



Target Mode

Vijay Natraj (Jet Propulsion Laboratory, California Institute of Technology)

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**Chris O'Dell (Colorado State University)
Denis O'Brien (Colorado State University)**

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OCO-2 Measurements

- OCO-2 measurement S expressed as:

$$S = m_1 I + m_2 Q + m_3 U + m_4 V$$

- m_1, m_2, m_3, m_4 : Mueller matrix (Stokes) coefficients
- Nadir/glint modes: $m_1 = 1/2; m_2 = -1/2; m_3 = m_4 = 0$
- Target mode: m_3, m_4 not necessarily zero



Implications for L2 Code

- **LIDORT calculations unchanged**
 - Exception: φ not necessarily zero
- **Changes to 2OS calculations**
 - NSTOKES = 3 (NSTOKES = 2 for nadir and glint modes)
 - LOS correction should be turned on (also true for glint mode)
 - φ not necessarily zero
- **Some aspects of code exercised only in target mode**



LOS Correction Bug

- **O₂ A band, optical thickness ~ 250**
- **SZA = 35° , VZA = 28° , AZM = 238° , ALB = 0.5**
- **$I = 7.106e-5$ (NFINE = 4)**
- **$I = 7.899e-6$ (NFINE = 100)!**
- **$I = 7.904e-6$ (pseudo-spherical)**
- **$I = 7.897e-6$ (plane-parallel)**



LOS Correction Bug (contd ...)

- **Optimum value of NFINE dependent on SZA and OD**
- **Advisable to have NFINE as small as possible for speed issues**
- **Several ways to fix this**
- **Root cause is 'shadowing' for optically thick layers**
- **Rob working on formulation that takes shadowing into account**
- **Results will not depend on choice of NFINE**



Validation of LOS Correction

- **U = 0** in principal plane
- **I and Q symmetric with respect to $\varphi = 180^\circ$**

$$I(360 - \varphi) = I(\varphi)$$

$$Q(360 - \varphi) = Q(\varphi)$$

- **U anti-symmetric with respect to $\varphi = 180^\circ$**

$$U(360 - \varphi) = -U(\varphi)$$

- **Stokes parameters converge to pseudo-spherical values for nadir viewing**