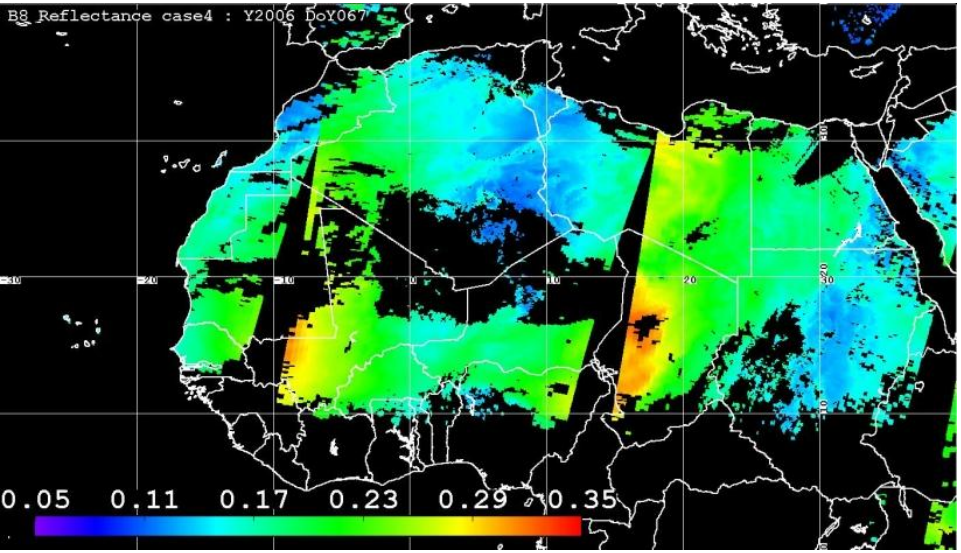
p_c : **Polarization correction factor**

$1/M_{11}$: **Response-Versus-Scan (RVS)**

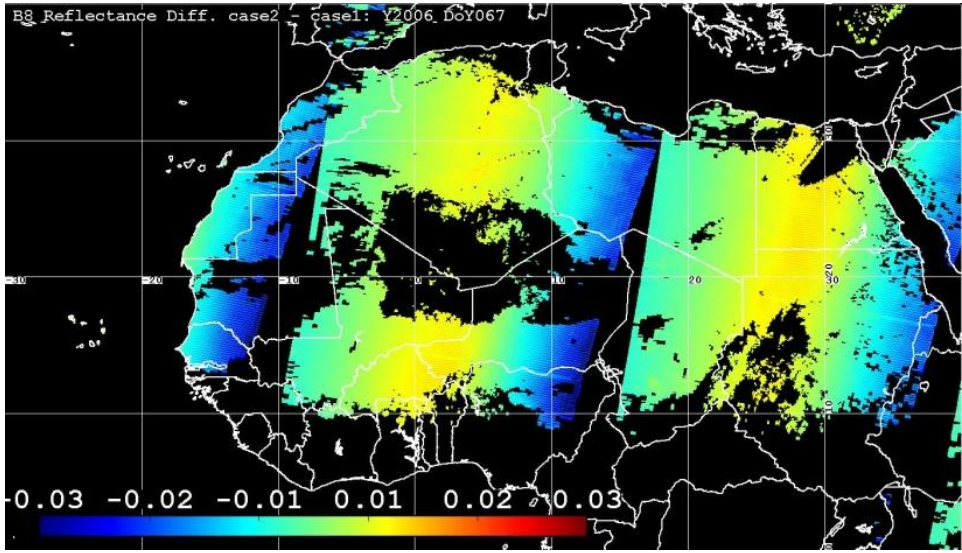
- **Case 1 (or C1) : No corrections applied to B8 reflectance**
- **Case 2 (or C2) : RVS correction for B8 reflectance**
- **Case 3 (or C3) : Polarization sensitivity correction for B8 reflectance**
- **Case 4 (or C4) : Both RVS and polarization sensitivity corrections applied to B8**

B8 (412nm) Reflectance: March 8, 2006

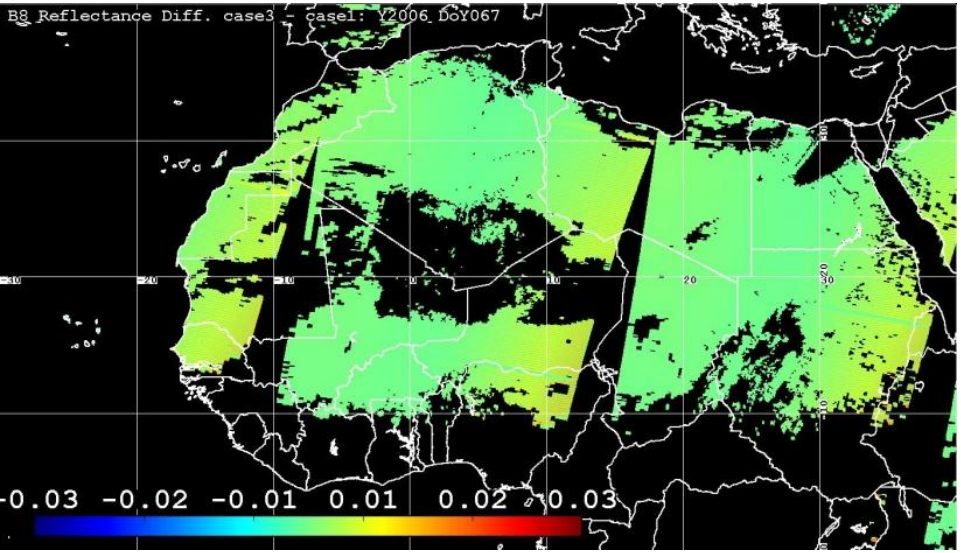
B8 Reflectance After Corrections



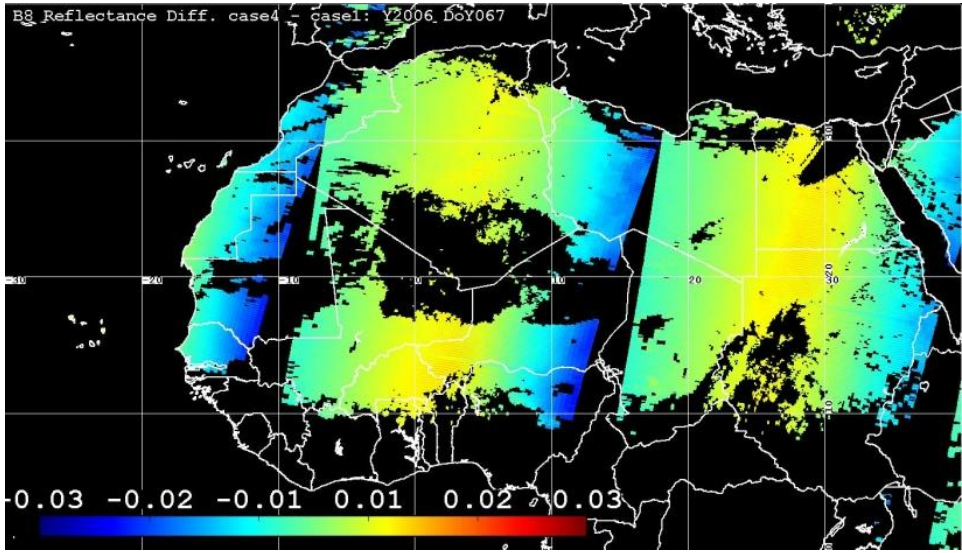
Reflectance Difference: C2-C1



Reflectance Difference: C3-C1

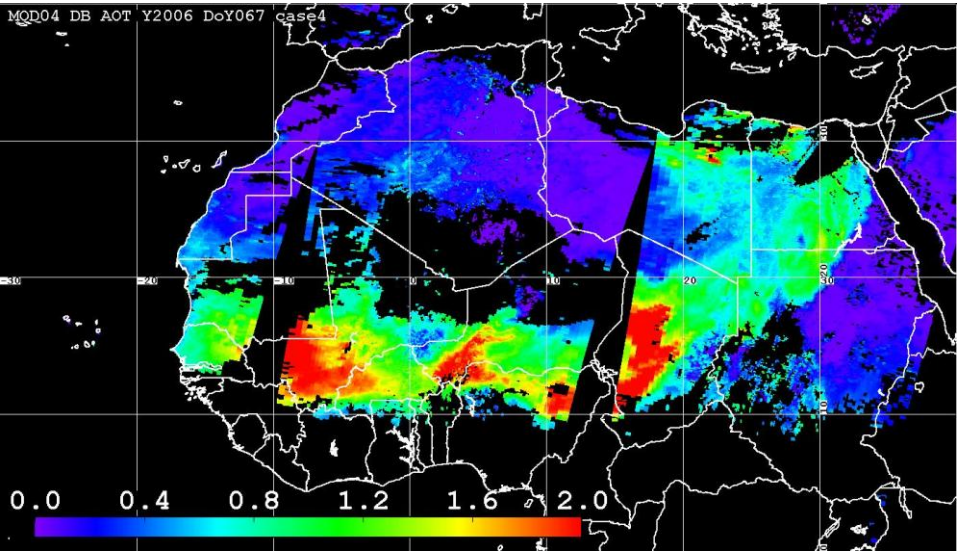


Reflectance Difference: C4-C1

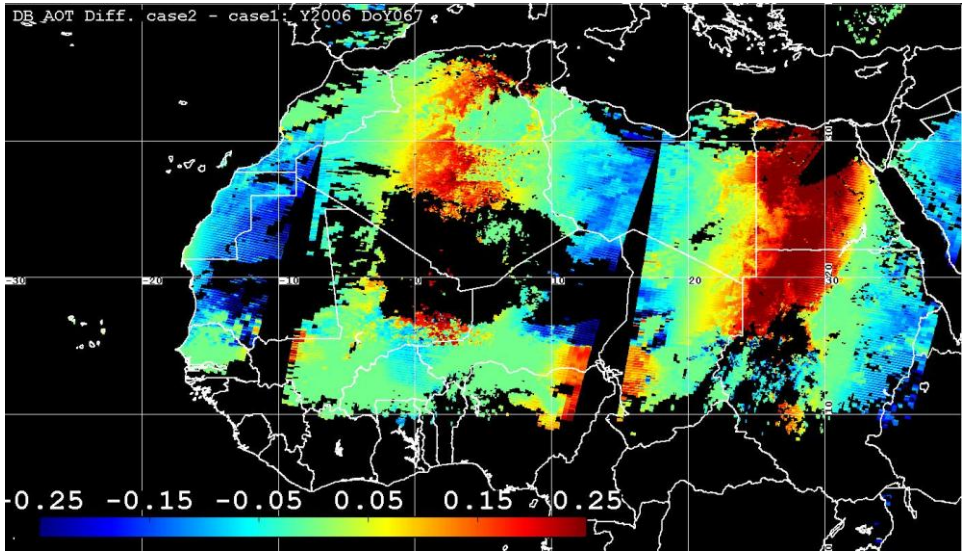


Deep Blue AOT (550nm): March 8, 2006

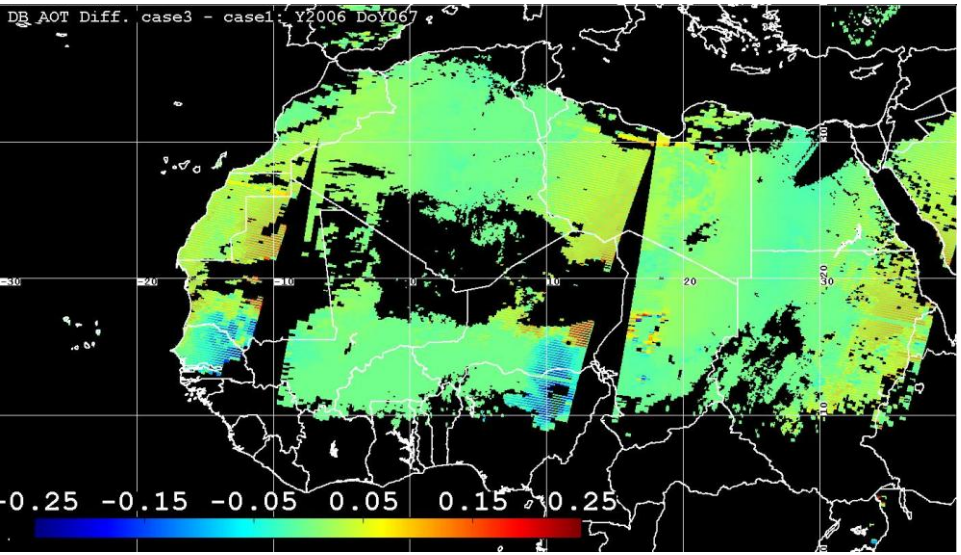
AOT (550nm): After Corrections



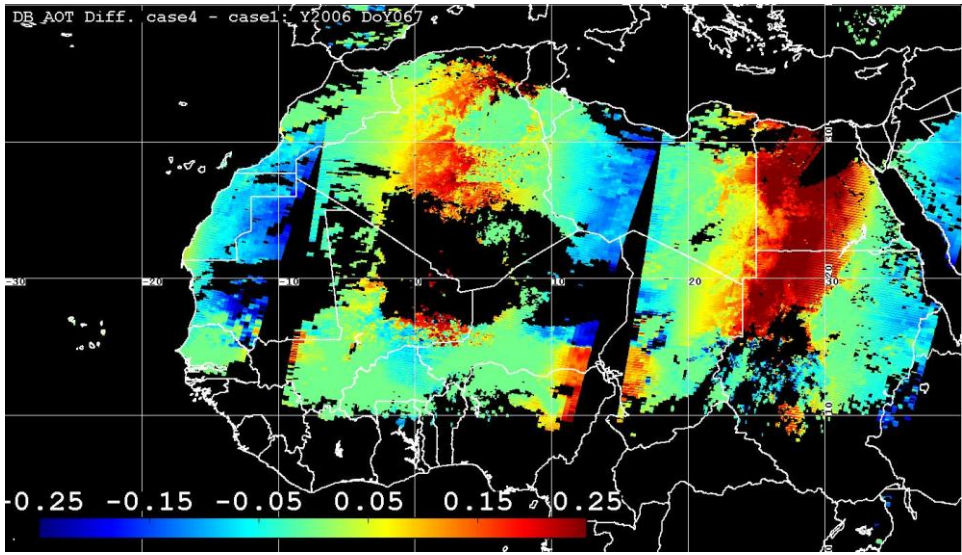
AOT Difference: C2 – C1



AOT Difference: C3 – C1

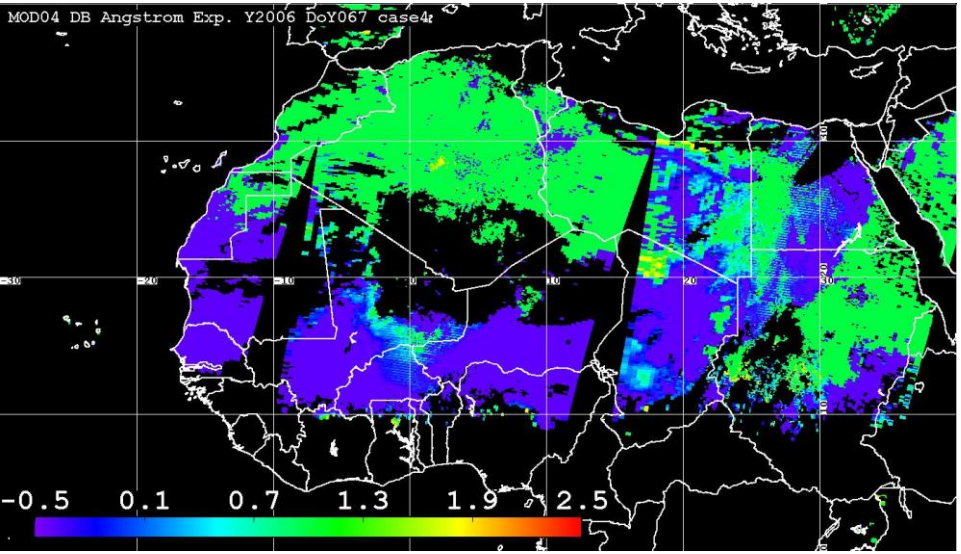


AOT Difference: C4 – C1

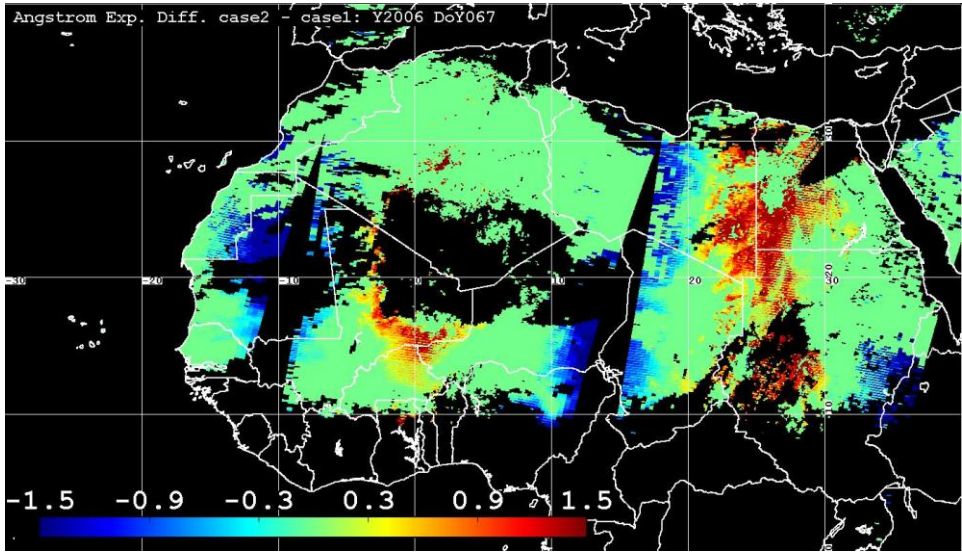


Deep Blue Angstrom Exponent: March 8, 2006

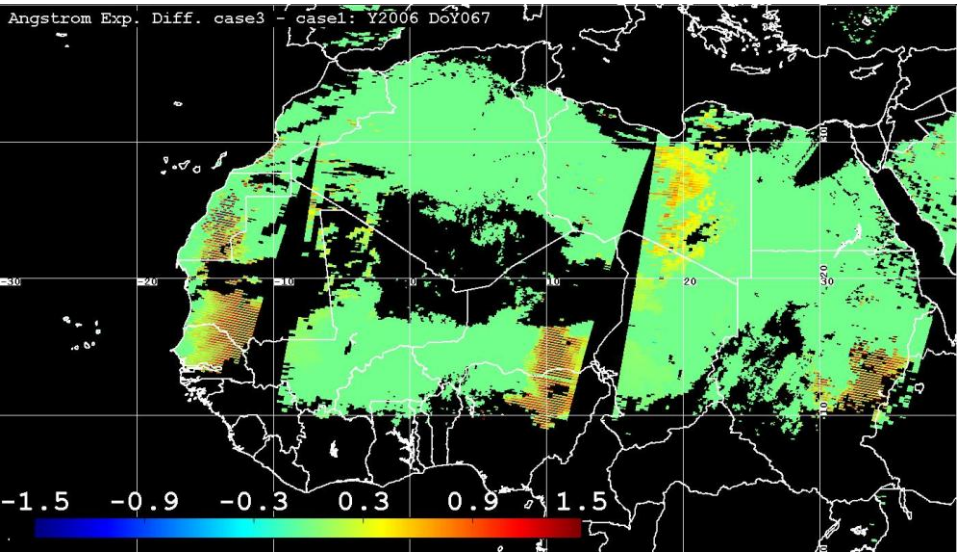
Angstrom Exp. (AE): After Corrections



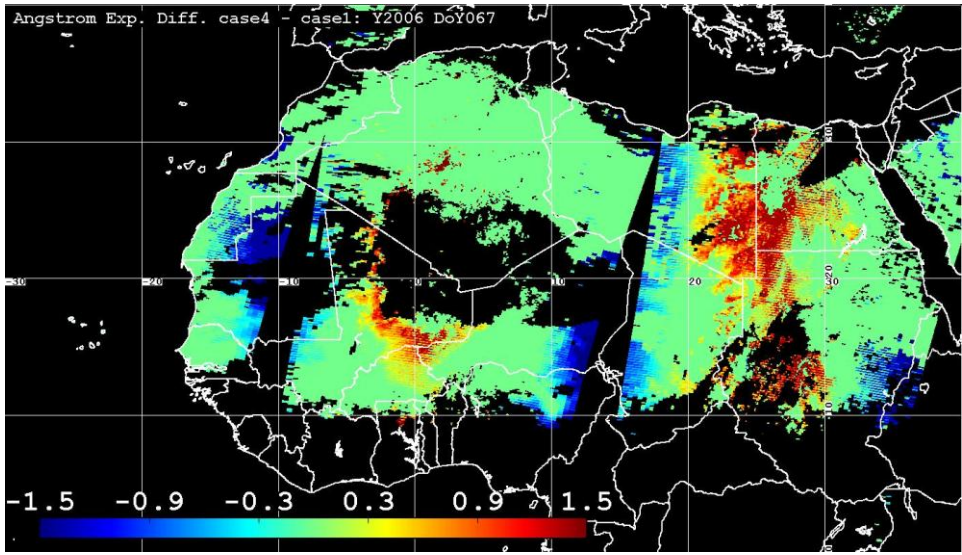
AE Difference: C2 – C1

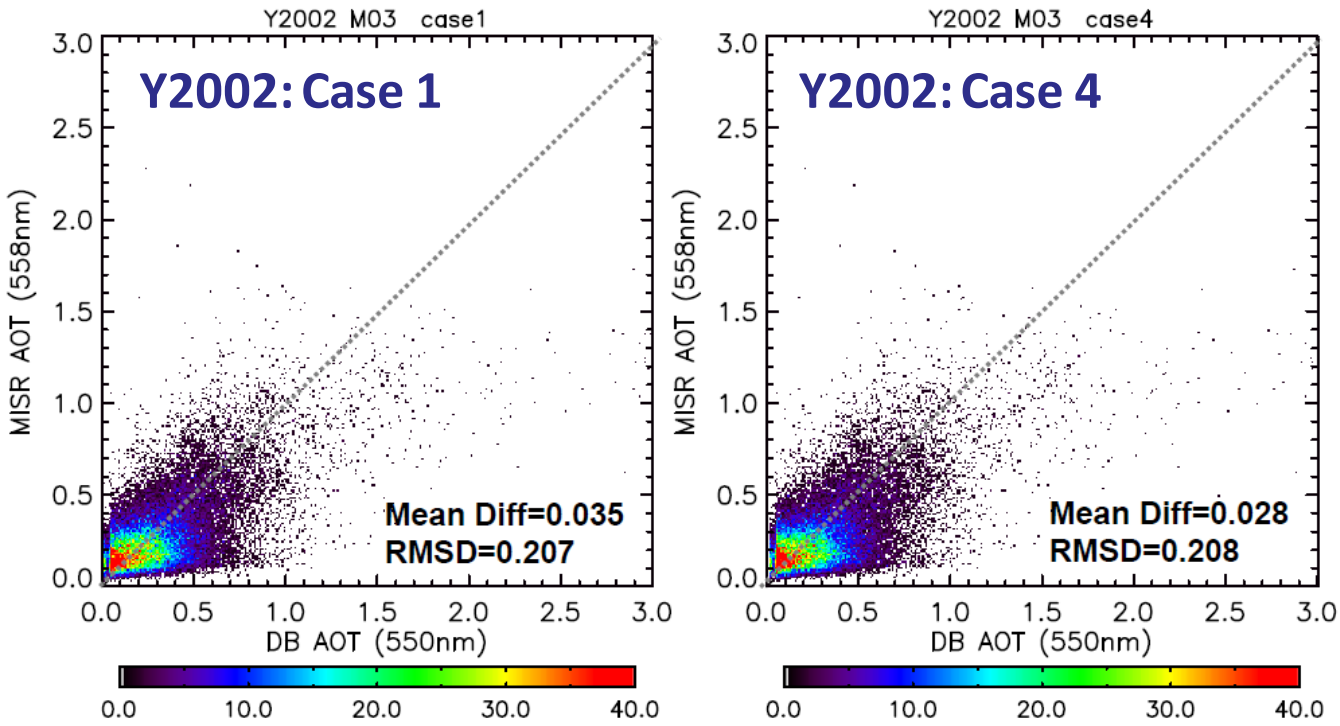


AE Difference: C3 – C1



AE Difference: C4 – C1



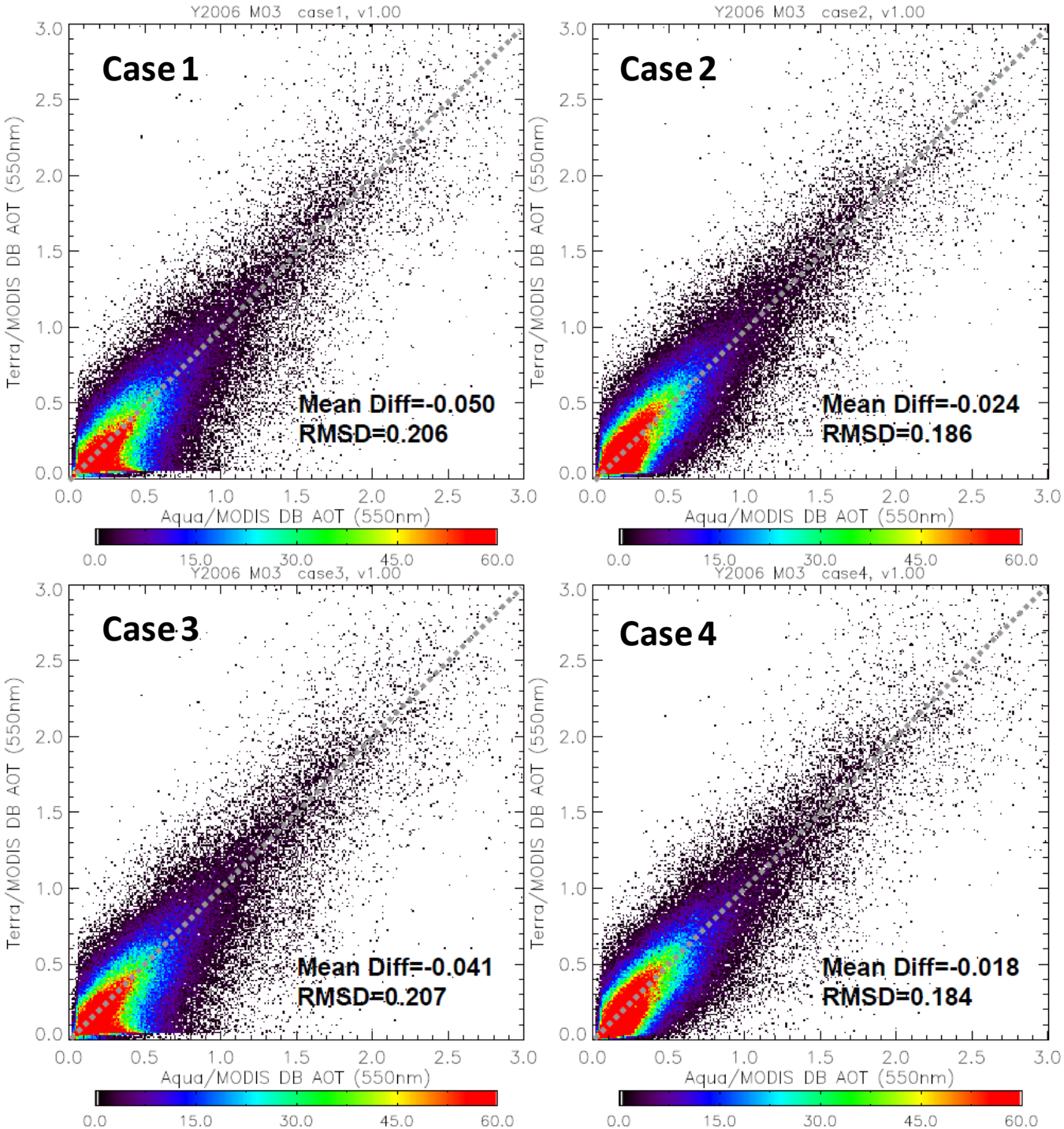


Terra/MODIS DB AOT (550nm) v.s. MISR AOT(558nm)

N. Africa
Mar 1-31, 2002
and
Mar 1-31, 2006

Case 1: No corr.
Case 4: Both corr.

Diff. = DB - MISR



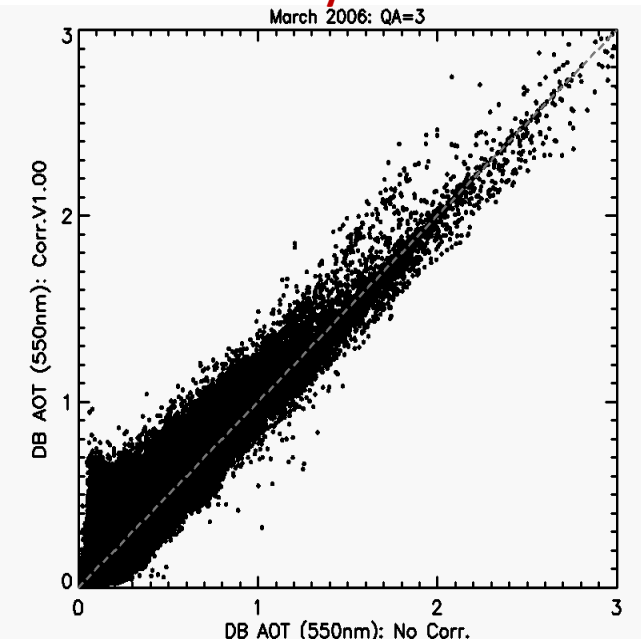
Terra/MODIS DB AOT (550nm) v.s. Aqua/MODIS AOT(550nm)

N. Africa
Mar 1-31, Y2006

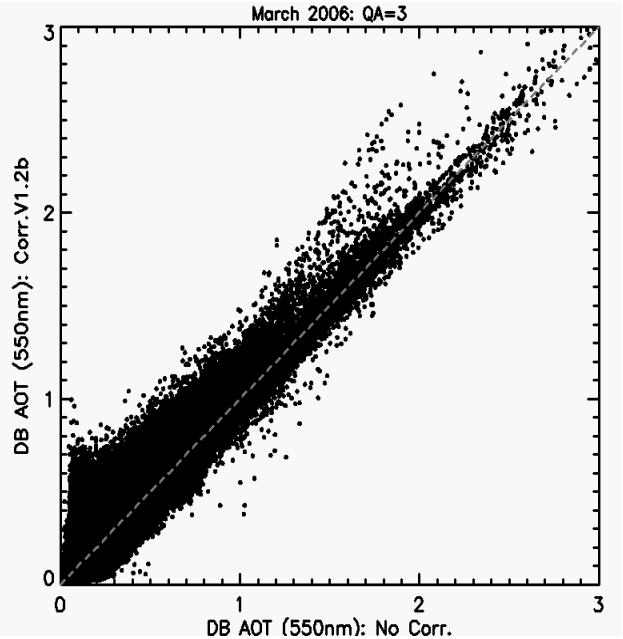
Case 1: No corr.
Case 2: RVS corr. only
Case 3: Polarization corr. only
Case 4: Both corr.

Diff. = Terra - Aqua

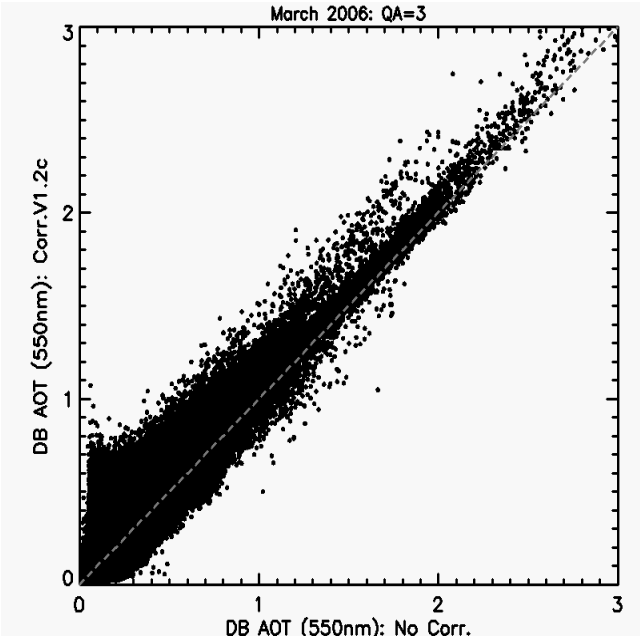
B8 Corr. only v.s. No Corr.



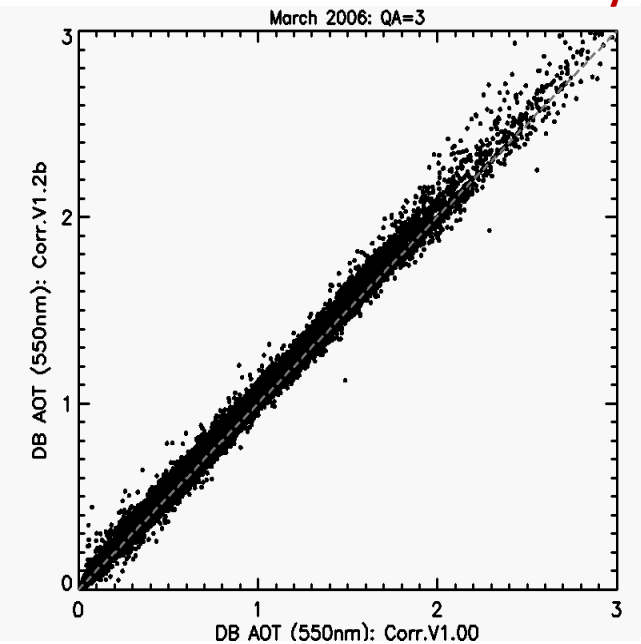
B8 & B3@ Corr. v.s. No Corr.



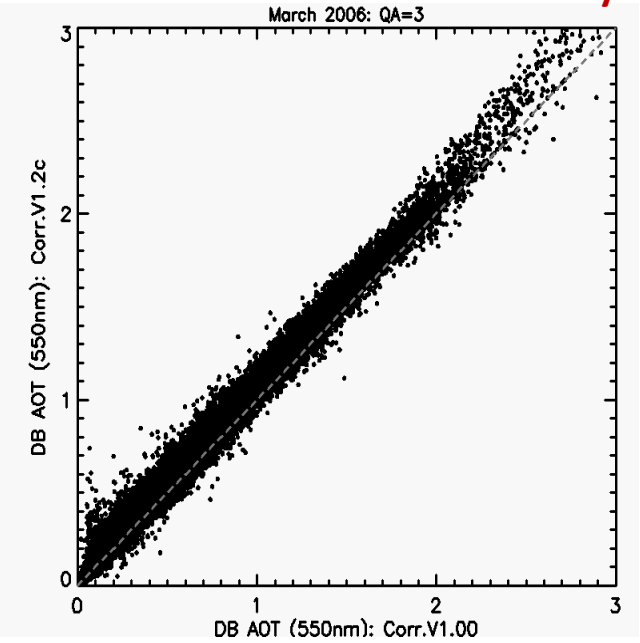
B8 & B3# Corr. v.s. No Corr.



B8 & B3@ Corr. v.s. B8 Corr. only

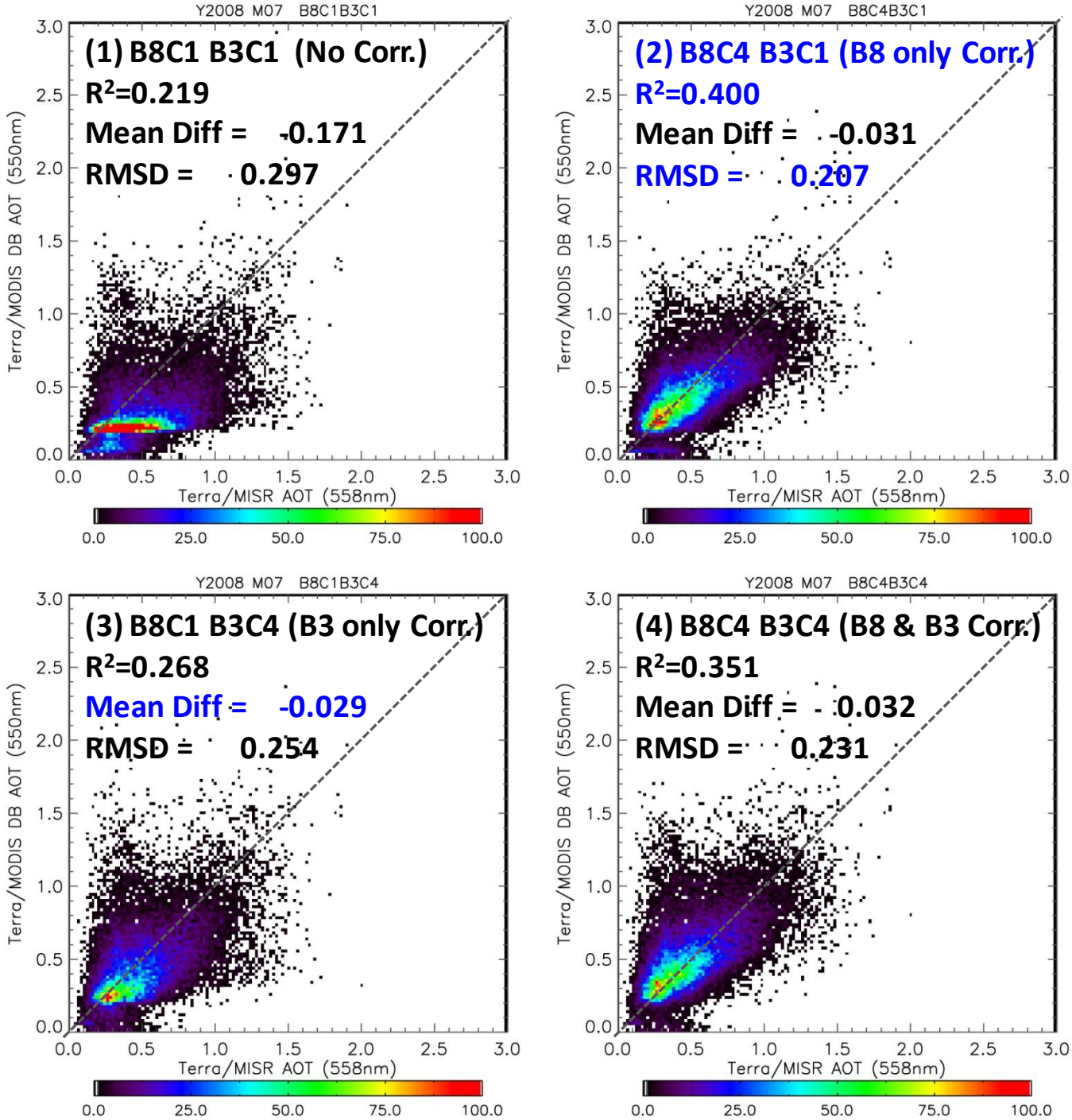


B8 & B3# Corr. v.s. B8 Corr. only



- **B8 & B3@ Corr. :** Corr. Parameters for B10 were applied to B3

- **B8 & B3# Corr. :** Corr. Parameters for B9 were applied to B3



Collection 006

Terra/MODIS DB AOT (550nm) v.s. Terra/MISR AOT (550nm)

N. Africa

Jul 1-31, 2008

Preliminary Results