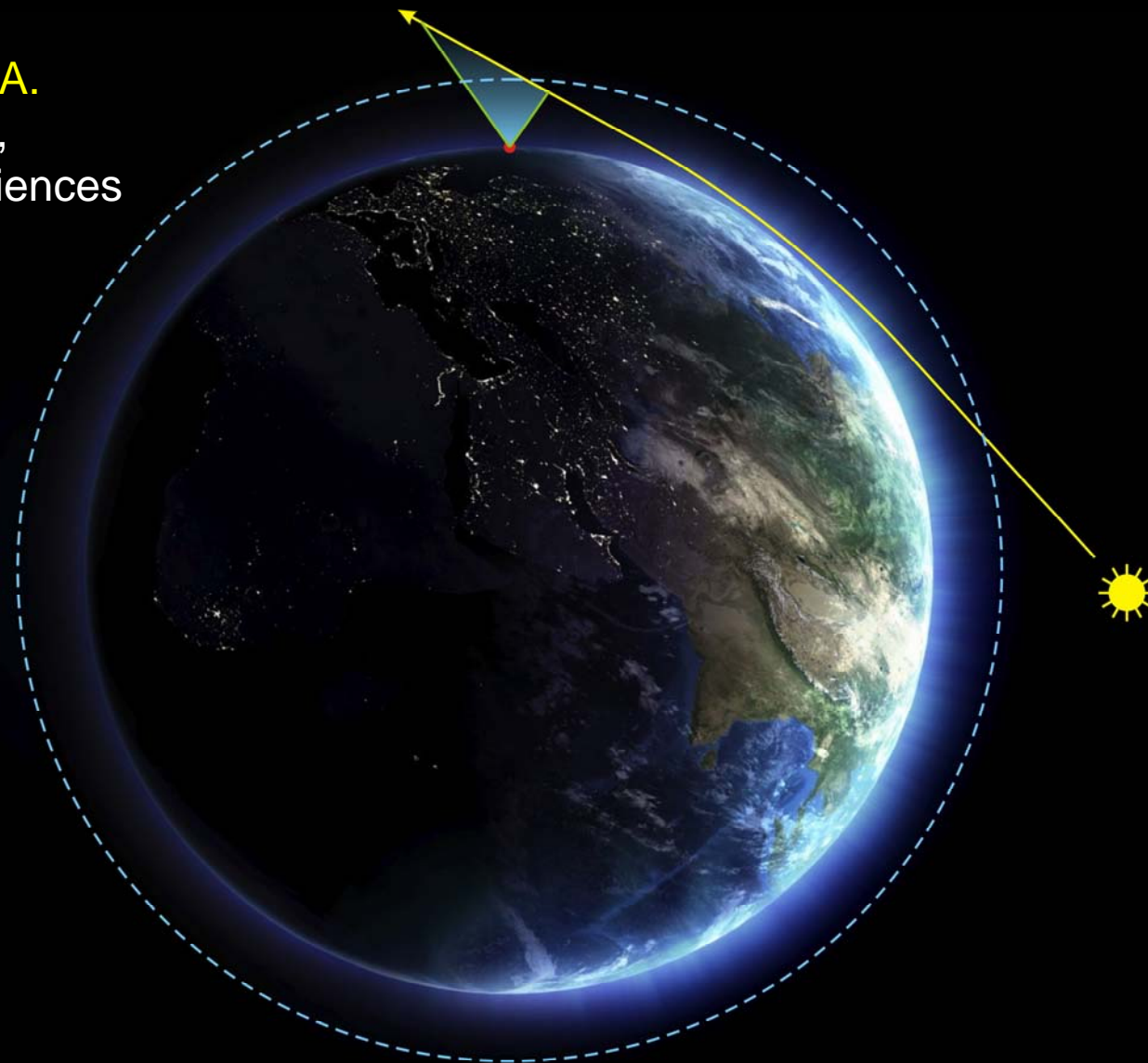


# SABER and MLS Summer Mesosphere Temperature Profiles compared with Rayleigh Twilight Polarization Measurements

Ugolnikov O.S., Maslov I.A.  
Space Research Institute,  
Russian Academy of Sciences



[ougolnikov@gmail.com](mailto:ougolnikov@gmail.com)

# Mesosphere

(or Ignorosphere)

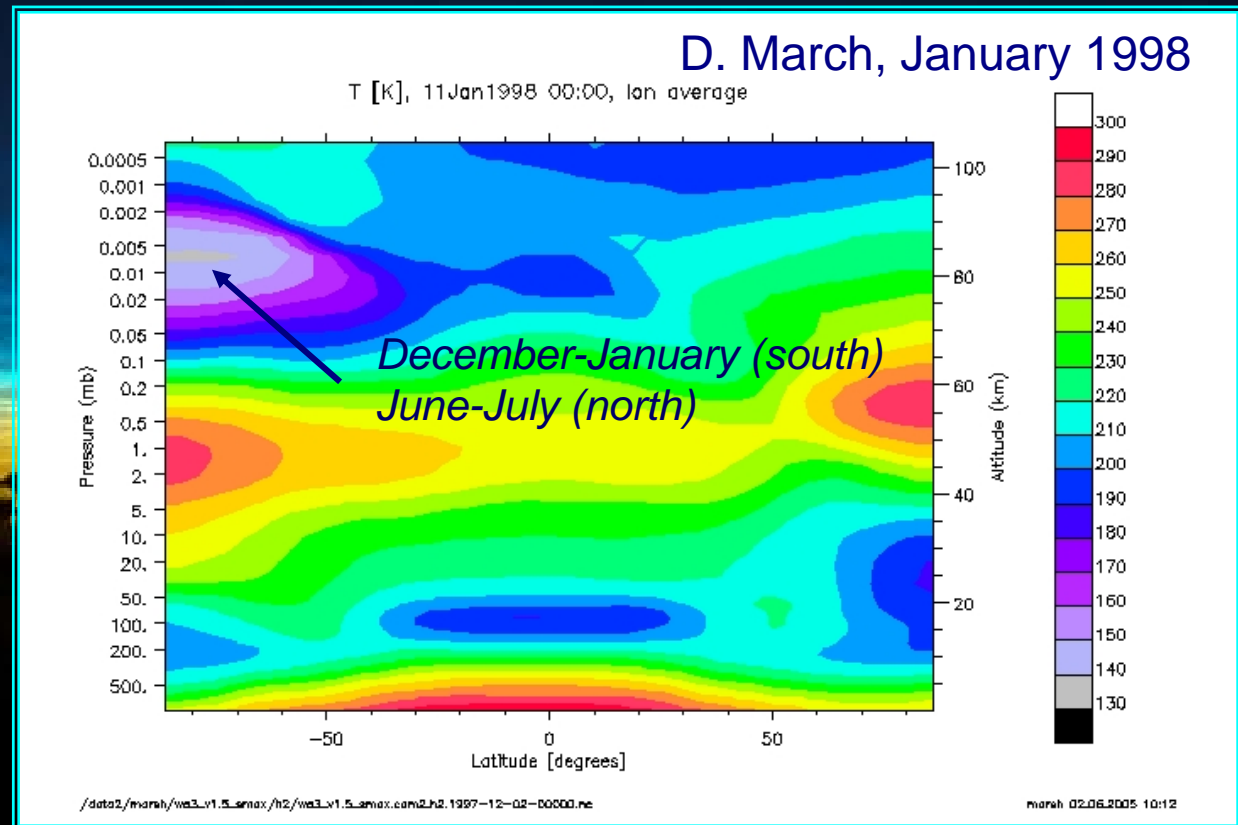
*Too high*



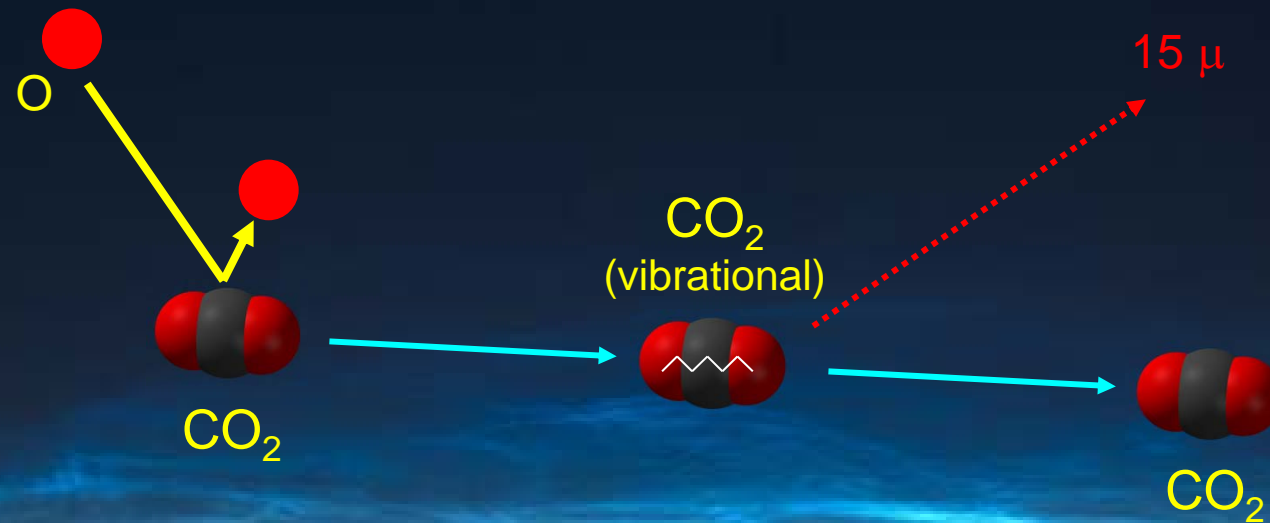
*Too low*



# Mesosphere cooling



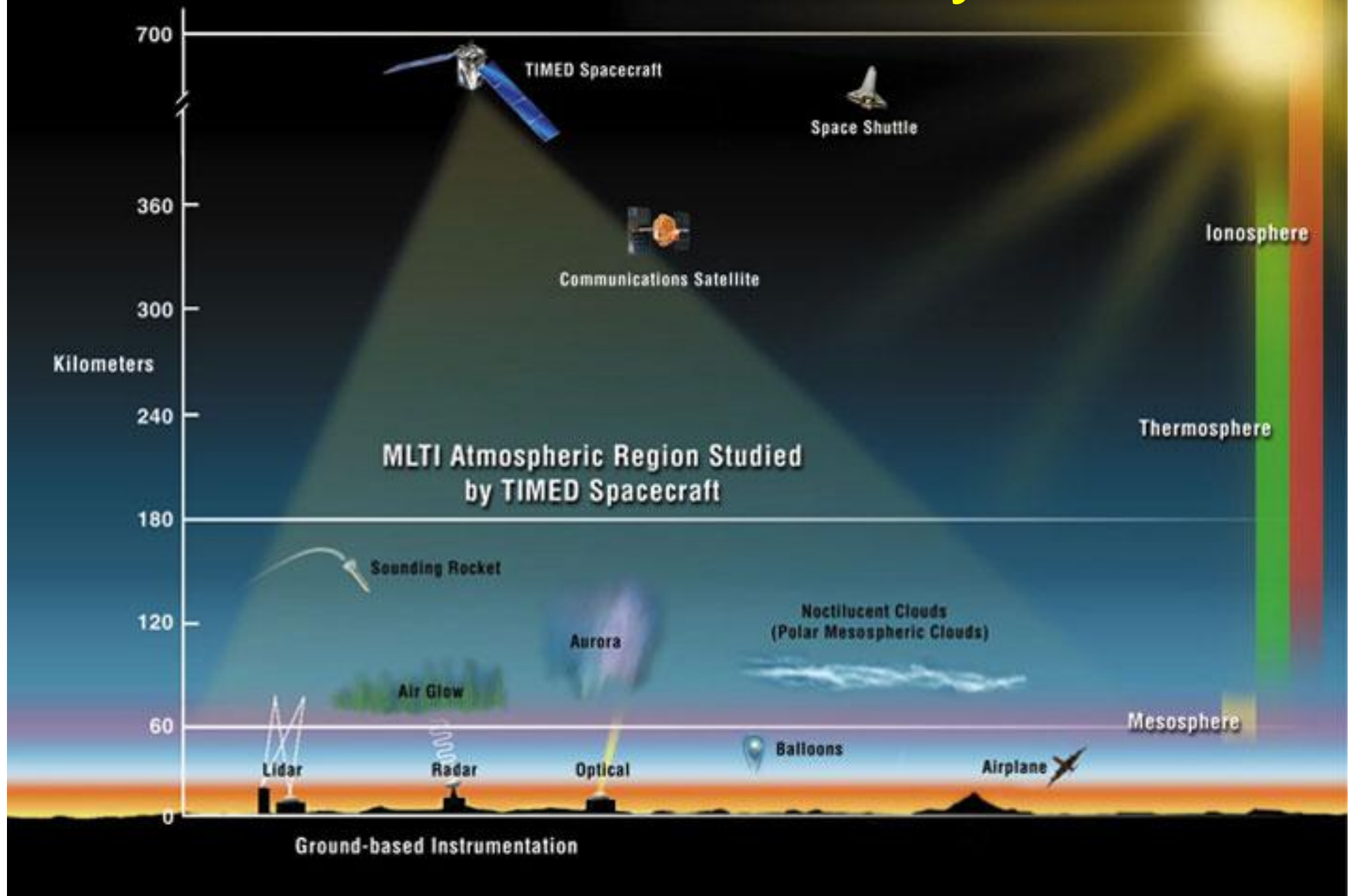
# Mesosphere cooling



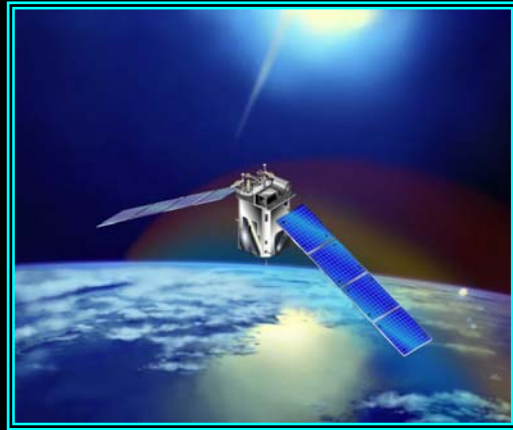
The same IR-band provides greenhouse effect in the troposphere!

Mesosphere: non-LTE state!

# Methods of study



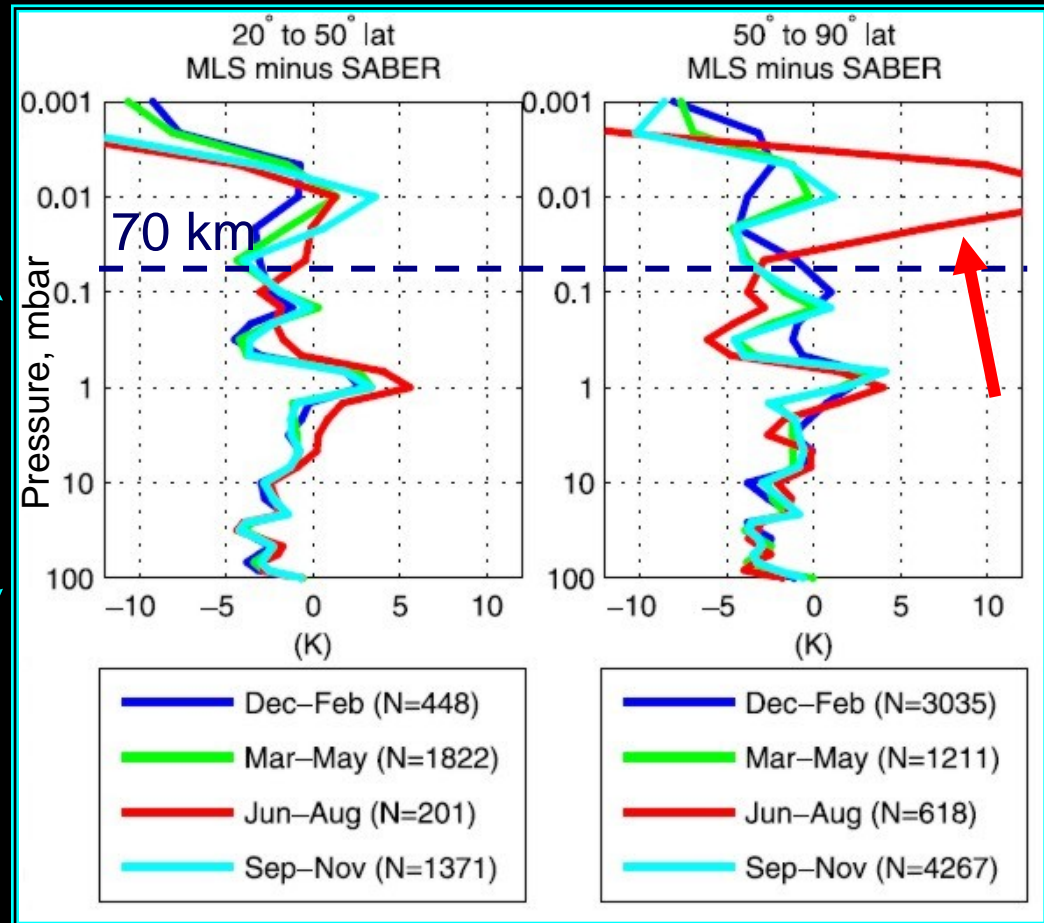
# Temp. values difference



TIMED / SABER  
*CO<sub>2</sub> emission*



EOS Aura / MLS  
*O<sub>2</sub> emission*



Schwartz et al., JGR, 2008

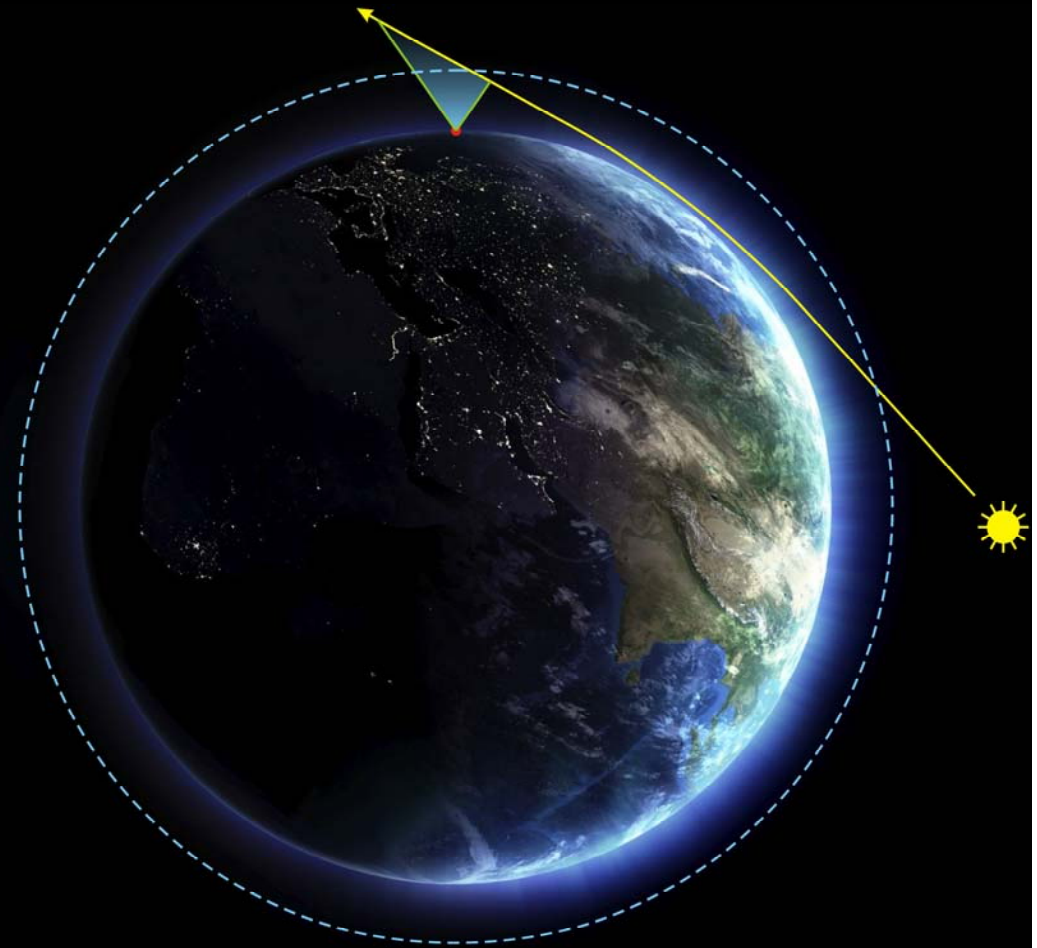
# Twilight method (Rayleigh scattering)

*Wider camera field –*

*Wide scattering angle range –  
Accurate scattering function  
determination*

*Higher sensitivity –*

*Wide solar zenith angle  
range –  
High atmosphere  
analysis*



# Twilight method (Rayleigh scattering)

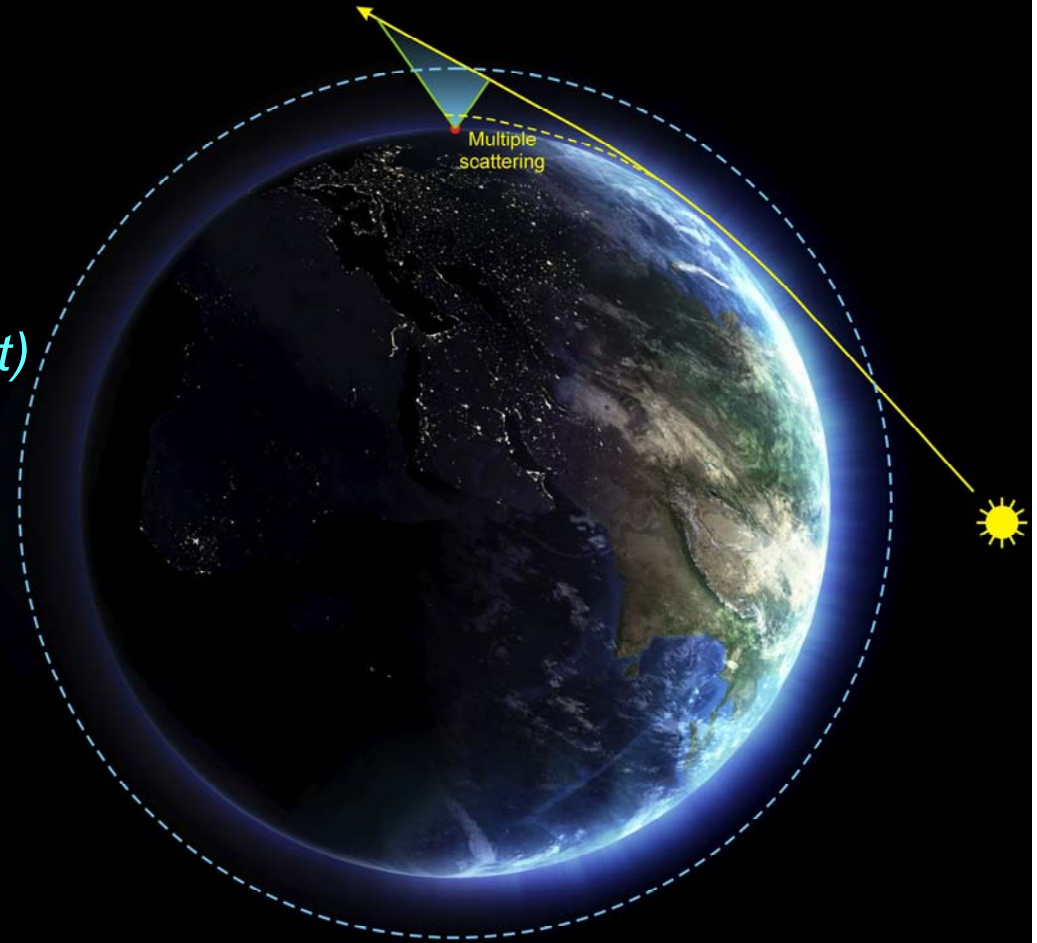
## *Basic Problems:*

*Multiple scattering  
(inc. light pollution,  
night sky background)*

*Aerosol and dust scattering  
(noctilucent clouds, meteoric dust)*

## *Way to solve:*

*Polarization analysis*





# Observations

55.2°N, 37.5°E, Summer 2011 and 2012

Rotating polarization filter, 540 nm

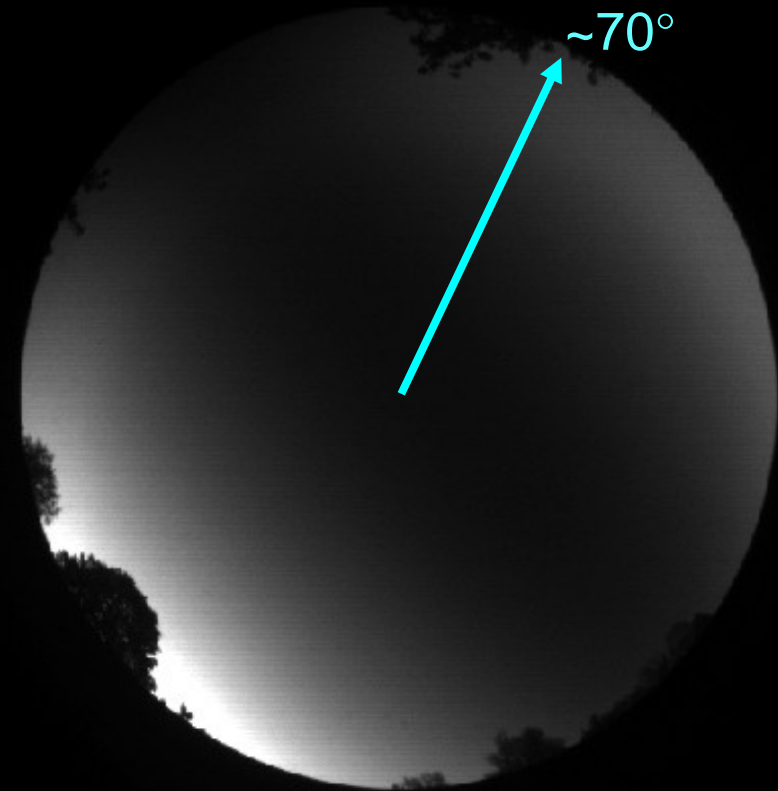


“Latitude Belt”:

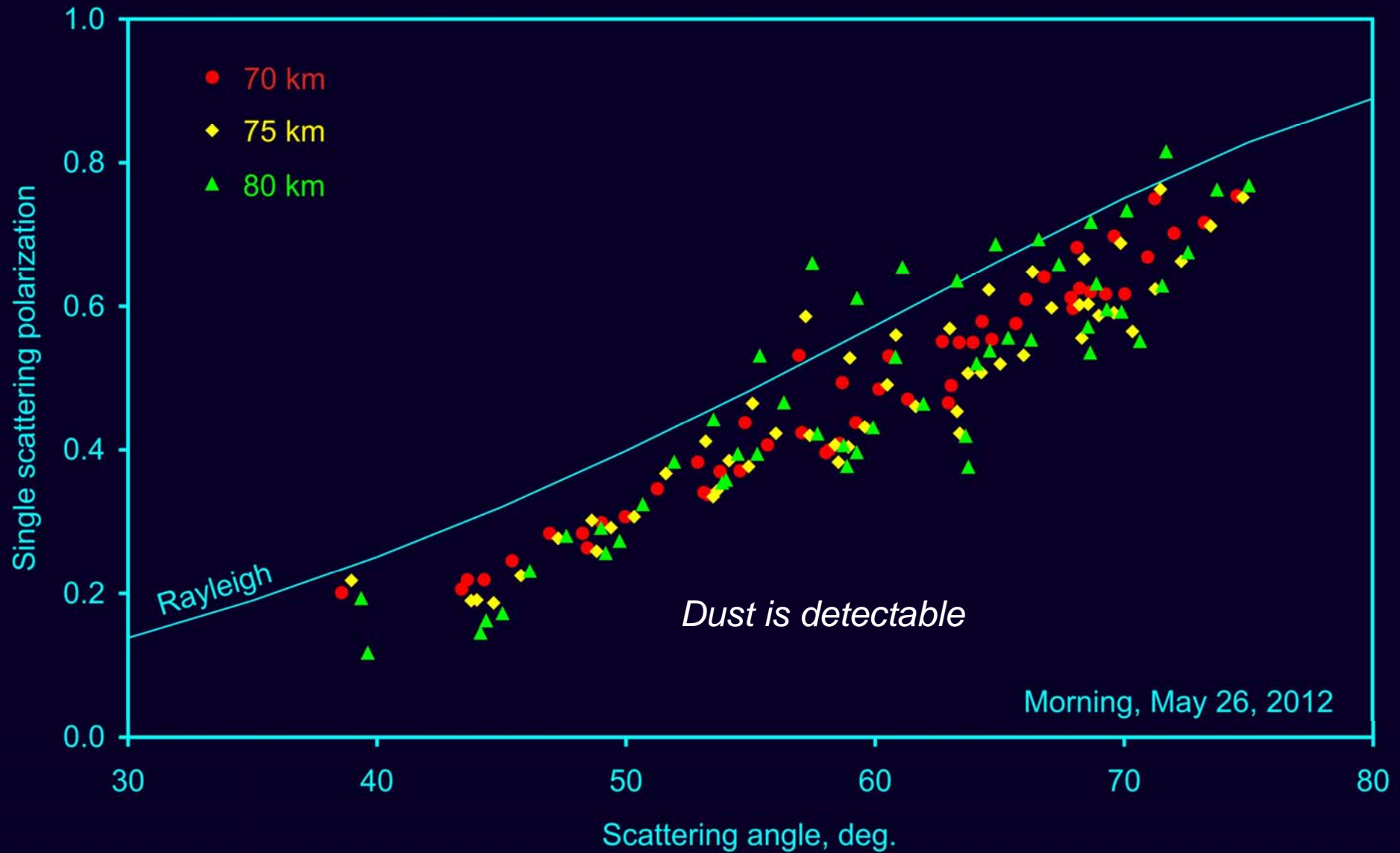
Deep twilight in June: latitude  $< 57^\circ$

MOSCOW

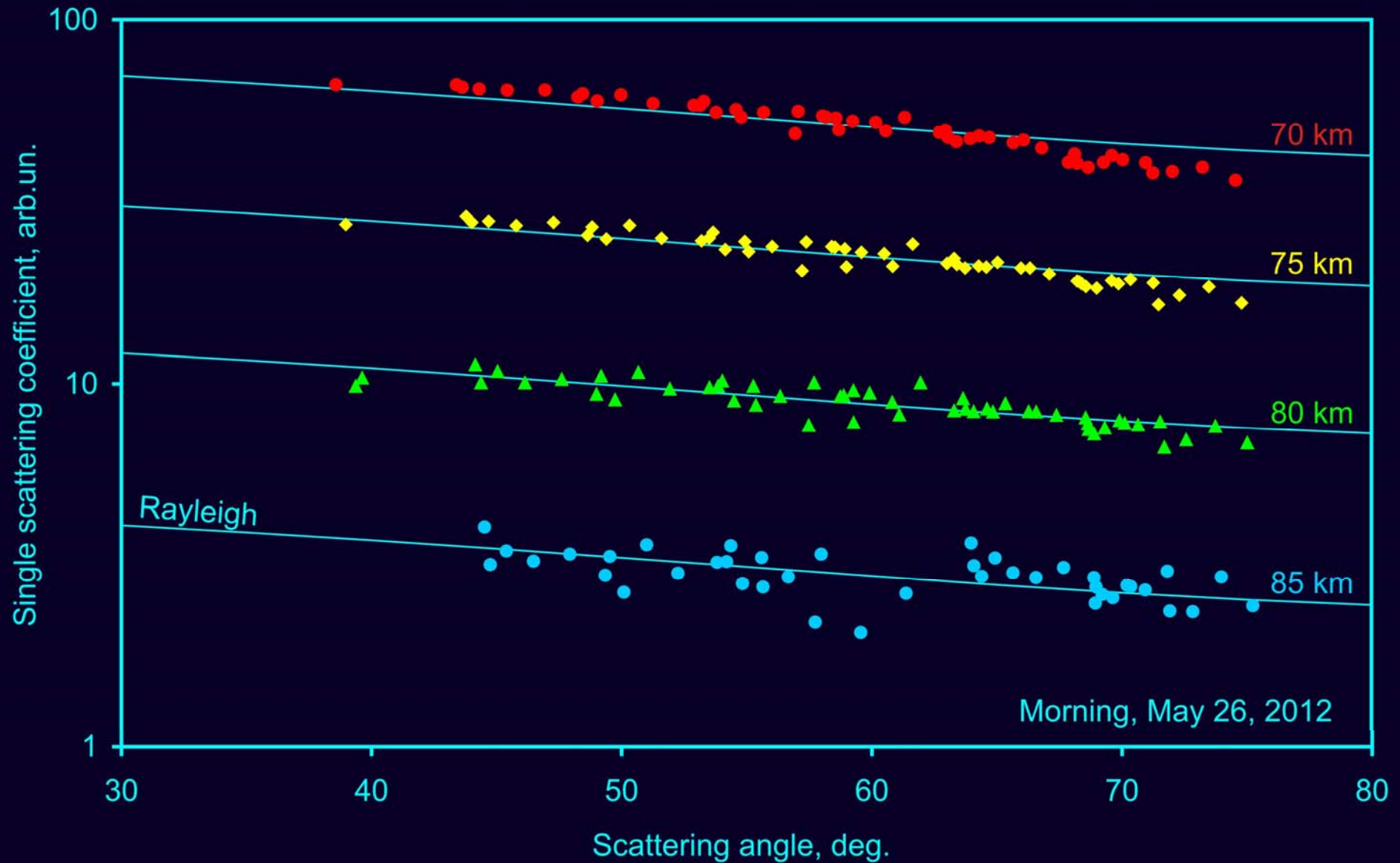
Mesosphere cooling: latitude  $> 50^\circ$



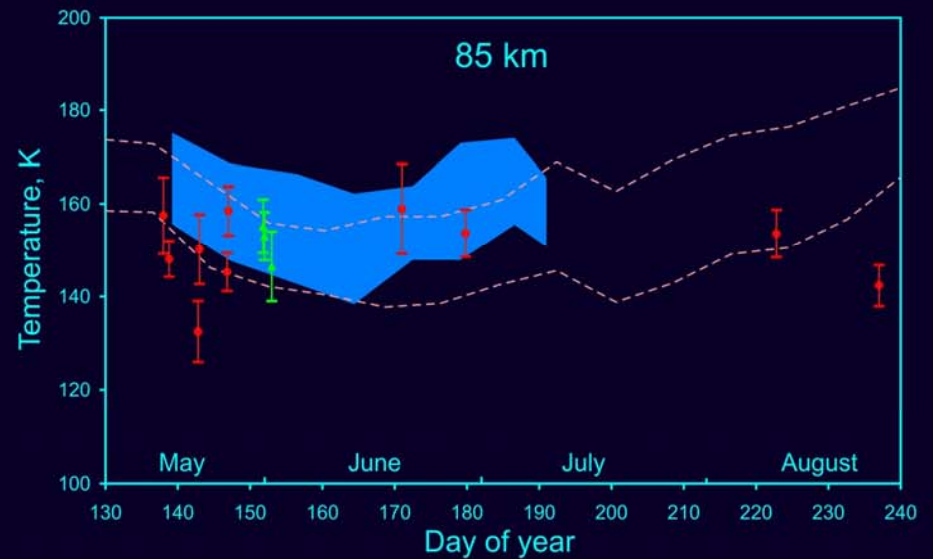
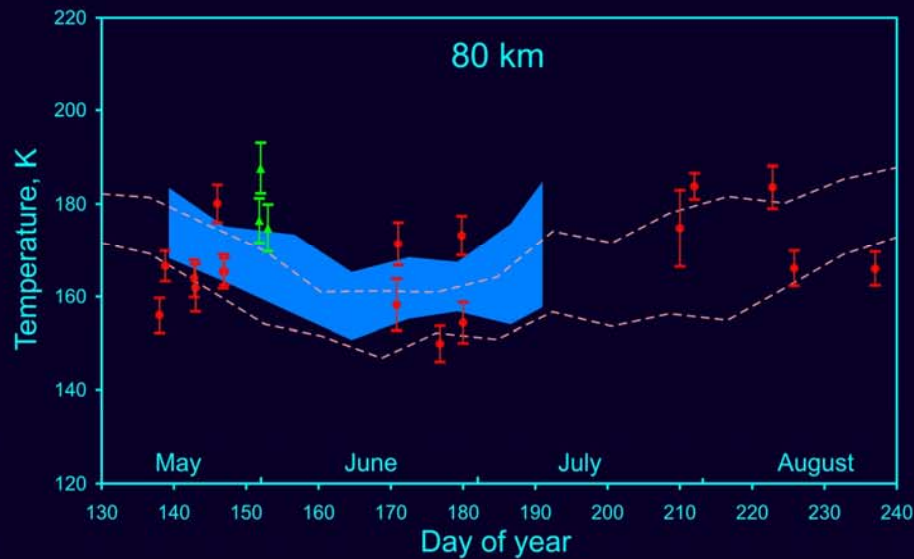
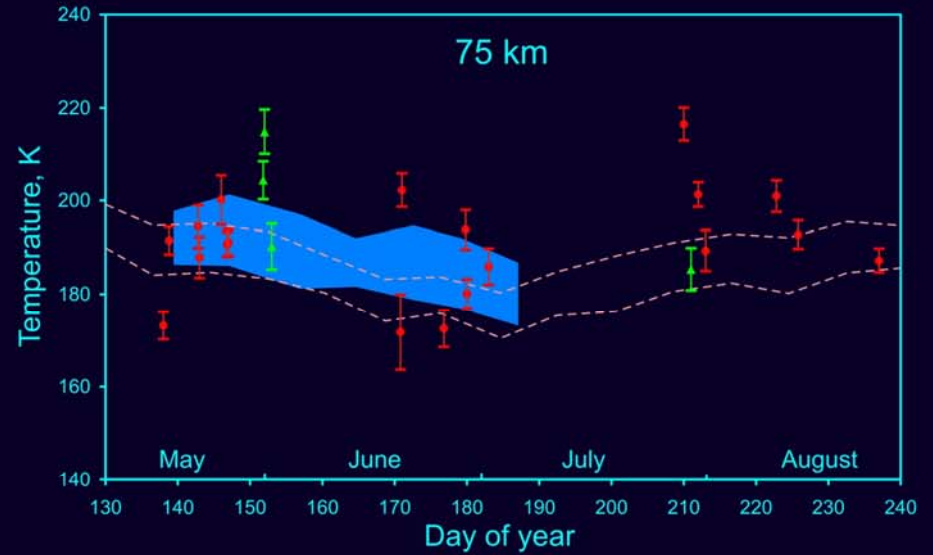
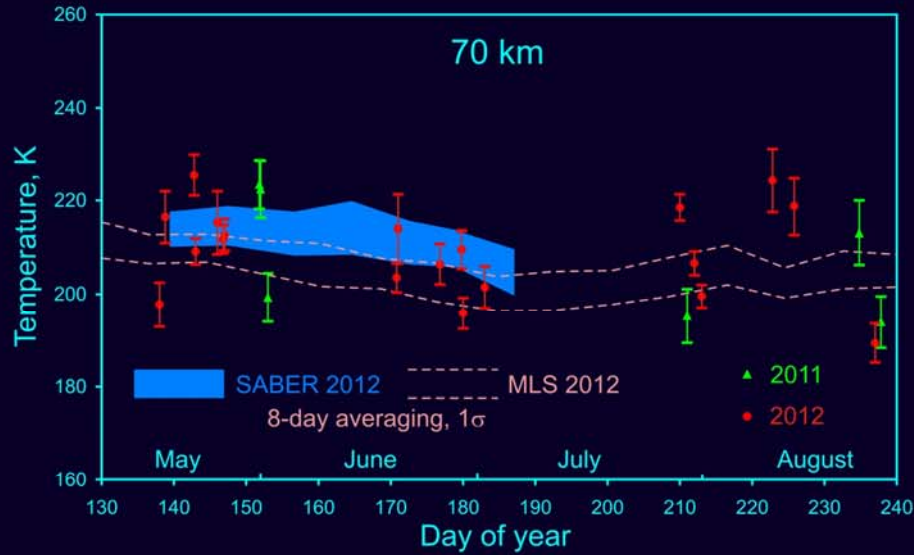
# Single Scattering Polarization



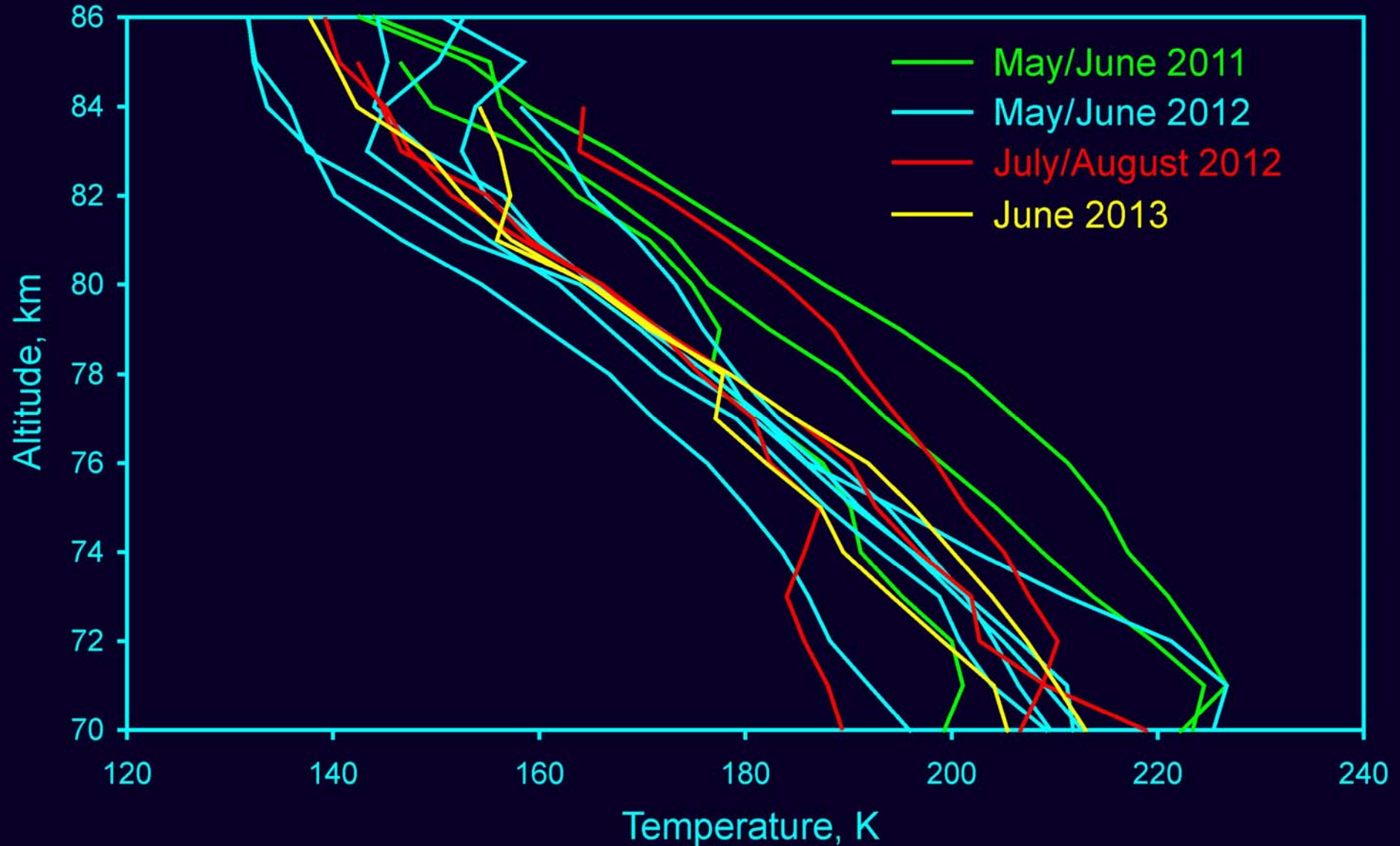
# Single Scattering Coefficient



# Mesosphere Temperatures



# Mesosphere Temperatures



# Mesosphere Cooling

Possible fast trends ( $\sim -2K$  per decade)

Necessity of long measurement sets

Relation with anthropogenic  $CO_2$

NON-LTE state of the mesosphere

Importance of different and less-expensive local methods of temperature measurements

*Thank You for the attention!*