# Results of RRTMGP with MC6 ice optics

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This file documents the application of MC6 ice scattering optics in RRTMGP package. The results are presented for computations upon an artificial cloud layer. Three model configurations are included: 1) the RRTMGP standard; 2) the full implementation of MC6 ice scattering optics (MC6_Scat); and 3) the use of MC6 absorption property only (MC6_noScat).

Section 1 lists the setup of cloud layer; Section 2 and 3 show the comparisons of fluxes and optical depths between MC6_Scat and RRTMGP Standard, and between MC6_noScat and MC6_Scat, respectively.

## 1. Cloud layer setup

- Ice clouds only (i.e., liquid water path and effective radius are set to 0)
- Ice cloud layer locate between 100-500 hPa and temperature must be < 263 K.
- Ice water path (i.e., **iwp**) equals 10.0 g/m$^2$ in each single layer.
- Ice effective radius (i.e., **rei**) ranges linearly from 11.3 To 180 $\mu m$, from the first to the last column (128 columns are applied).

## 2. MC6_Scat vs. Standard

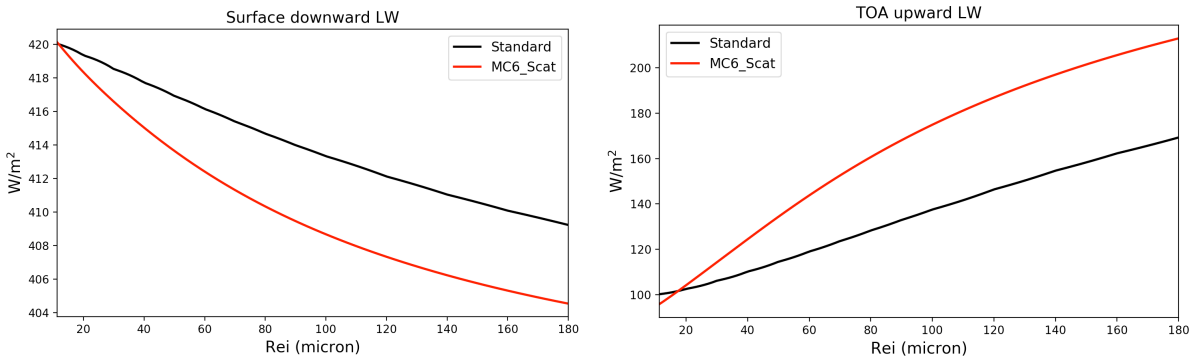


Figure 1. Surface downward (left) and TOA upward (right) longwave fluxes for RRTMGP standard ice optics (black) and MC6 scattering ice optics (red).

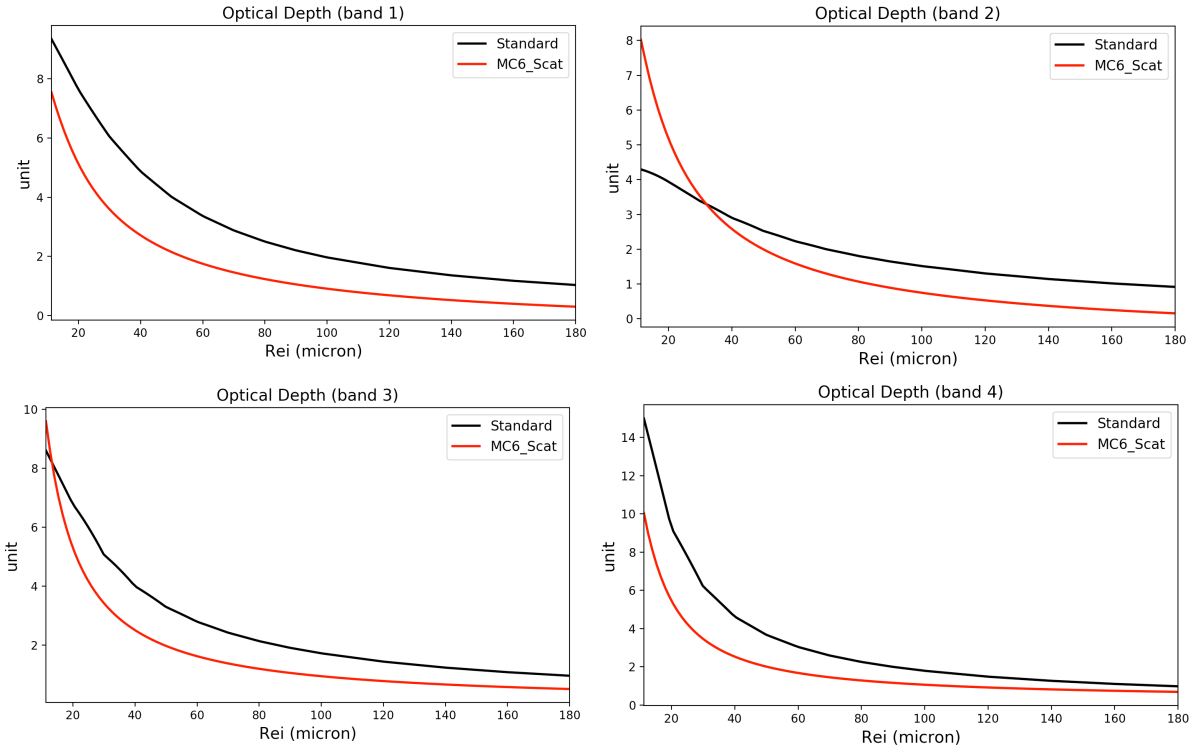


Figure 2. The same as Fig. 1, but for the optical depth (vertical accumulated) of the first four longwave bands.

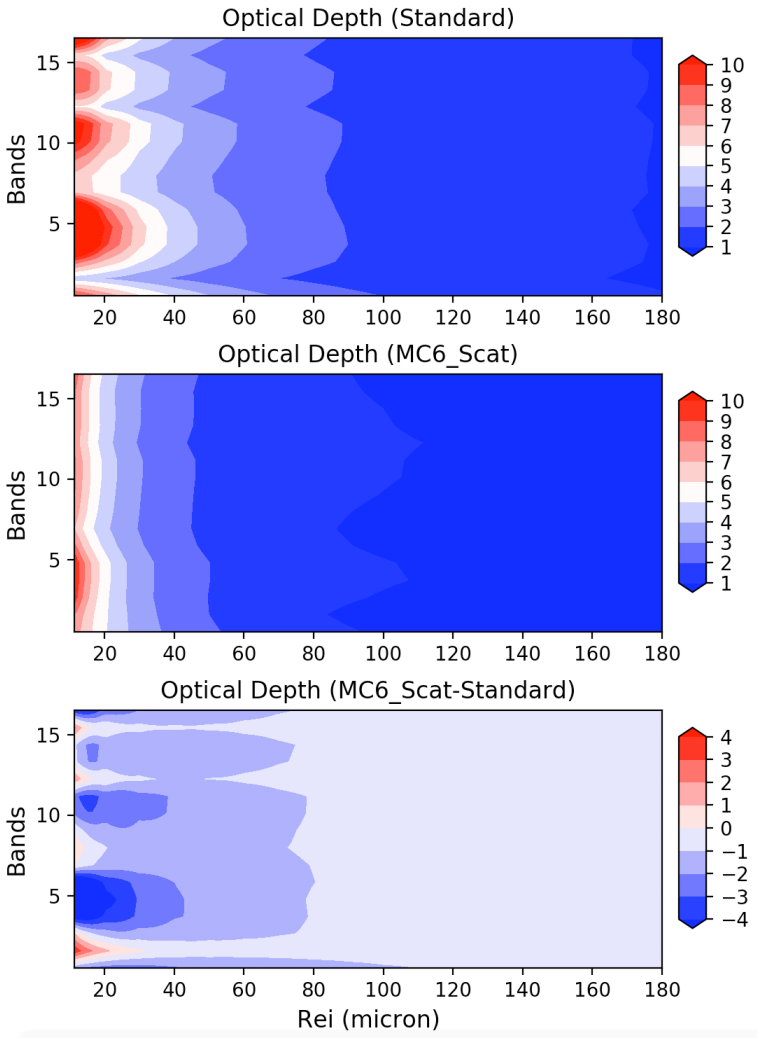


Figure 3. The optical depths as a function of effective radius (Rei) and band numbers for RRTMGP Standard, MC6_Scat, and their differences.

3. MC6_noScat vs. MC6_Scat

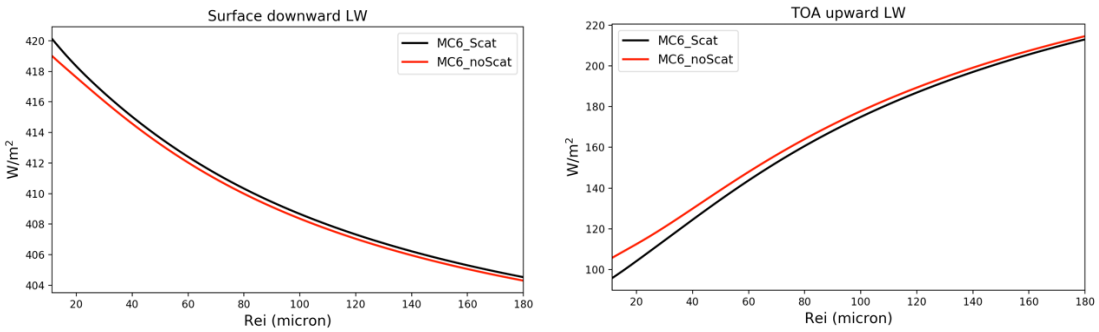


Figure 4. The same as Fig. 1, but for MC6_noScat and MC6_Scat.

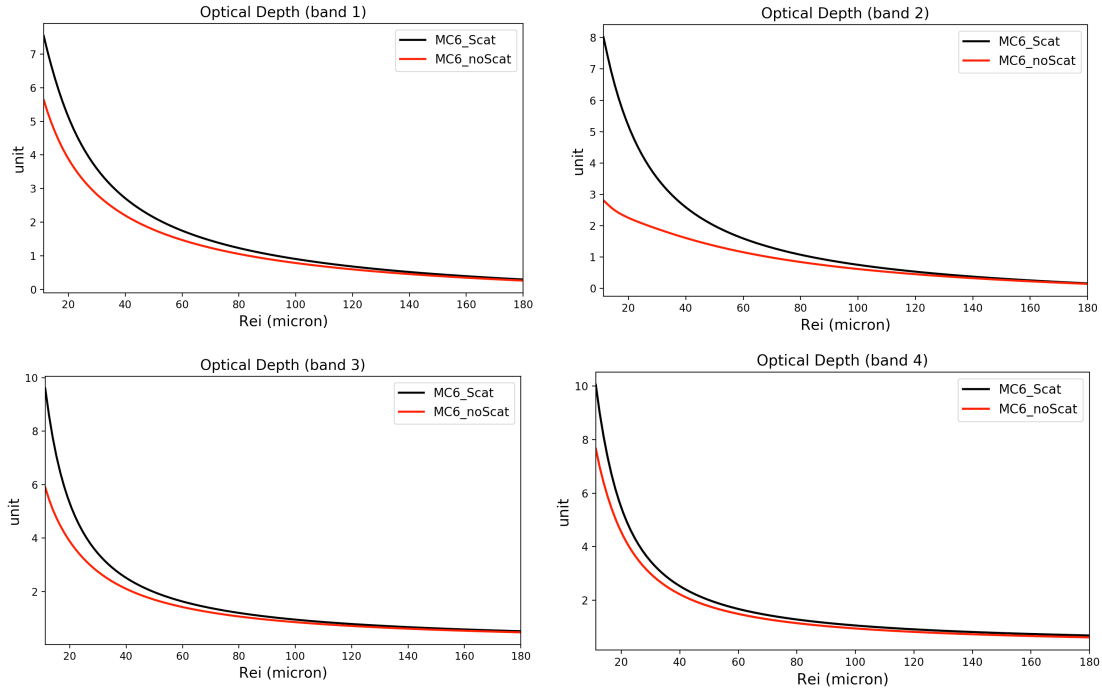


Figure 5. The same as Fig. 2, but for MC6_noScat and MC6_Scat.

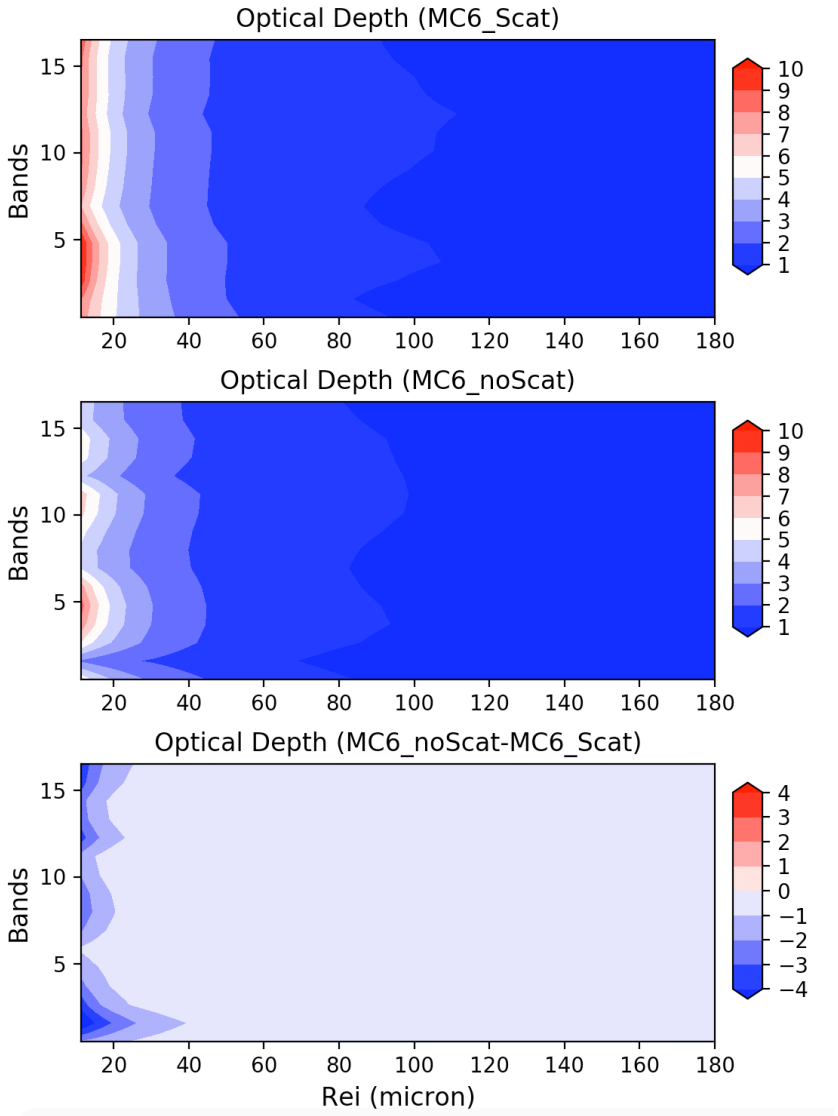


Figure 6. The same as Fig. 3, but for MC6_noScat and MC6_Scat.