RTM Development for GOME and SCIAMACHY

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Overview

- GOMETRAN/SCIATRAN radiative transfer model overview
- Spherical and pseudo-spherical radiance
- Verification of spherical model
- Cloud approximation
- Illustration of program features
  (Weighting functions, BRDF, Ring)

GOMETRAN/SCIATRAN RTM

GOMETRAN/SCIATRAN

A radiative transfer model for UV/Vis/NIR (240 – 2400 nm)

Products: Radiance, Weighting functions, Air Mass Factors

Spherical RTMs (CDI/CDIPI)

- SCIAMACHY (limb mode)
- Ground-based DOAS (off-axis)

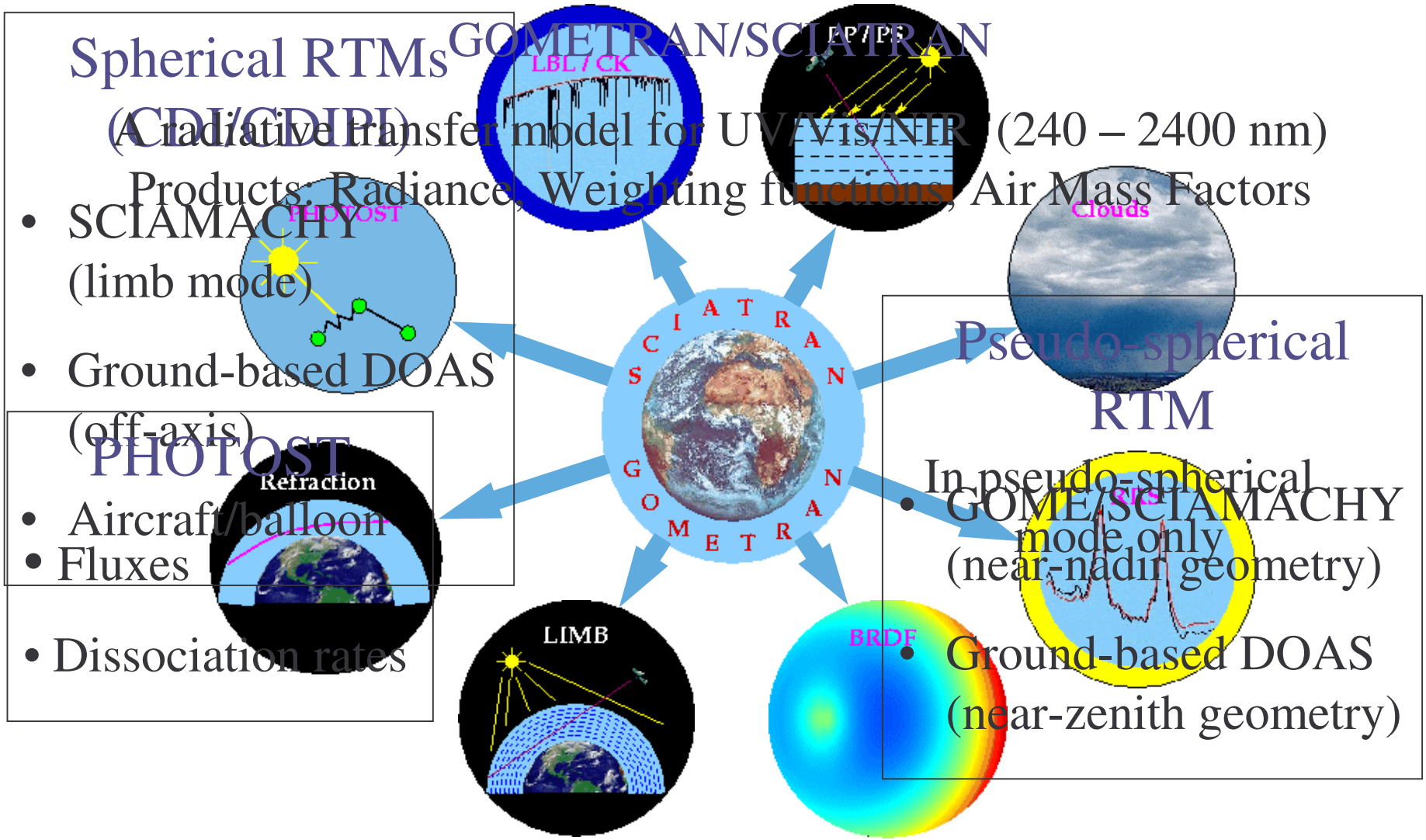
PHOTOST

- Aircraft/balloon
- Fluxes
- Dissociation rates

Pseudo-spherical RTM

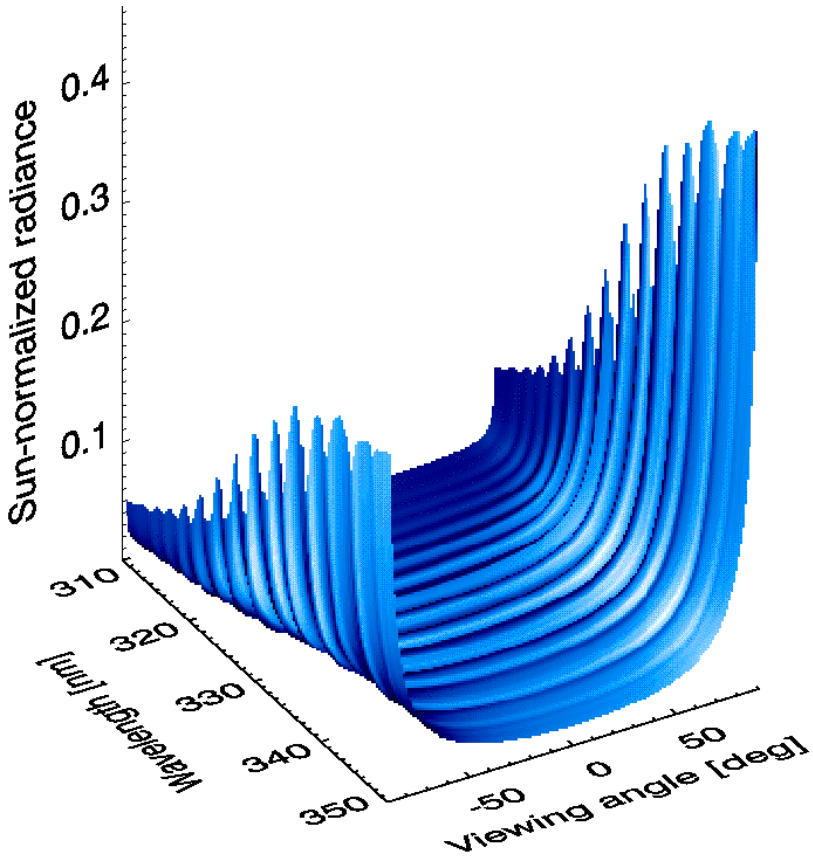
In pseudo-spherical mode only

- GOME/SCIAMACHY (near-nadir geometry)
- Ground-based DOAS (near-zenith geometry)

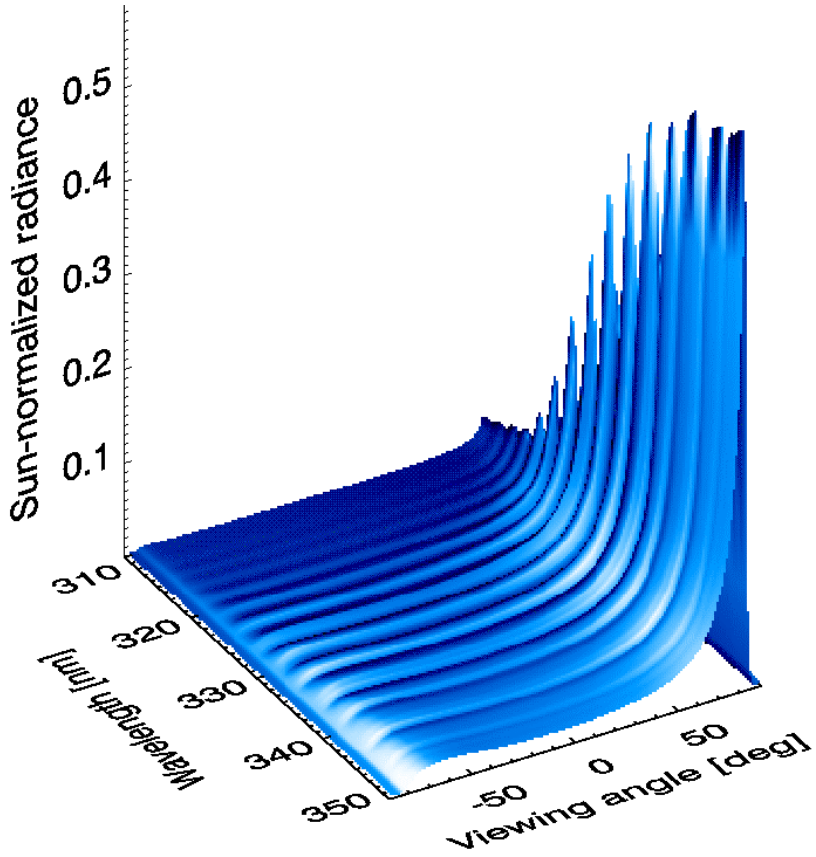


Outgoing radiation at SZA = 89 deg

Pseudo-spherical model



Spherical model



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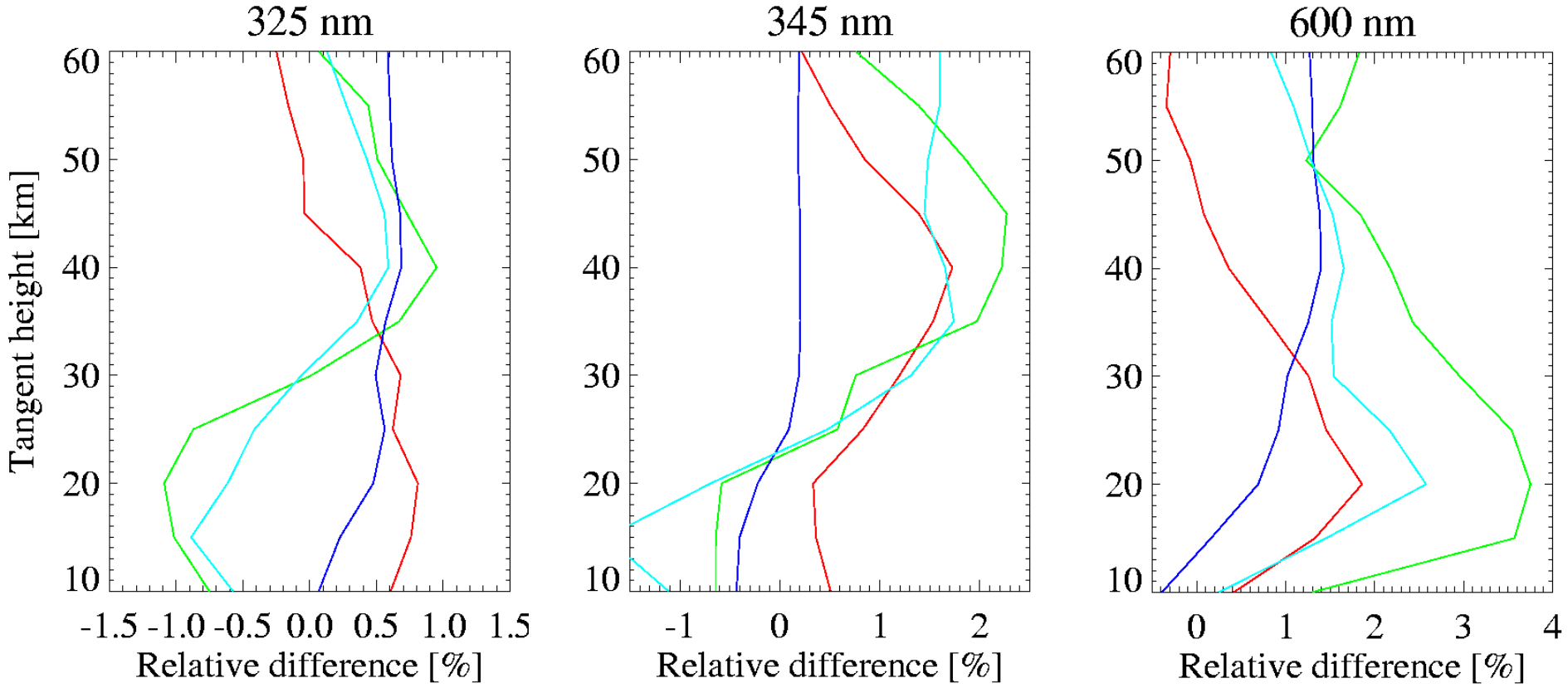
Spherical model verification (limb geometry)



Siro – Finnish Meteorological Institute, Helsinki, Finland.
MCC++ – Obukhov Institute of Atmospheric Physics, R.A.S., Moscow, Russia.
LIMBTRAN – Earth and Atmospheric Sciences, York University, Canada.
GSS – University of Arizona, Tuscon, USA.

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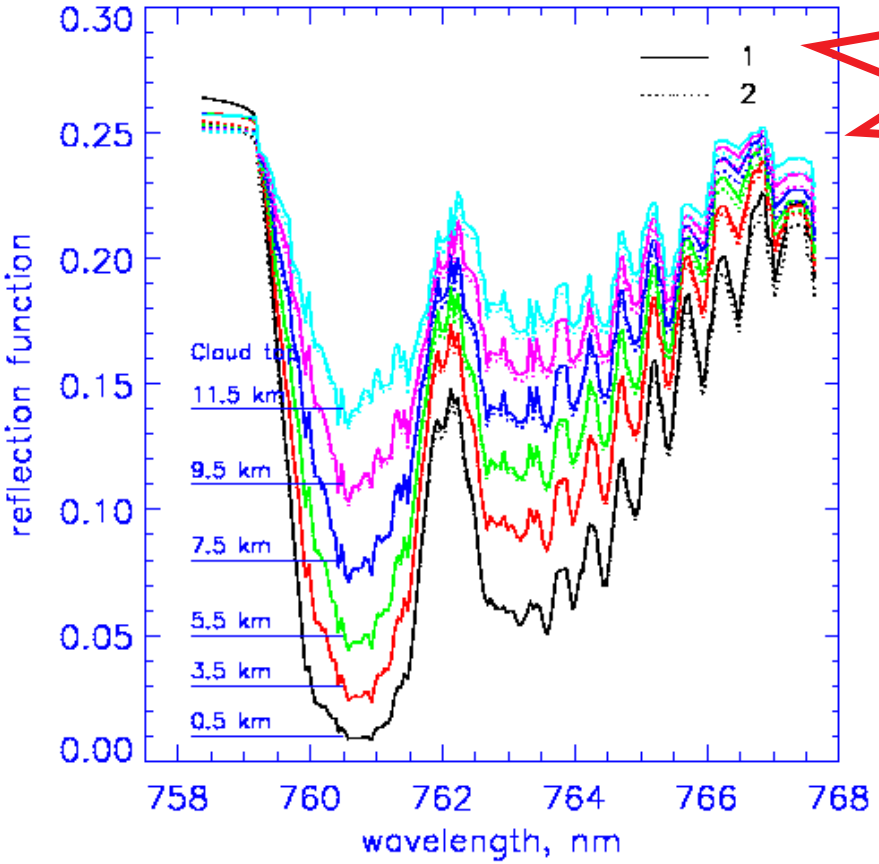
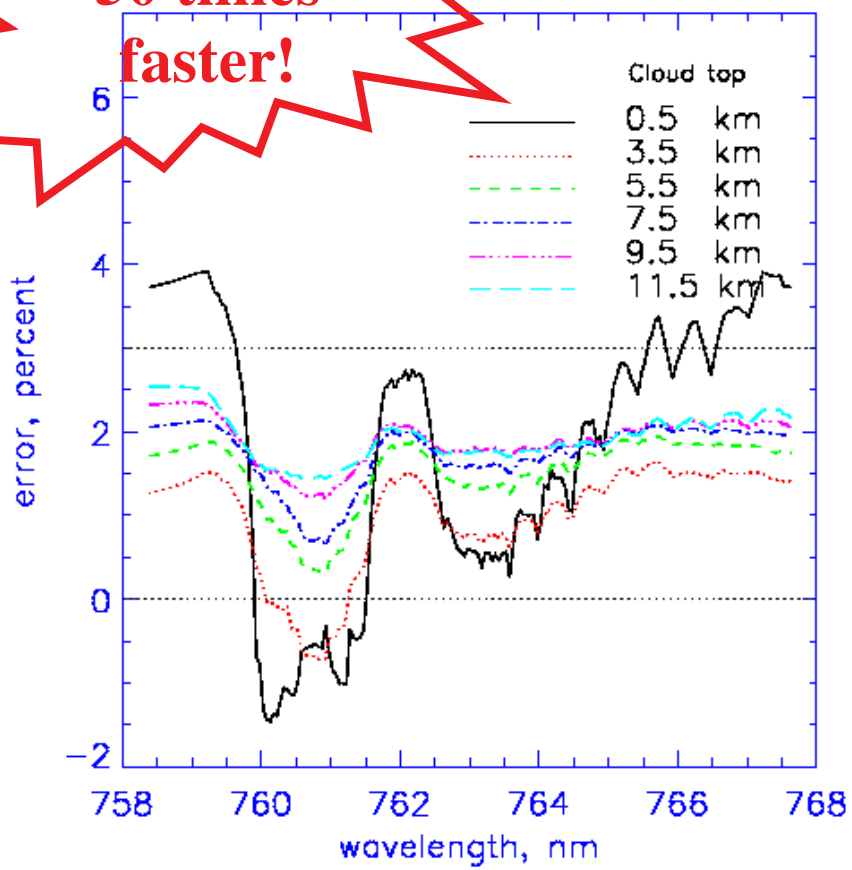
Approximation of the outgoing radiation in the presence of clouds

Optical thickness = 5

Geometrical thickness = 0.25 km



50 times faster!



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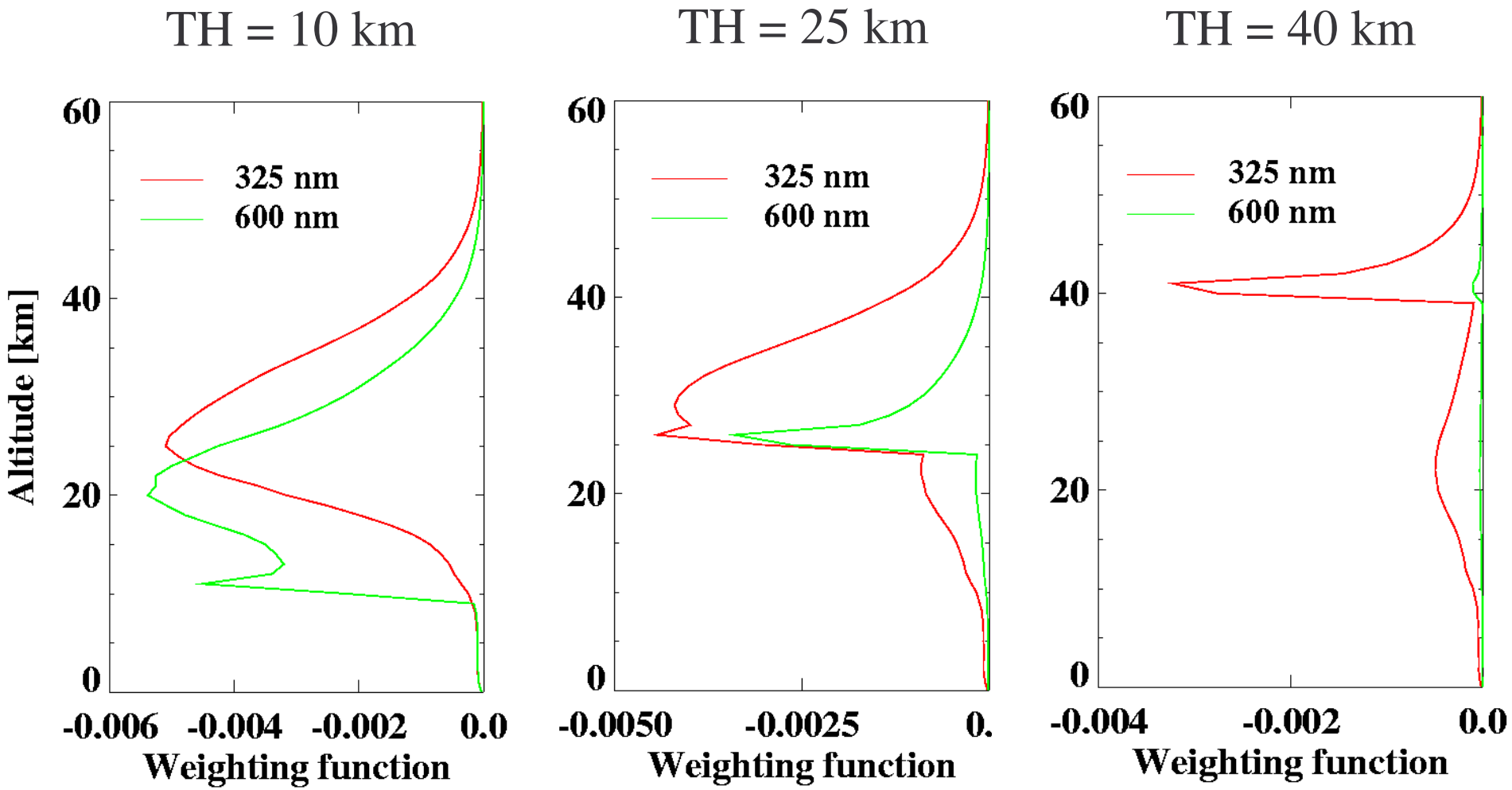
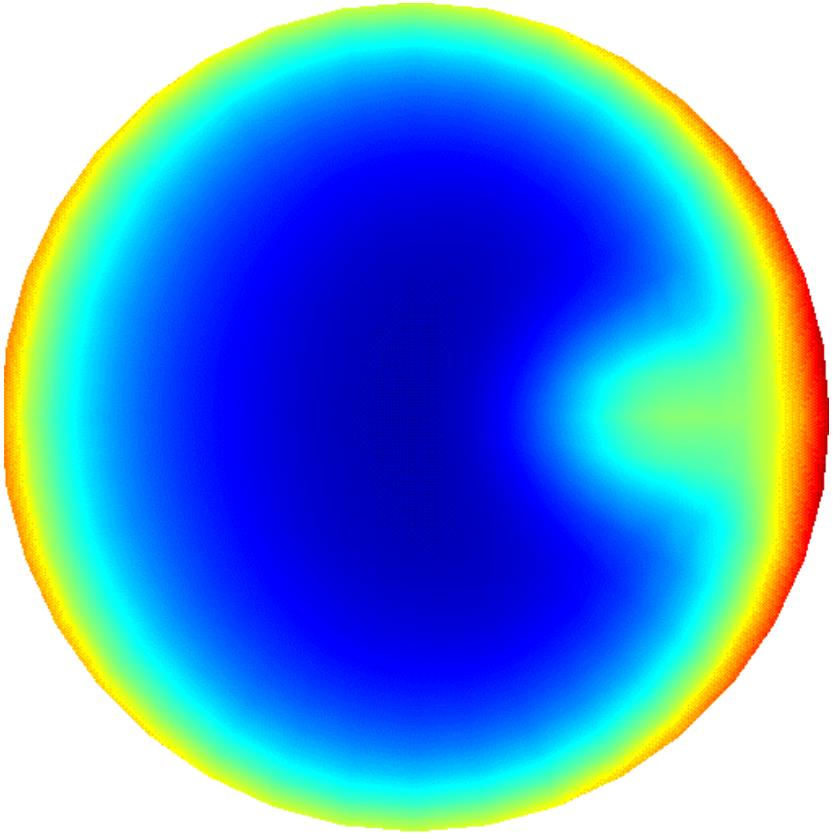
Ozone weighting functions

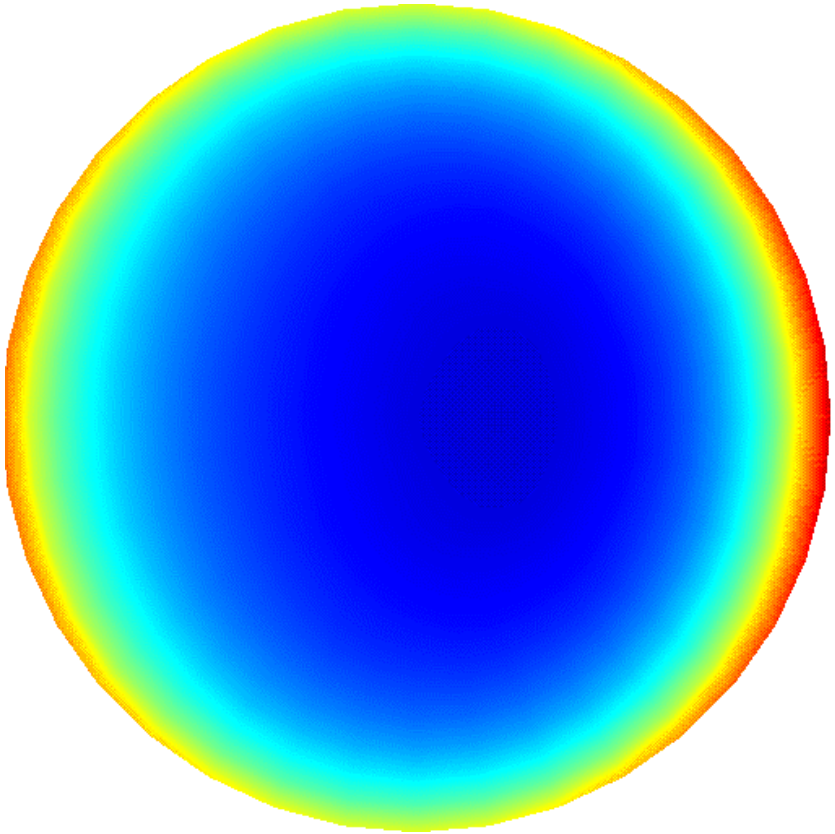


Sun-normalized radiance at TOA (SZA = 40 deg)

Ocean

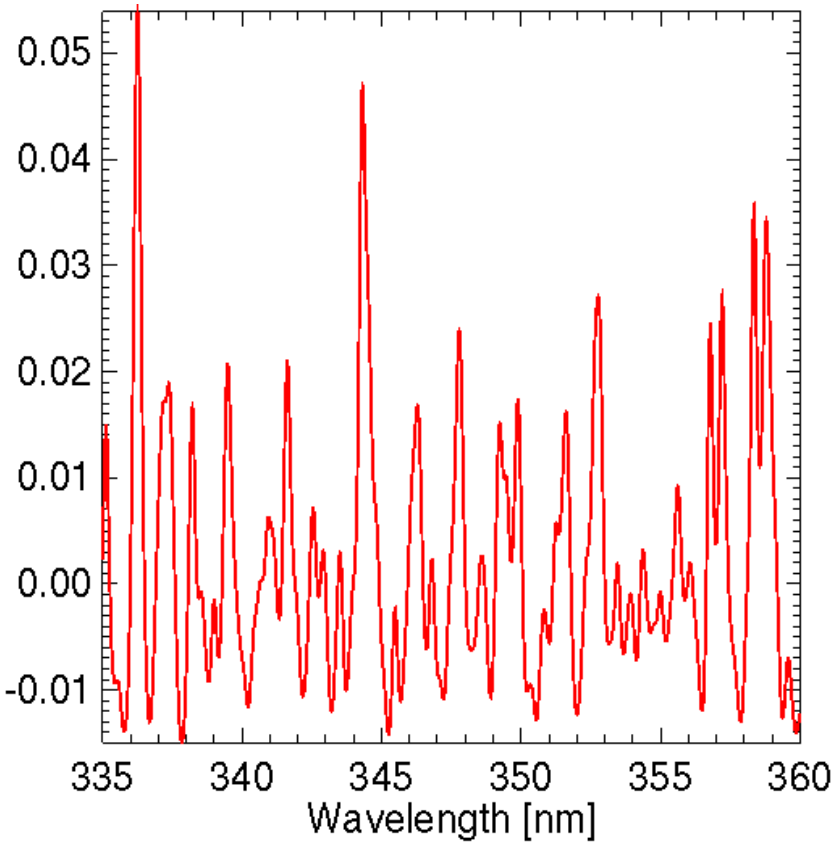


Lambertian surface

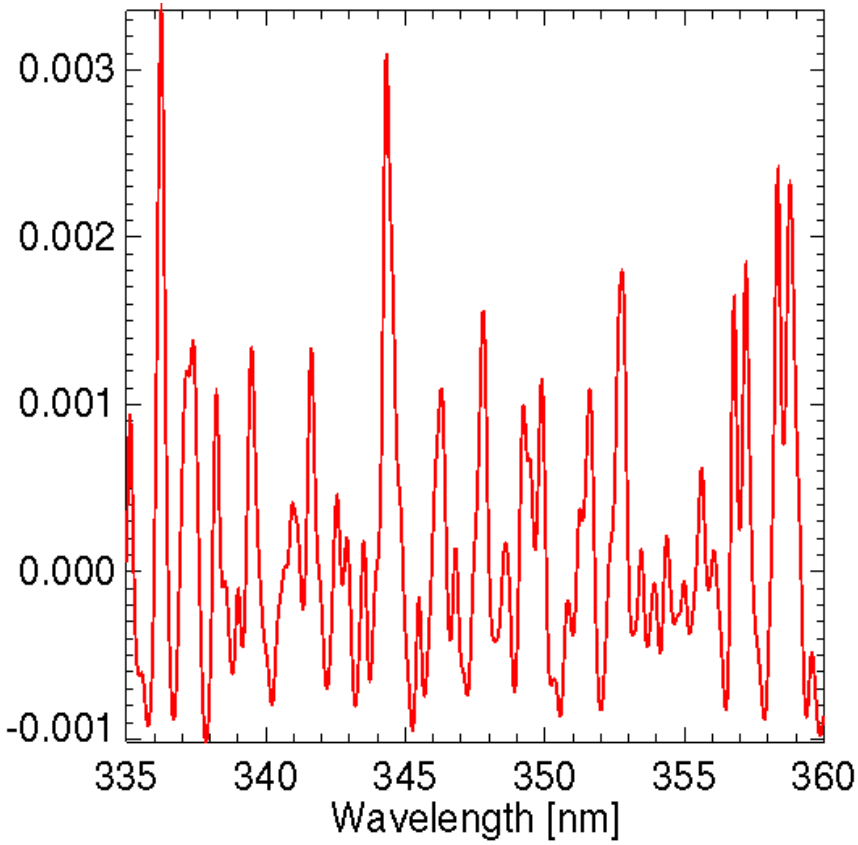


Ring

Ring spectrum at 20 km tangent height



Difference between nadir and limb Ring spectra



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SCIAMACHY

Summary and Outlook

GOMETRAN/SCIATRAN:

- Developed and validated
- Sufficient to perform forward modeling of GOME/SCIAMACHY measurements in nadir and limb geometry.

To be done:

- Computational efficiency
- Clouds in spherical mode