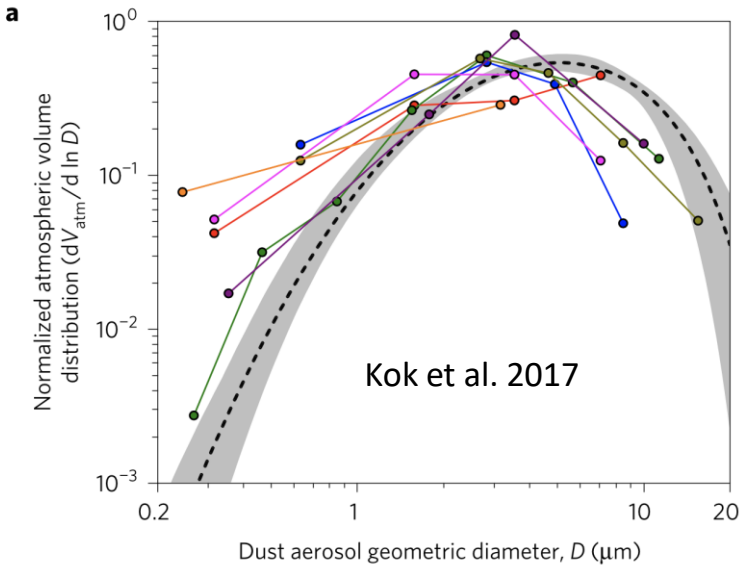
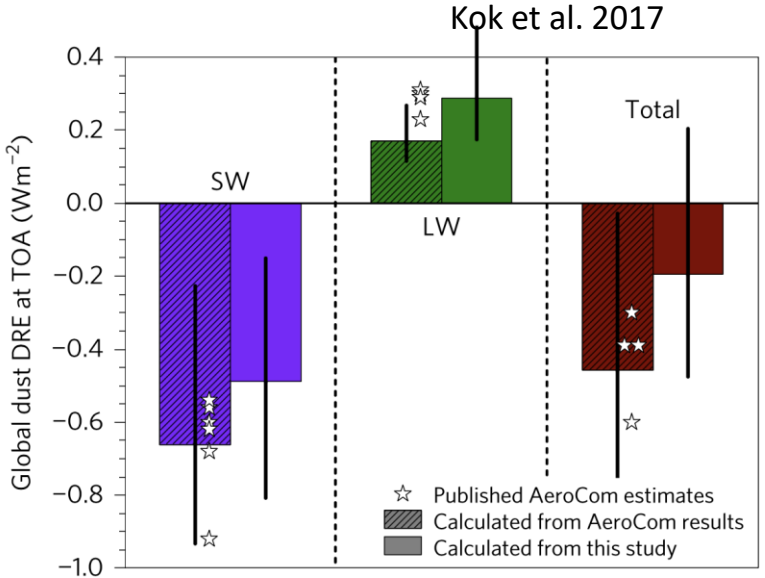
Background Introduction

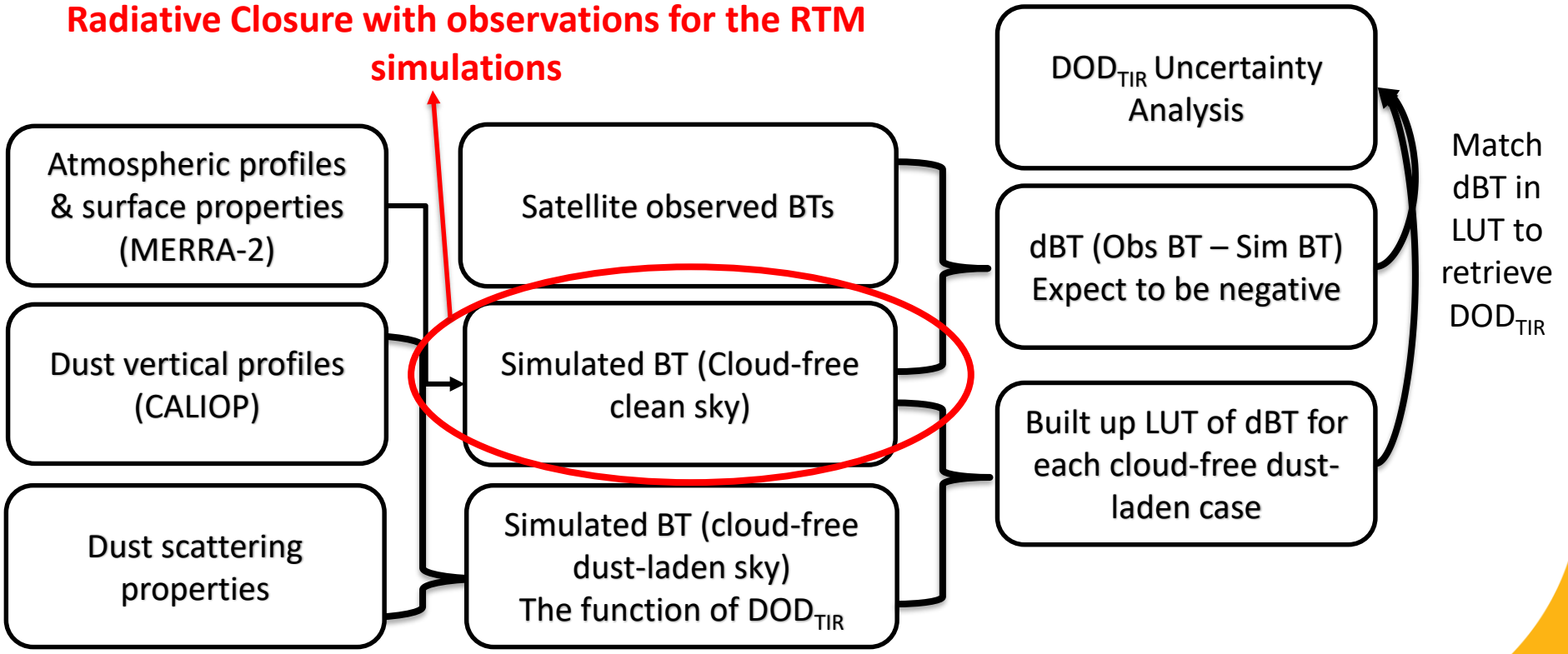
Q: Why is the dust net DRE uncertain? **Ans 1: Dust particle sizes**



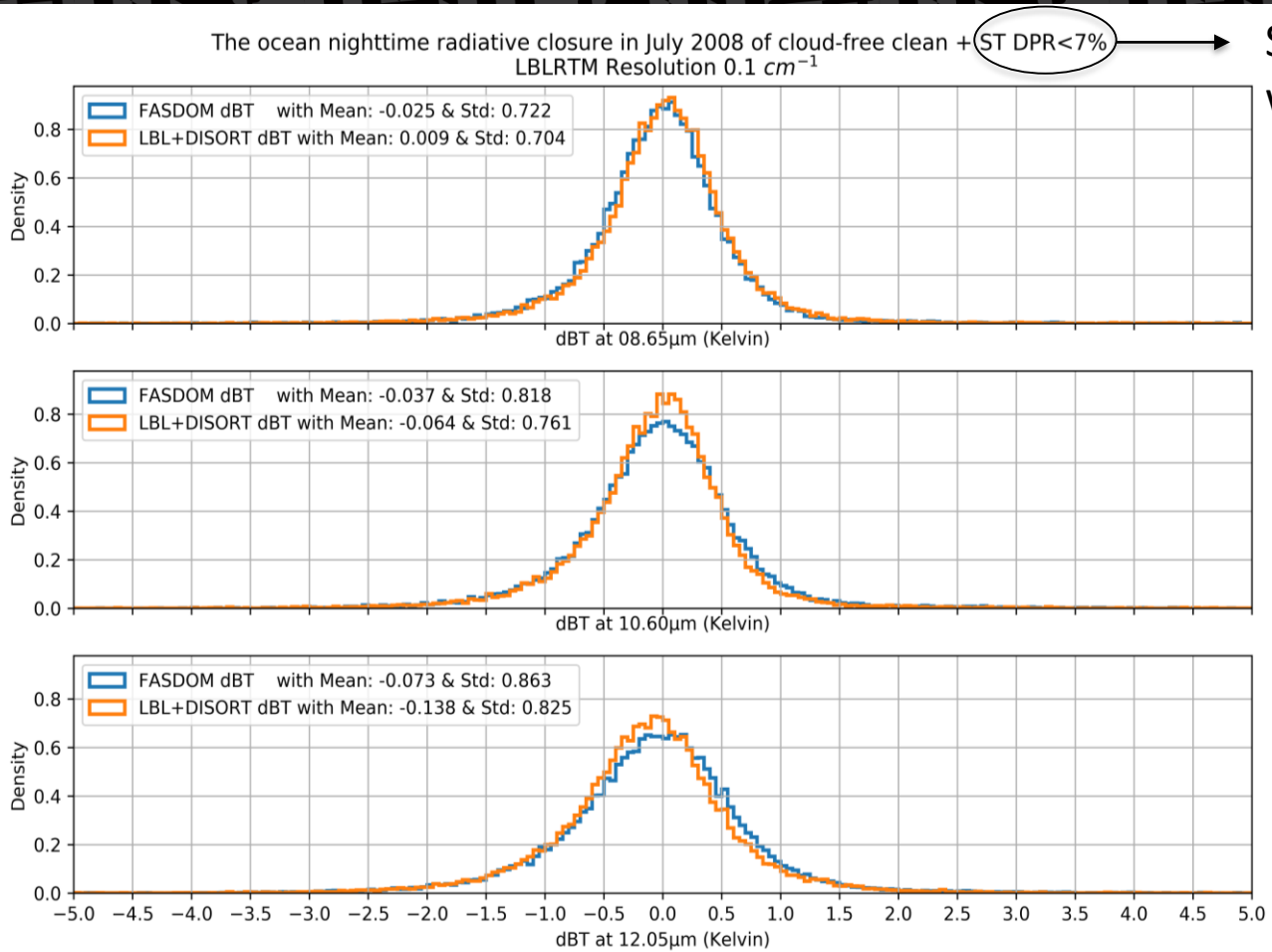


- Dust particle sizes are underestimated in climate models, which leads to an overestimated SW cooling DRE and an underestimated LW warming DRE.
- Dust longwave DRE is more sensitive to the coarse mode of the dust (Peyridieu et al. 2010; Capelle et al. 2014).

Flow Chart of the Retrieval Scheme



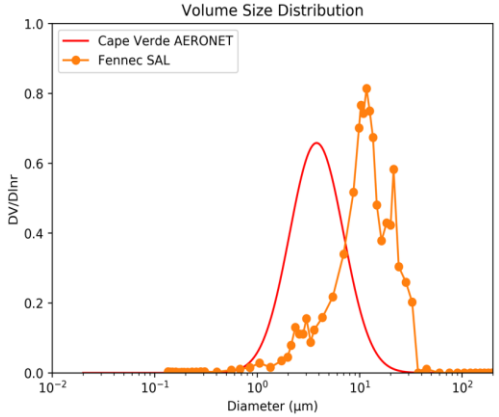
Clear-sky: IIR with FASDOM & LBL at Nighttime



Semi-transparent aerosol with depolarization ratio < 7%

Comparing with FASDOM again, the LBL+DISORT simulation with 0.1 cm^{-1} improves the radiative closure now.

Dust model in the retrieval scheme



Particle Size Distribution (PSD):

The Cape Vade AERONET PSD is Re = 1.58um

The Fennec PSD is close to Re = 4.74um ()

Refractive Index (RI):

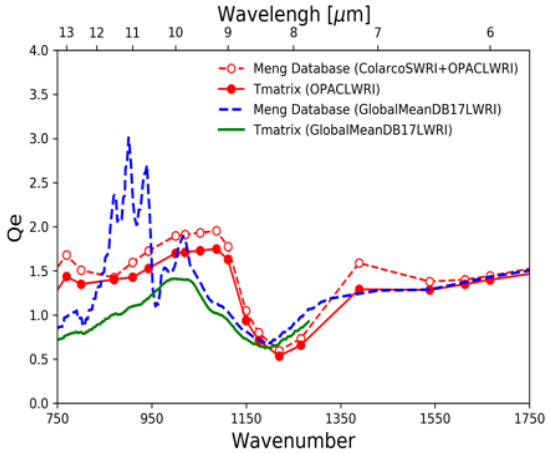
Global Mean RI from Di Biagio et al. (2017)

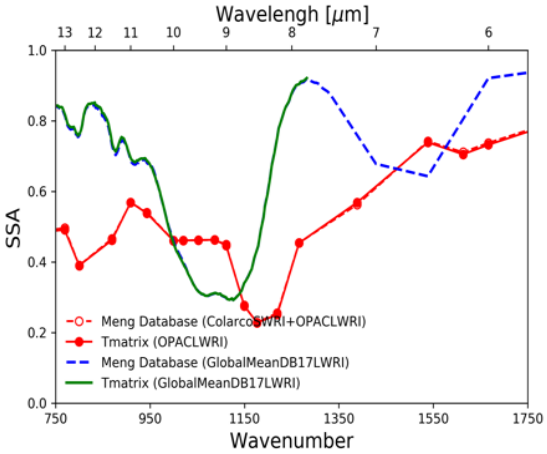
OPAC (Hess et al., 1998)

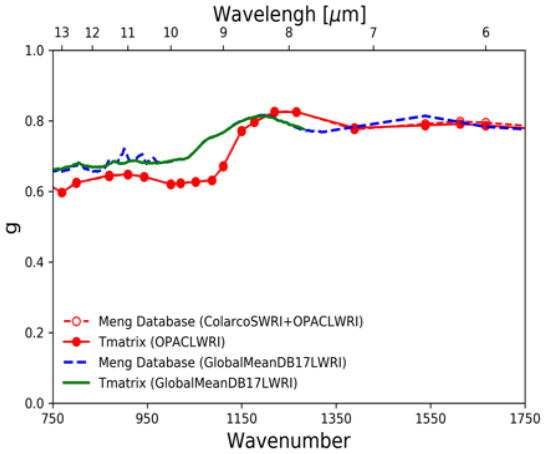
Particle Shape:

Spheroid with aspect ratio distribution from Dubovik et al. (2006)

Fennec SAL PSD, Dubovik shape







Future steps: LUT of BT & spectral BTD with dust particle sizes

The example LUT is built by using the IIR BT at 10.6 µm and BTD of 10.6 µm – 12.05 µm.

With the combination dust dBT at 10.6um and spectral regarding to particle size, we can further retrieve the dust effective radius with respect to the assumed monomodal size distribution.

In the future, we need a trustable dust model with a trustable RTM simulation for all three IIR bands.