

Playing with MYSTIC 3D simulations

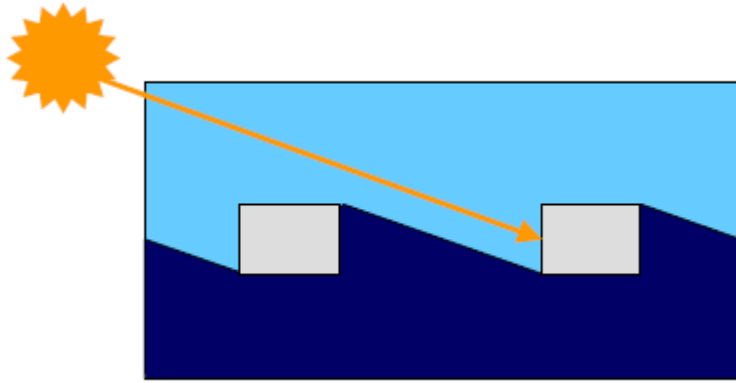
Jeová Junior – IAG/USP

Jorge Rosas – IAG/USP

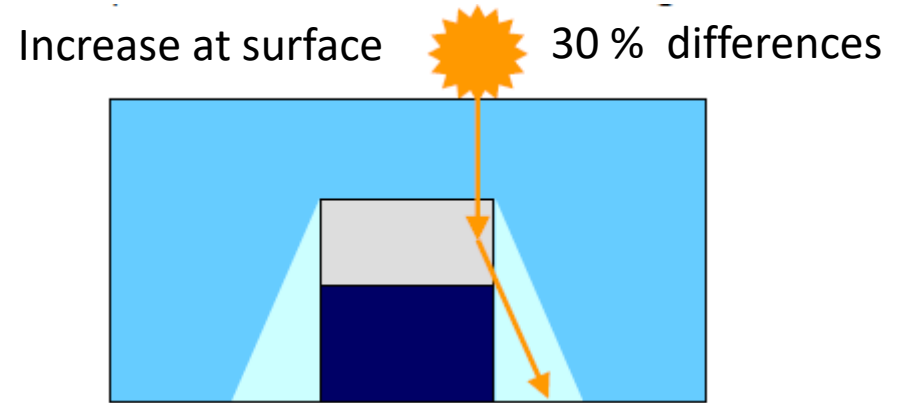
Josielli Simões - DCAC/UFRN

3D effects not considered in 1D simulations

- Shortwave side illumination



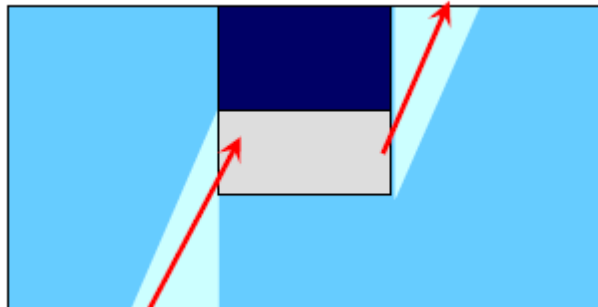
- Shortwave side escape



Schafer (2017)

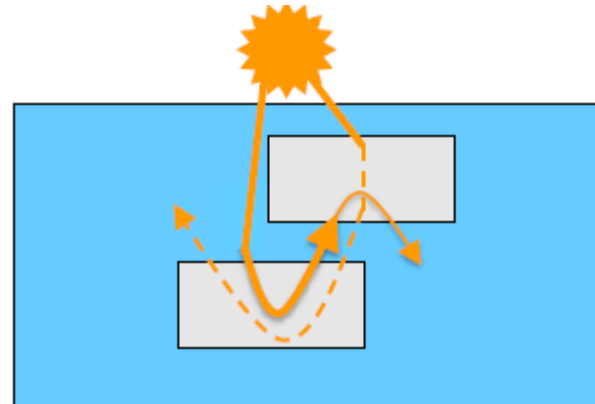
- Longwave cloud side illumination

Increase at surface



- shortwave in-region transport

Regions are not exactly vertically overlapped



Work objectives

1. Simulate the 3D effects listed by Schafer (2017)
2. Compare 3D results with IPA results.

atmosphere_file /work/alunos/libRadtran/share/libRadtran/examples/UVSPEC_MC_ATM.DAT
source solar /work/alunos/libRadtran/share/libRadtran/data/solar_flux/atlas_plus_modtran

mol_modify O3 300. DU
day_of_year 170 # Correct for Earth-Sun distance
albedo 0.2 # Surface albedo
Sza 0 #30 #60 #80 # Solar zenith angle
phi0 180.0 # Sun in the North

rte_solver montecarlo # Radiative transfer equation solver MYSTIC
mc_photons 10000000 # MYSTIC number of photons
#mc_ipa

mc_sample_grid 201 201 1 1 # sample grid, 201 x 201 grid boxes
#mc_sample_grid 50 50 0.5 0.5

MYSTIC input files
wc_file 3D CLOUDS_1.DAT

wavelength 550.0 550.0 # Wavelengths considered

quiet

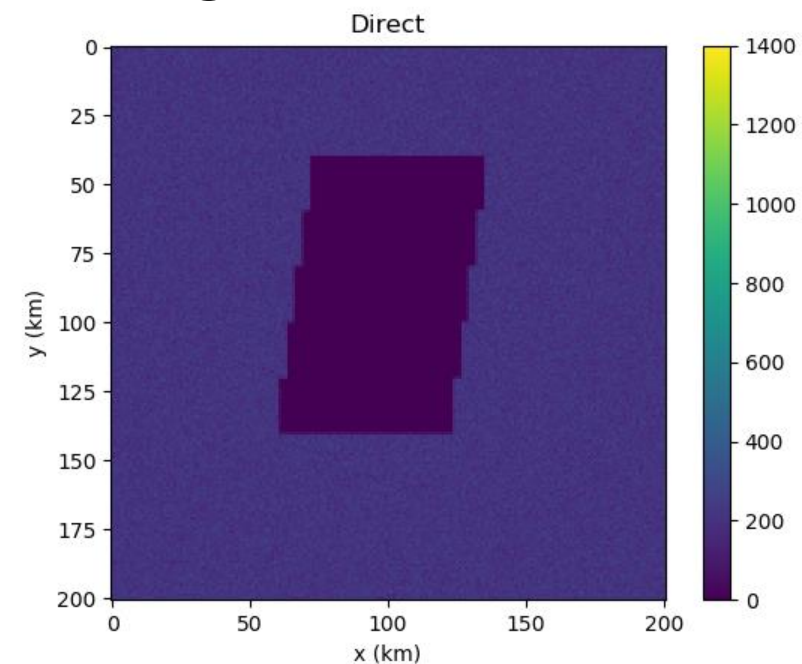
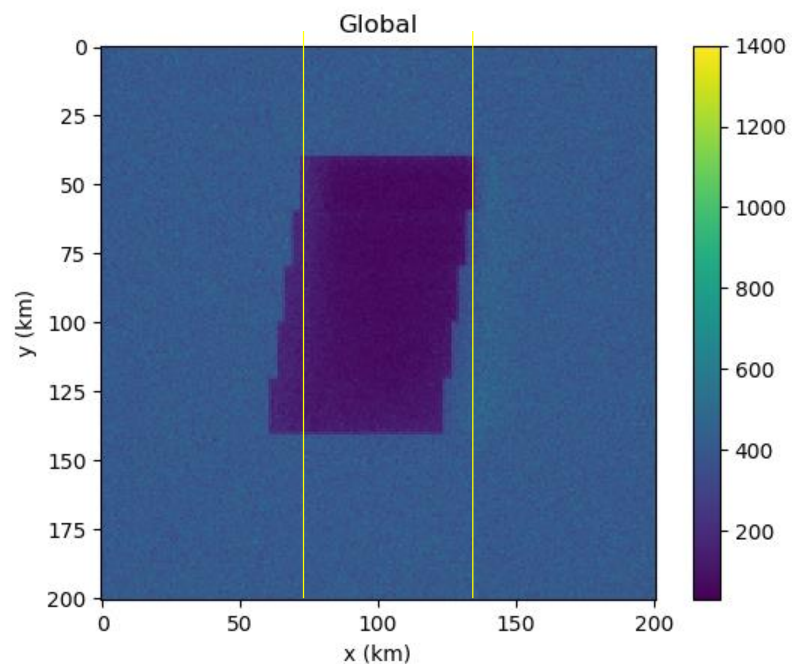
Cloud parameters

LWC = 0.5

Ref = 10.0

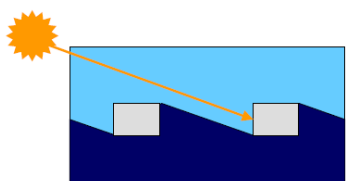
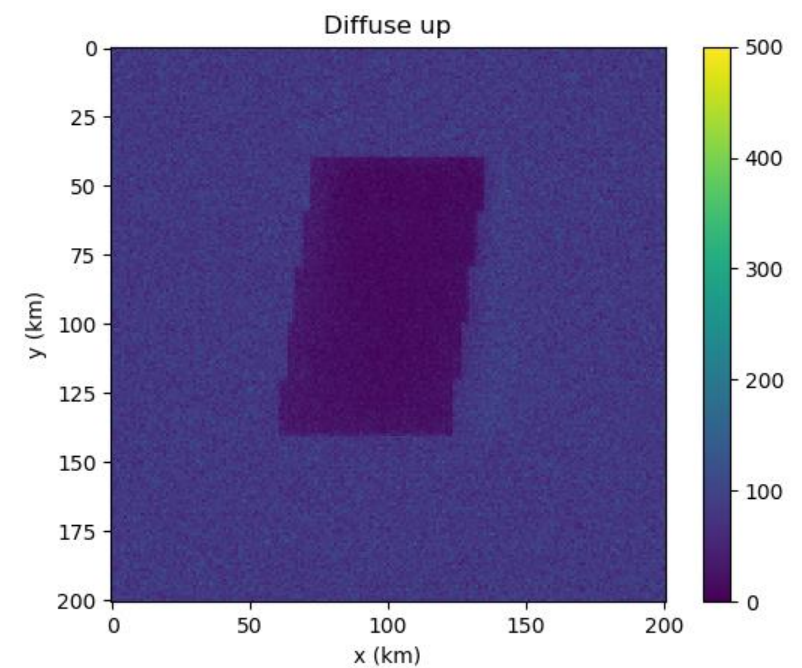
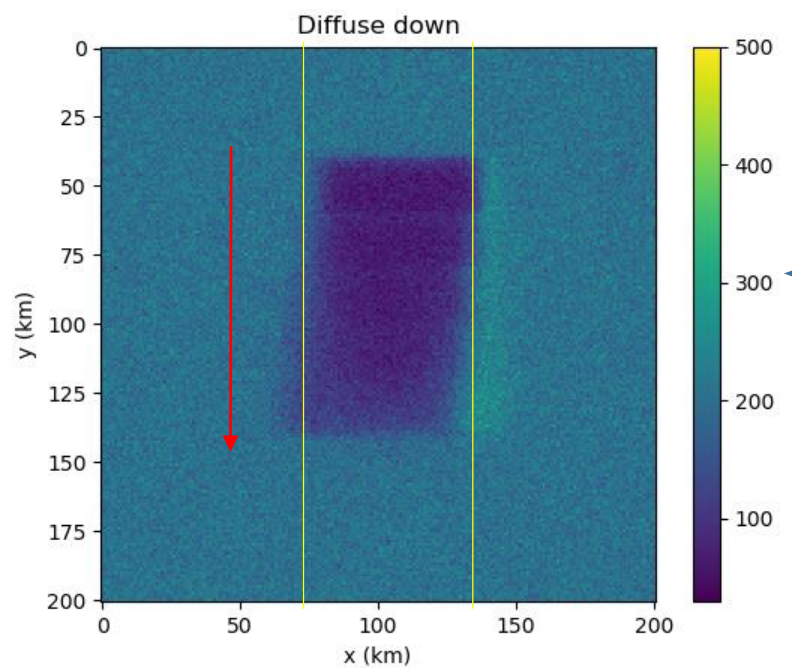
3D cloud effects on shortwave irradiances
at surface

Increase of cloud height.

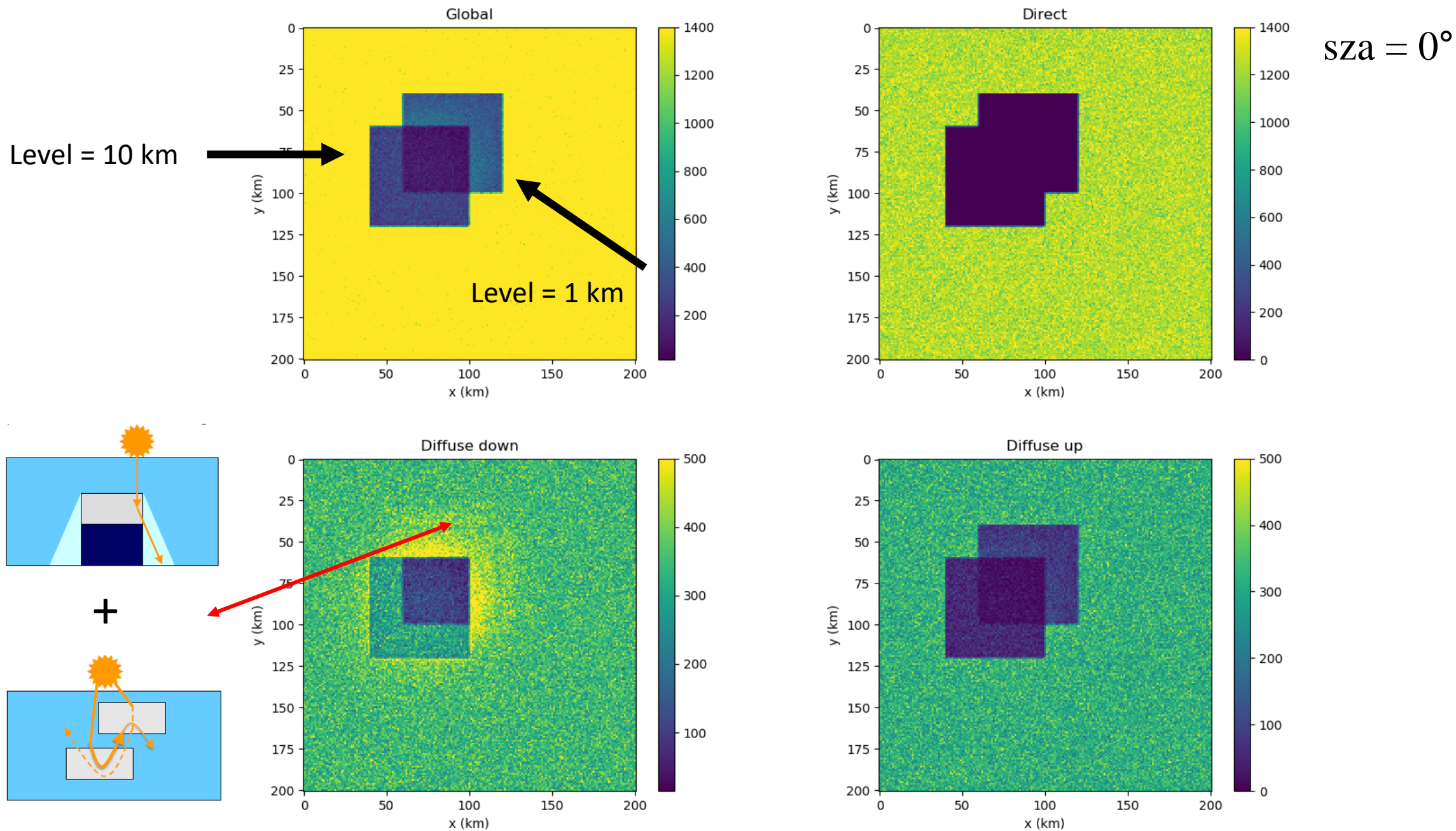


$sza = 70^\circ$

Higher cloud level with y axis.

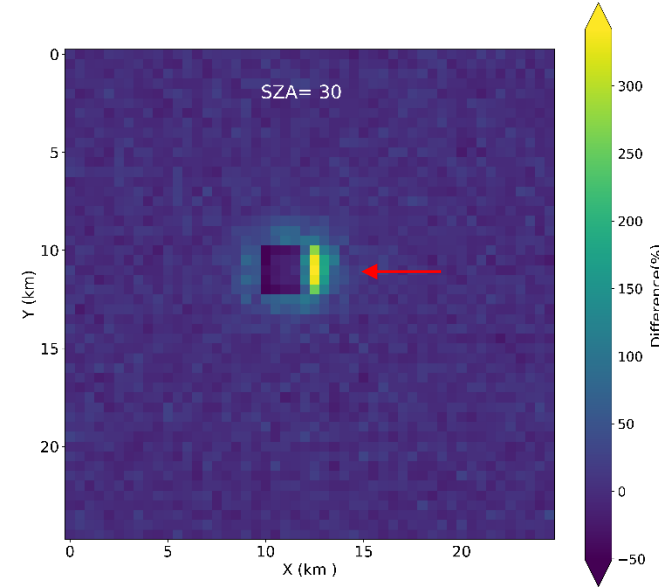
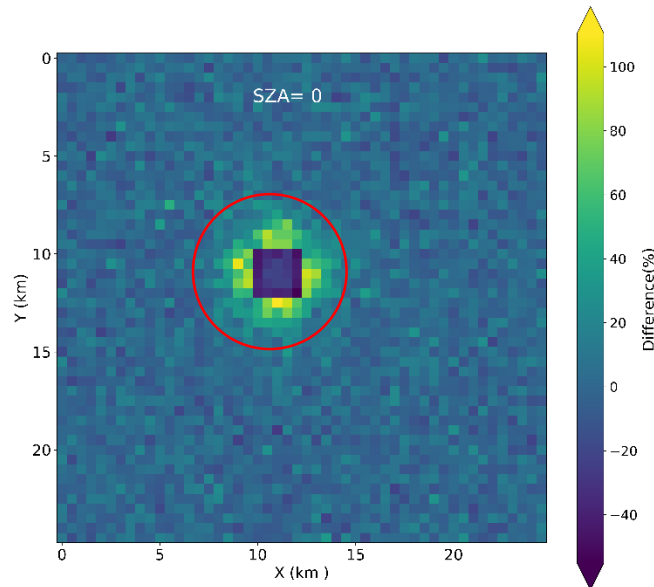


Shortwave in-region transport

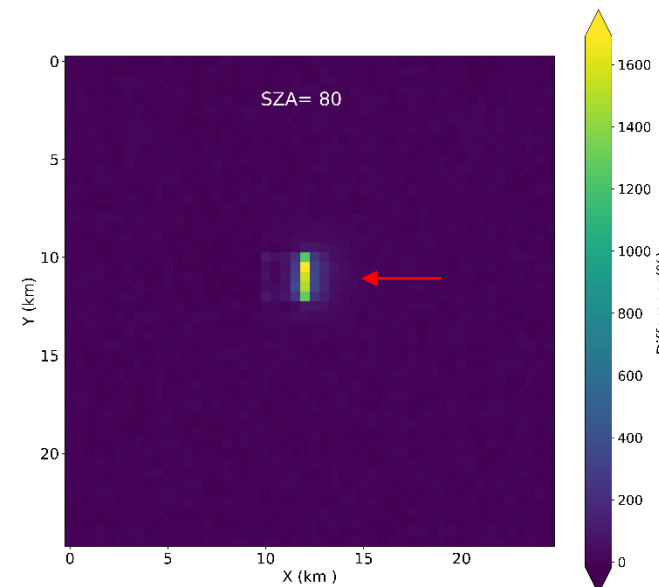
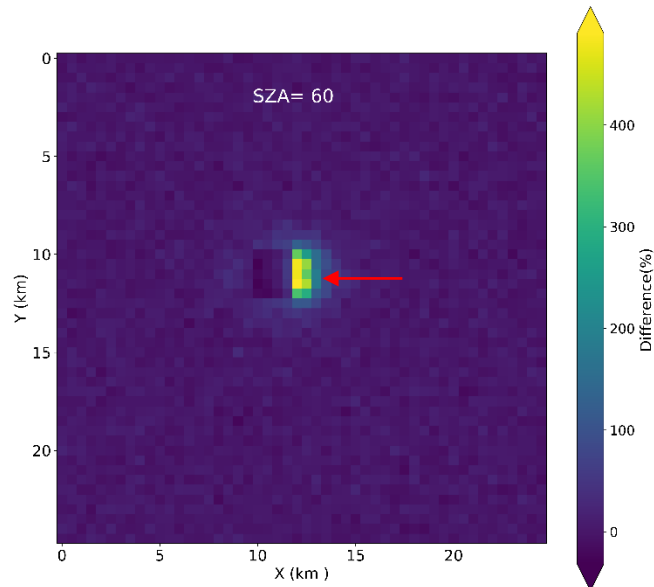


Diffuse radiation on surface changing with SZA (3D -IPA)

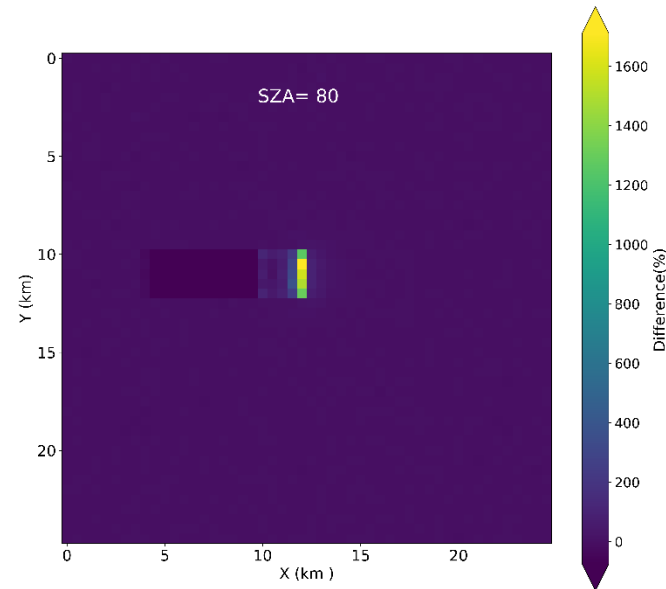
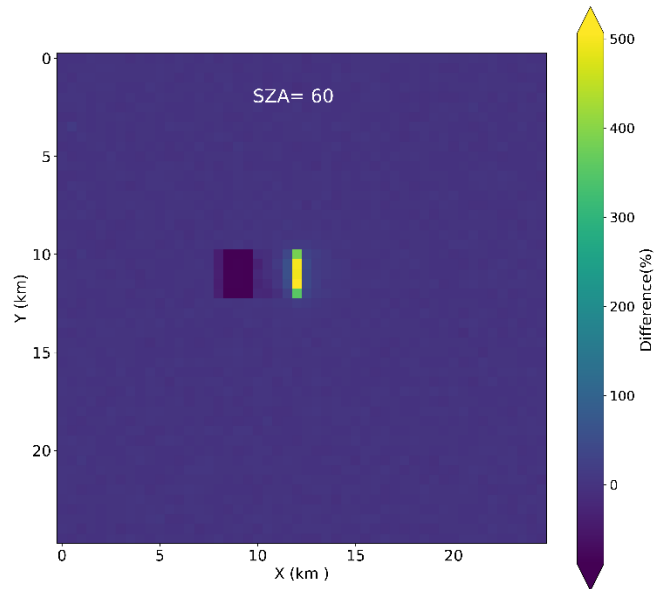
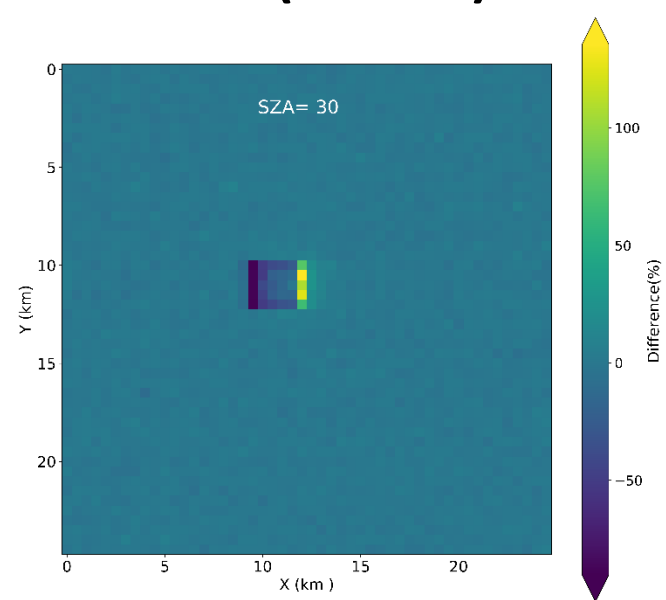
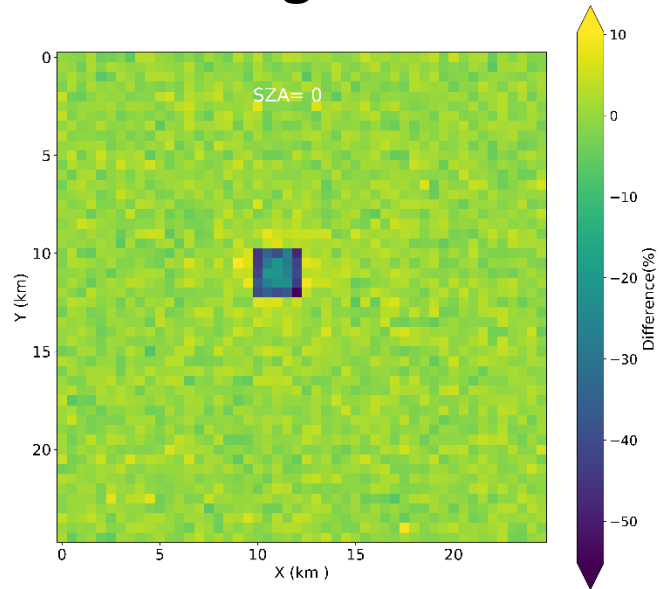
- Shortwave side escape



- Shortwave side illumination



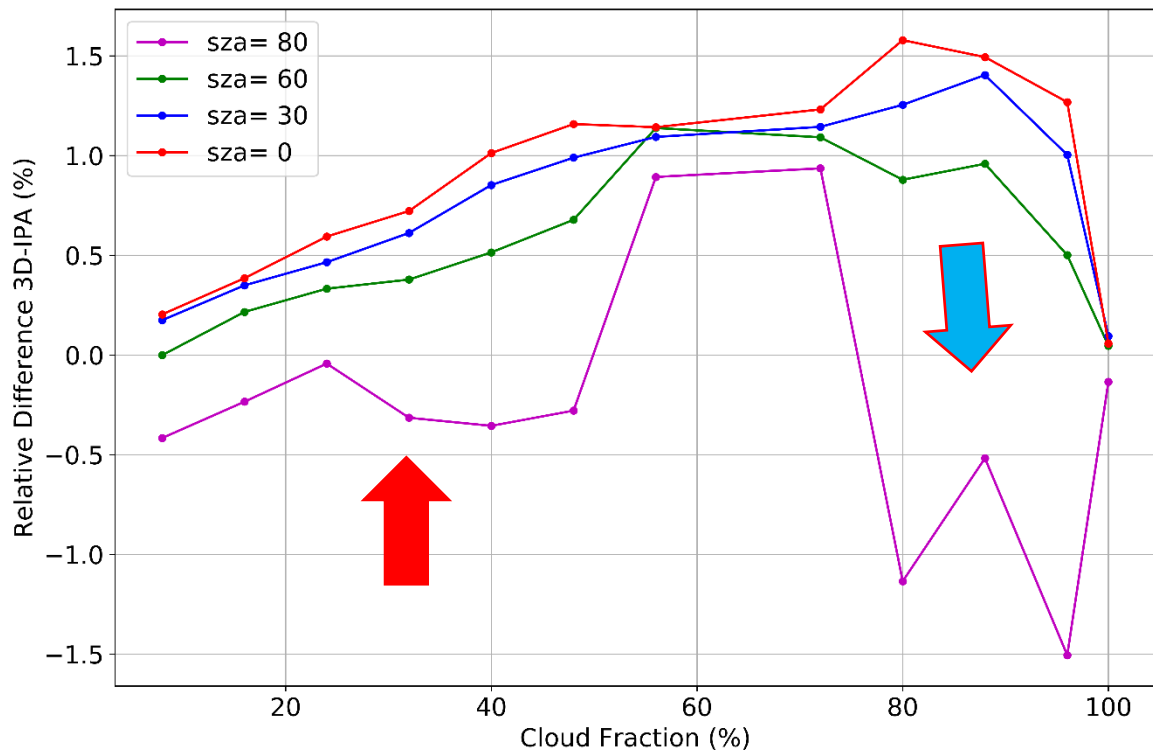
For global radiation at surface (3D-IPA)



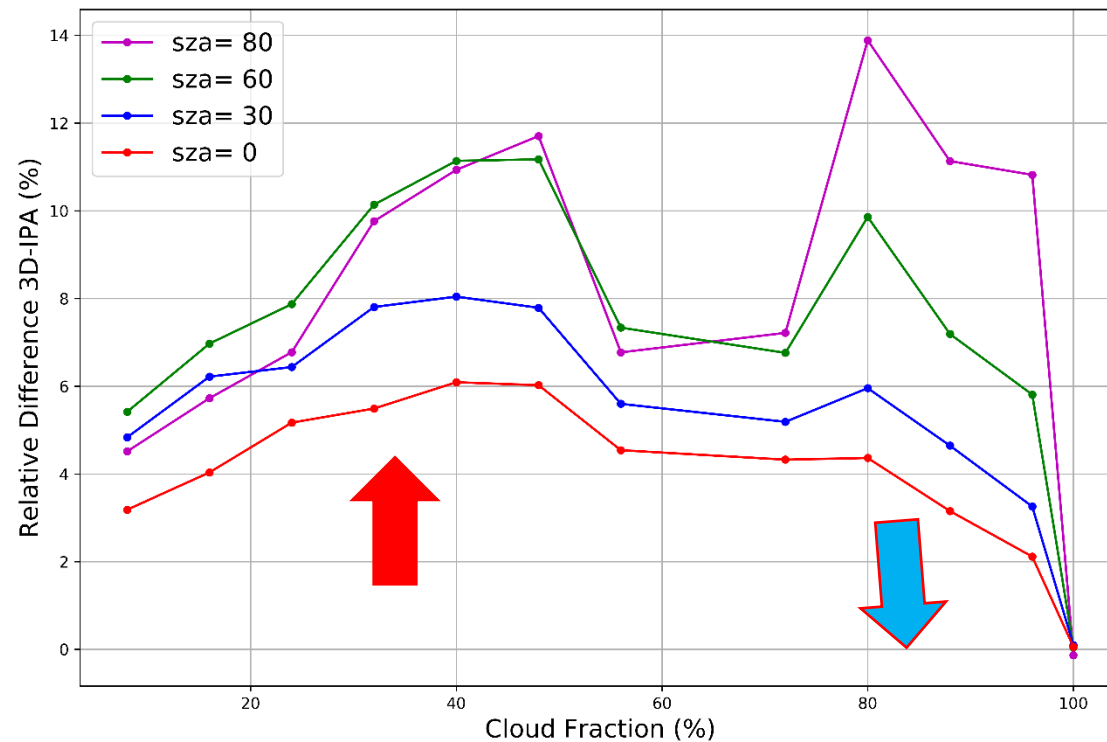
3D-IPA in the grid area for different cloud fraction

- 14 hours running for 5X5 grid box.

Global



Diffuse



A sunset scene with a bright sun low on the horizon, casting a warm orange glow. The sky transitions from a deep blue at the top to a lighter blue and then to the orange of the sunset. The text 'Thank you!' is centered in a large, black, sans-serif font.

Thank you!