Oxygen Airglow Studies in Support of the MethaneSAT Mission

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MethaneSAT™

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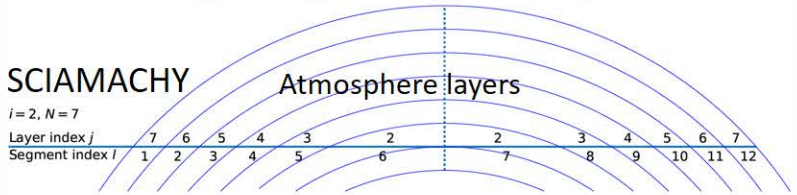
Motivation

Oxygen bands (A and $^1\Delta$) are crucial for GHG remote sensing. Both bands feature airglow emissions in the upper atmosphere. $^1\Delta$ airglow is strong and interferes nadir signal

Fitting airglow limb spectra

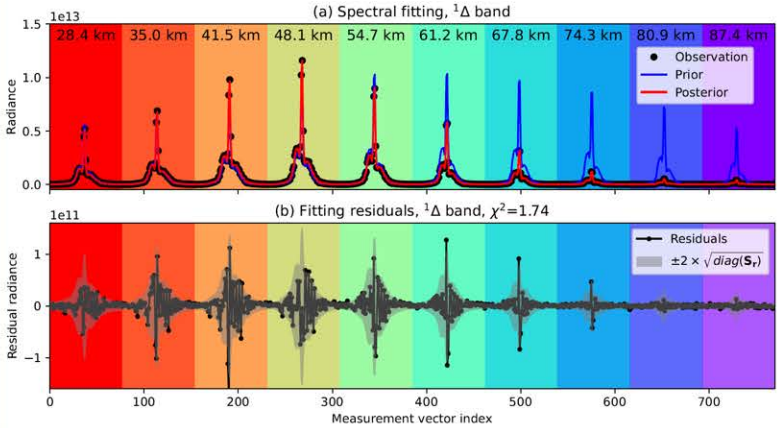


$$r_{\lambda,i} = \sum_{l=1}^{2N-i} \left(\frac{L_{ij}\varepsilon_{\lambda,j}}{4\pi} \exp\left(-\tilde{\tau}_{\lambda,ij} - \sum_{l'=1}^{l-1} \tau_{\lambda,ij'} \right) \right)$$

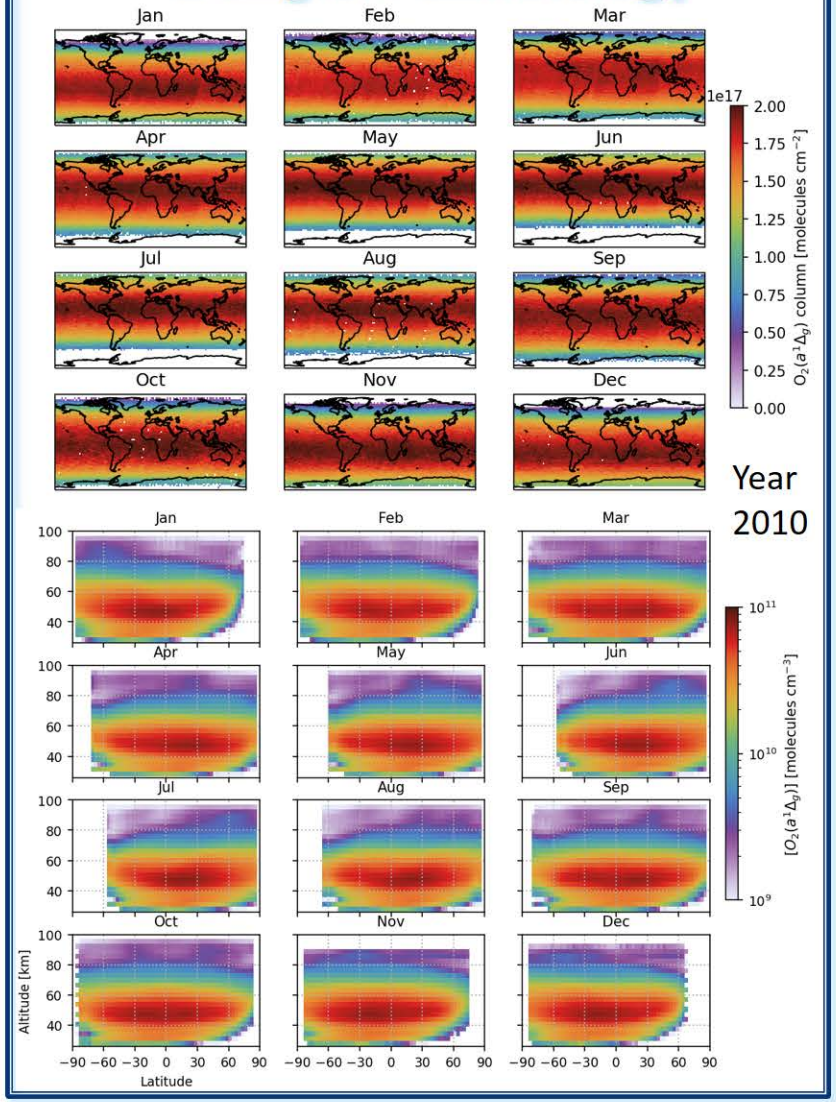
Observed radiance

Emission from segment

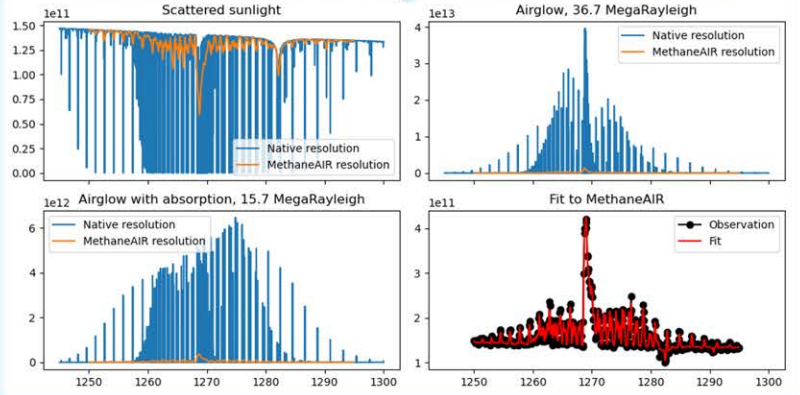
Self-absorption by the emitting/other segments



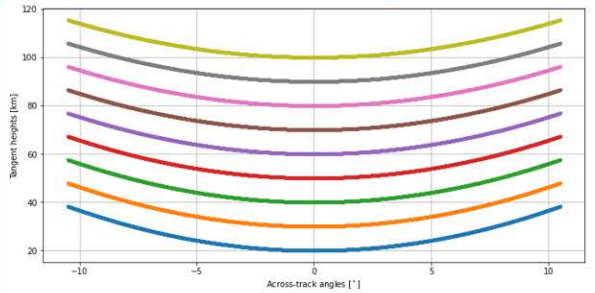
¹Δ airglow climatology



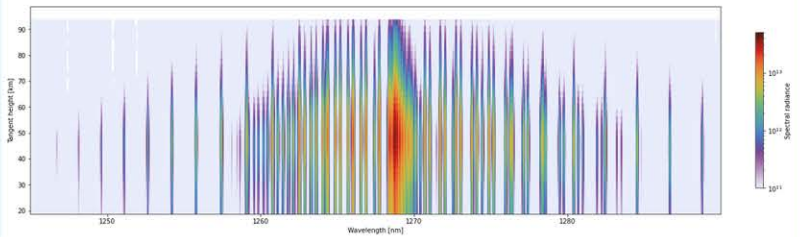
Zenith view by MethaneAIR



Limb view by MethaneSAT



Airglow tomography; Spectral calibration; Temperature retrieval



Reference: Sun et al., doi:10.5194/amt-15-3721-2022