Spectral Radiative Transfer Model for Radiative Closure Studies in Mixed-Phase Clouds

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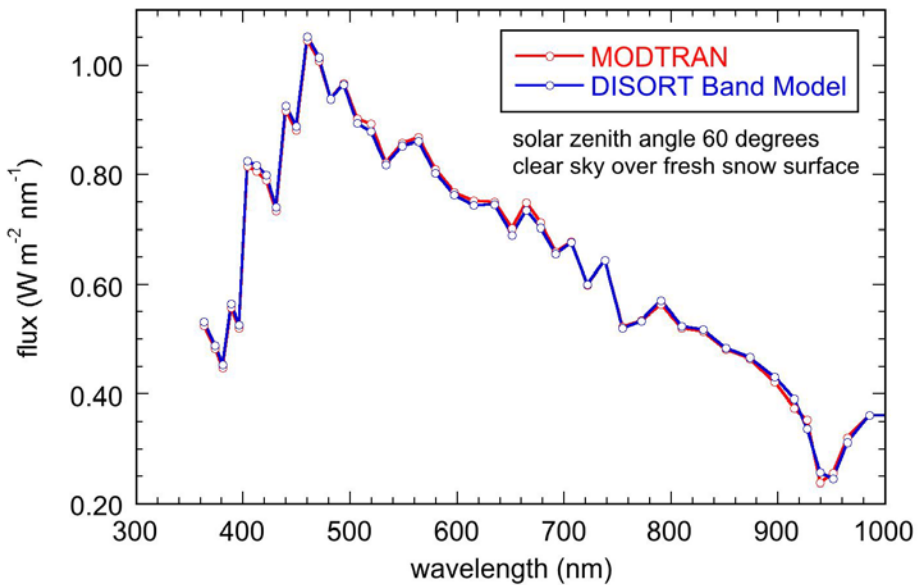
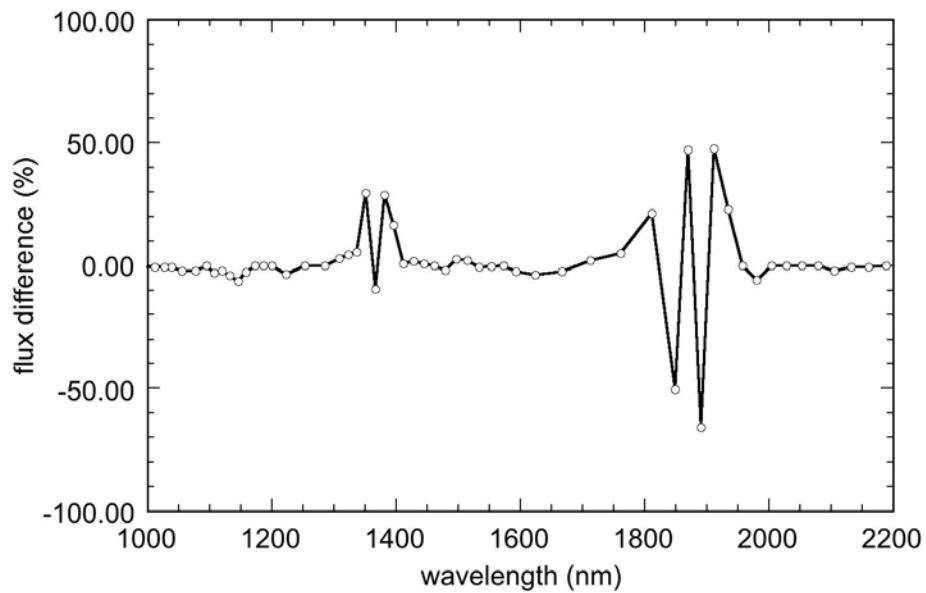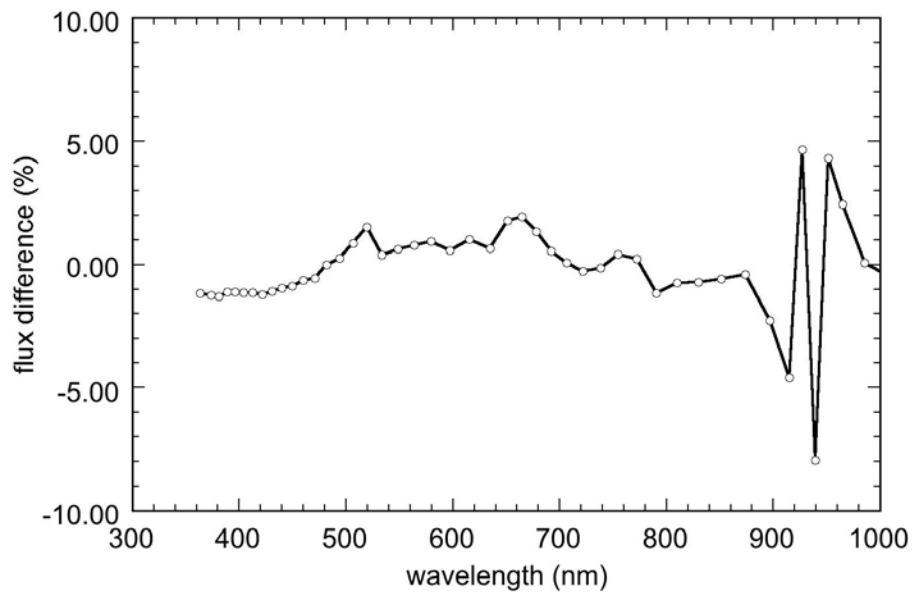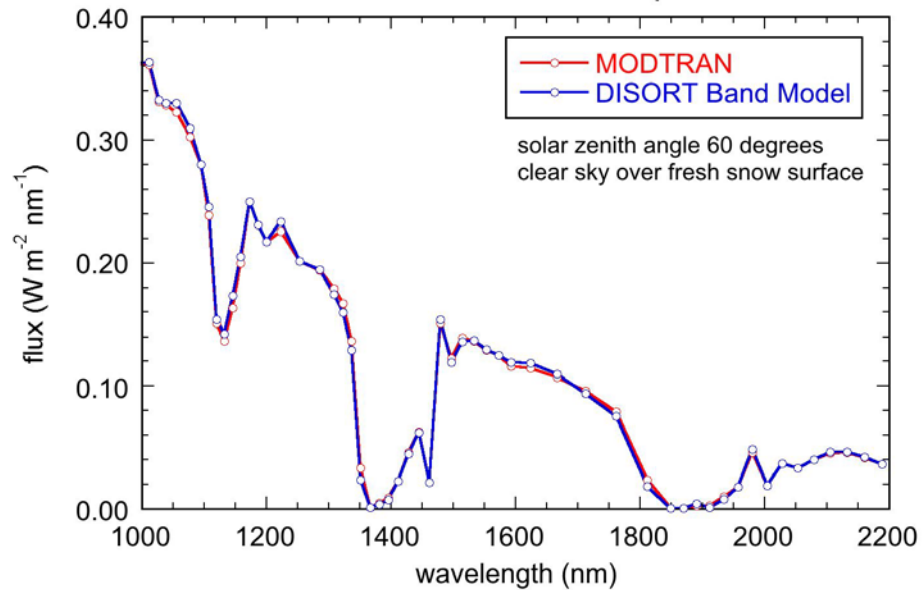ICEPRO Session

ASR PI Meeting 2014 Potomac, MD

DISORT-Based Band Model

- MODTRAN limited to single-phase clouds
  - Too clumsy to configure with microphysical simulation output
- Configure 179-band Exponential Sum Fitting of Transmissions (ESFT) model with DISORT
  - From Tsay et al., 1989, *J. Atmos. Sci.*
  - 100 bands from 280 – 2200 nm
  - Adequately covers spectral variation in cloud properties
- Fast enough to run with microphysical simulation output.
  - 12 seconds per run for fluxes on MacBook Pro
  - 2 minutes for 16-stream radiances

Subarctic Winter Atmosphere

solar zenith angle 60 degrees
clear sky over fresh snow surface

MODTRAN
DISORT Band Model

Radiances for SAS-Ze Analysis

Cloud Optical Depths
tau = 0
tau = 2
tau = 5
tau = 20

liquid water cloud over snow surface
solar zenith angle 66 degrees