Can We Derive Atmospheric Temperature Profile from OMPS LP?

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Basic Idea

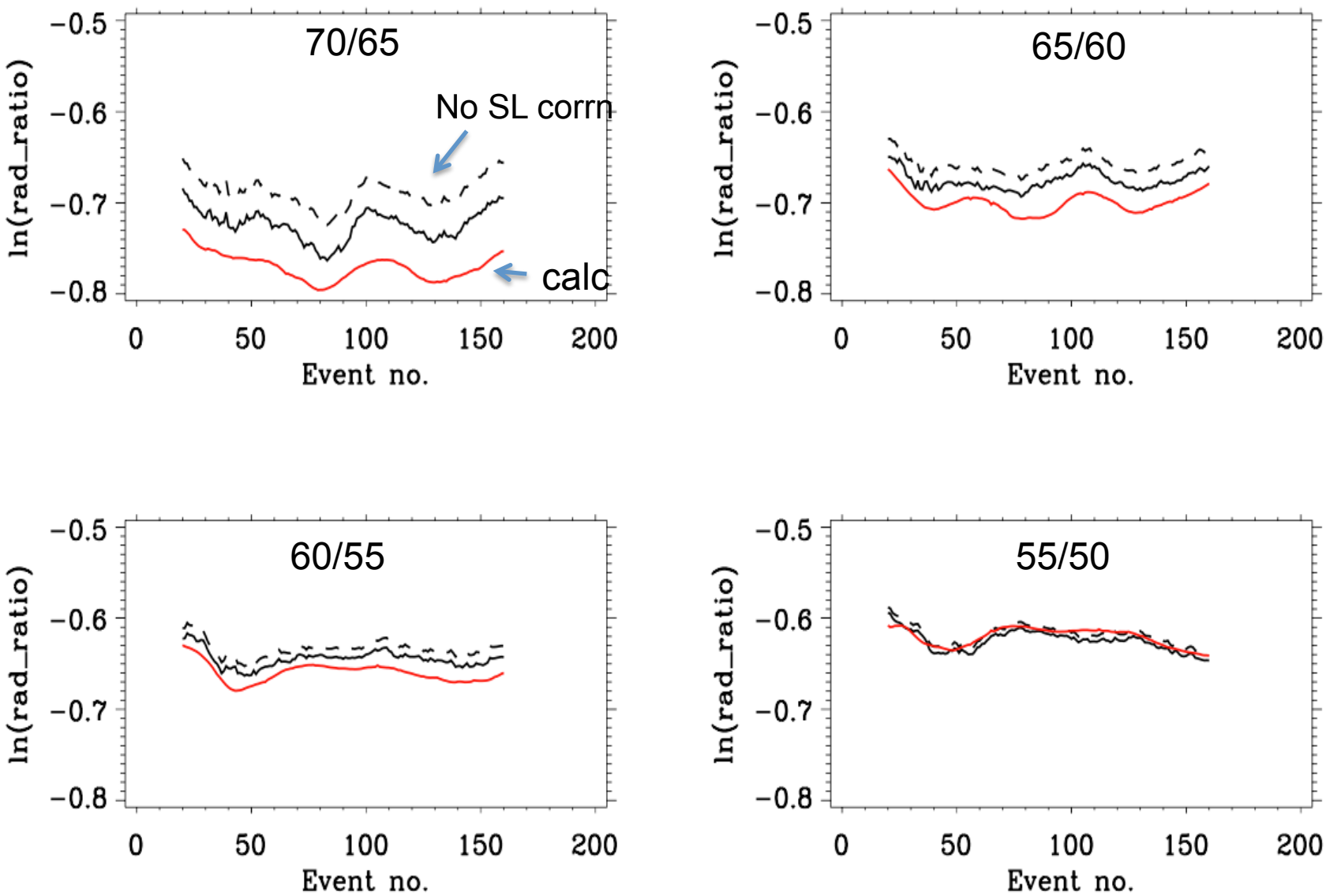
From hydrostatic eqn & gas law: $\frac{d\ln\rho_l}{dz} = -\frac{g(z)}{RT_l} - \frac{d\ln T_l}{dz}$

At wavelengths where there is no significant trace gas absorption (~350 nm) and at altitudes where aerosol scattering is negligible (z>40 km)

$$\frac{d\ln I}{dz} = \sum_l w_l \left(-\frac{g(z)}{RT_l} - \frac{d\ln T_l}{dz} \right)$$

Comparison of measured ΔlnI with MERRA2 calc

350 nm



Plan

- Correct biases using MERRA2 data, assuming no latitude/seasonal variation of the bias.
- Calculate zonally-averaged temperature profiles from 35-75 km at 2-3 km vertical resolution.
  - Algorithm: Chahine's non-linear relaxation method
  - First Guess: NRT GMAO data, which doesn't use MLS temperatures.
- Validate using MLS.
- Work with GMAO in directly assimilating LP radiances near 350 nm using 2D RTM provided by Rob Loughman.