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

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Reference:
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

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 & 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
(1) **B8C1 B3C1** (No Corr.)
R$^2$ = 0.219  
Mean Diff = -0.171  
RMSD = 0.297

(2) **B8C4 B3C1** (B8 only Corr.)
R$^2$ = 0.400  
Mean Diff = -0.031  
RMSD = 0.207

(3) **B8C1 B3C4** (B3 only Corr.)
R$^2$ = 0.268  
Mean Diff = -0.029  
RMSD = 0.254

(4) **B8C4 B3C4** (B8 & B3 Corr.)
R$^2$ = 0.351  
Mean Diff = -0.032  
RMSD = 0.231

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**Preliminary Results**

Collection 006  
Terra/MODIS DB AOT (550nm) v.s. Terra/MISR AOT (550nm)  
N. Africa  
Jul 1-31, 2008