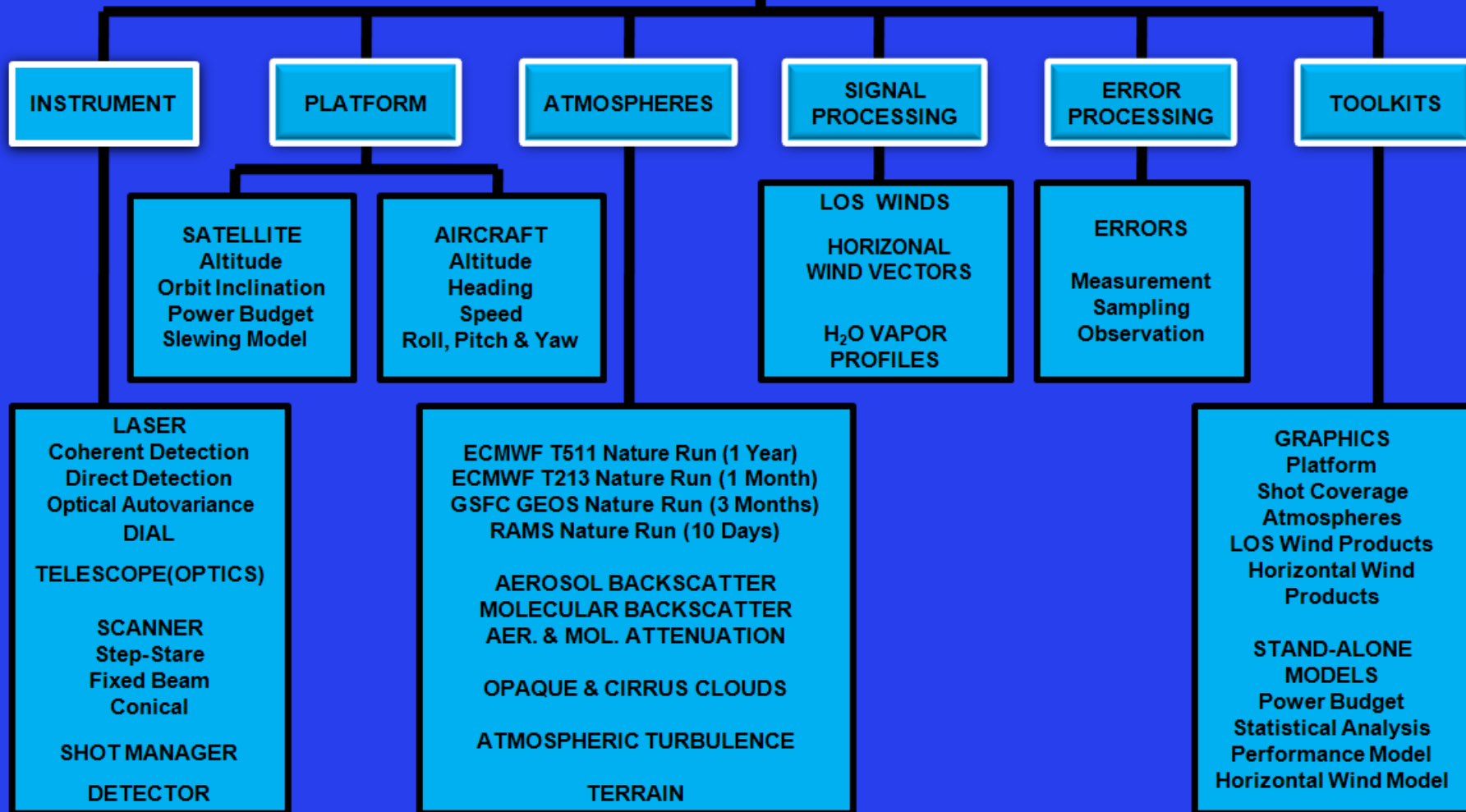
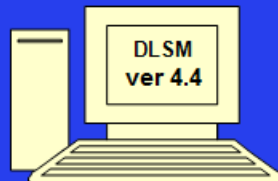


Global Aerosol Backscatter Opportunities as used in OSSEs: a new approach.

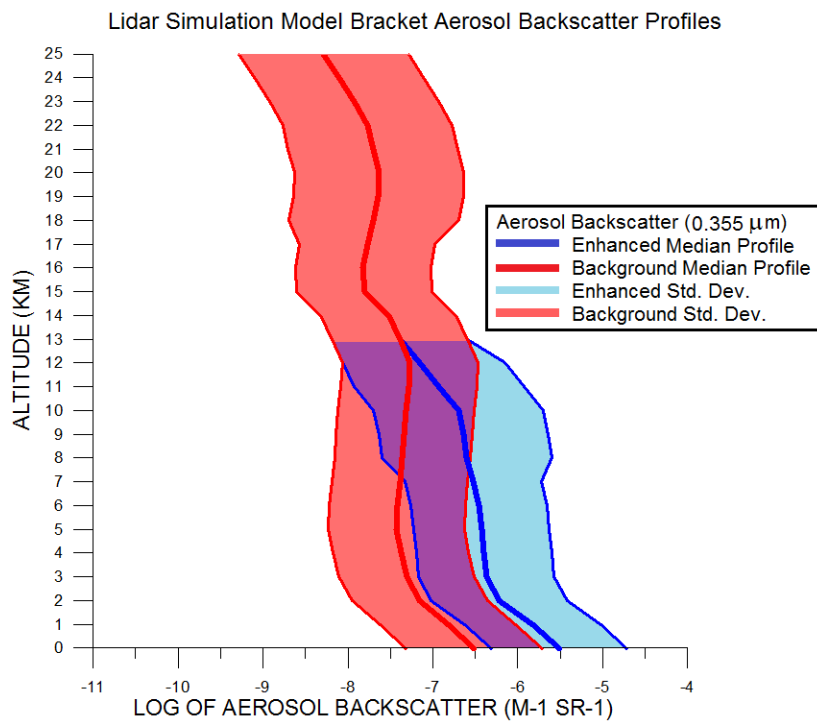
S. A. Wood and G. D. Emmitt

Lidar Working Group meeting 4/17-19/13

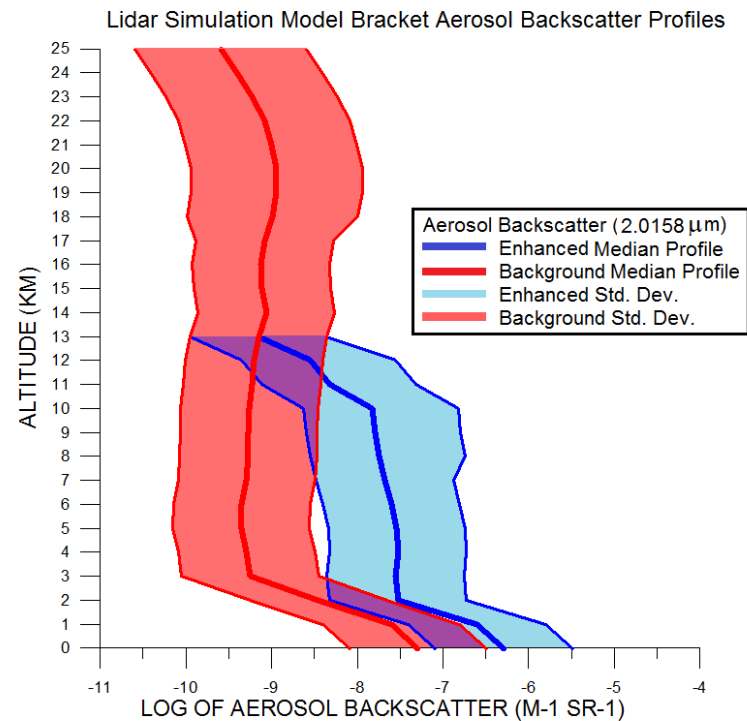
DOPPLER LIDAR SIMULATION MODEL



OAWL

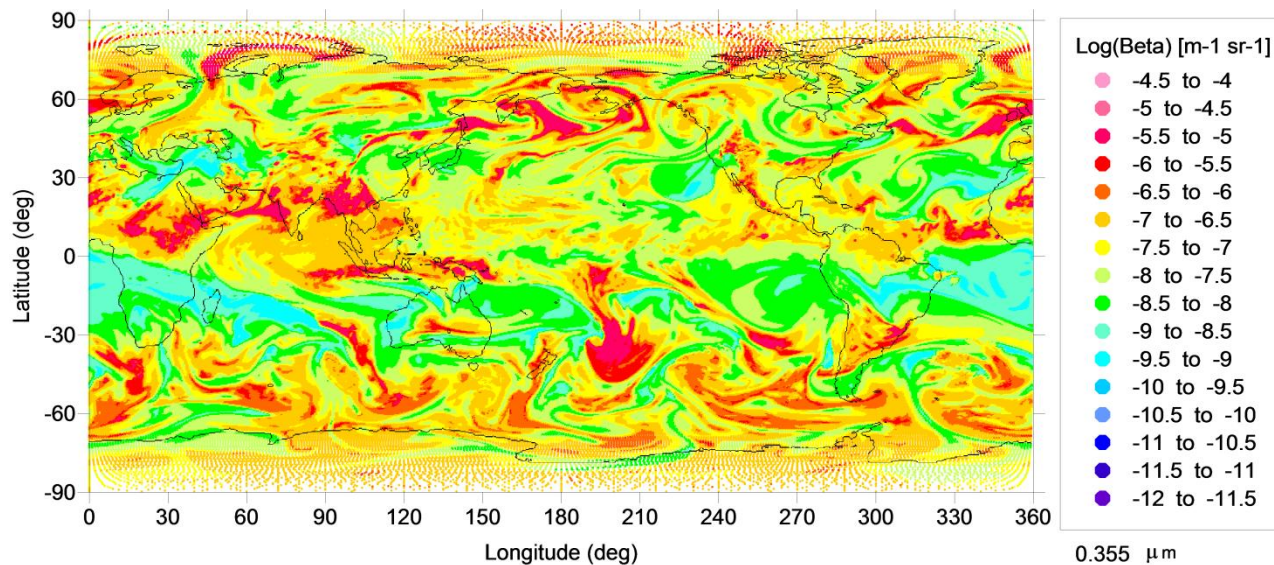


WISSCR Coherent

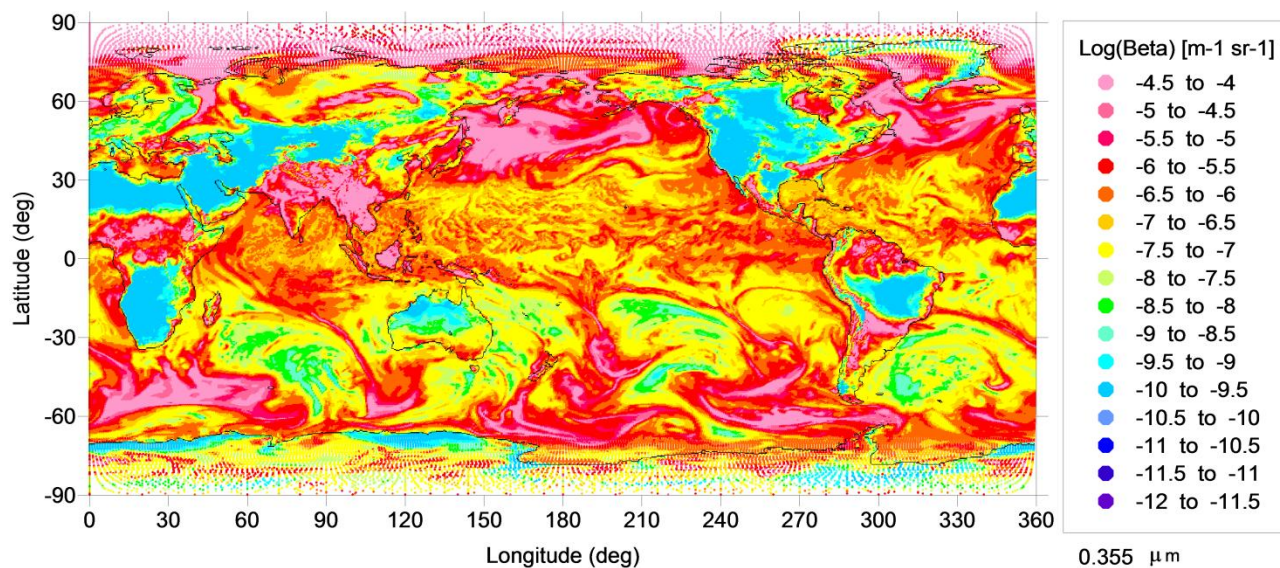


Global Aerosol Backscatter using Relative Humidity for Scaled Spatial Coherence

Aerosol Backscatter (background) for T511 NR 7/1/2005 00Z (500 mb)



Aerosol Backscatter (background) for T511 NR 7/1/2005 00Z (1000 mb)



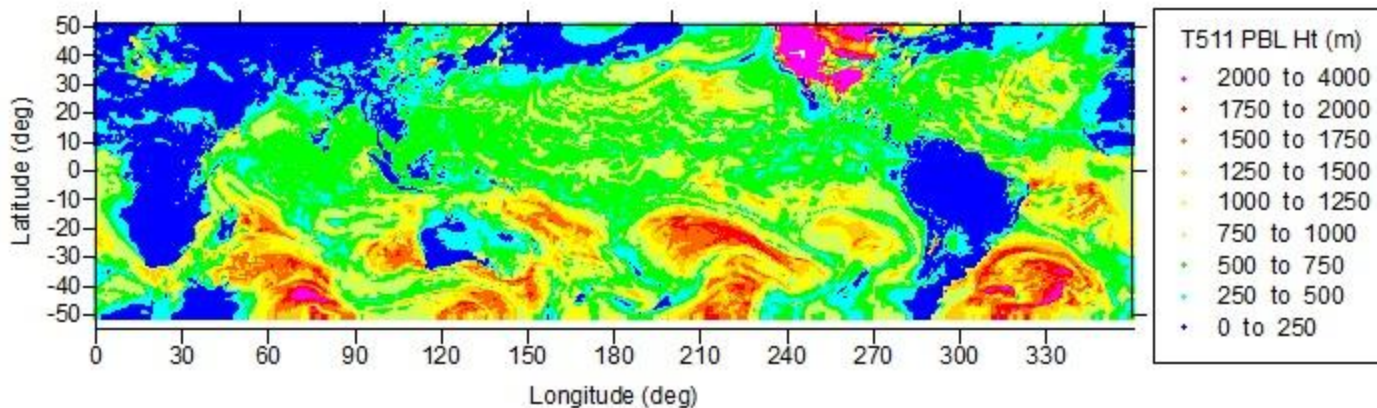
Motivation

- Currently in our OSSE simulations of DWL observations we simply assign to a given level in the atmosphere an aerosol backscatter value taken from a PDF published as NMP reference atmospheres.
- Those backscatter profiles are composites constructed from sets of airborne backscatter observations and represent PDFs for different layers in the atmosphere **making no assumption of temporal or spatial correlation.**

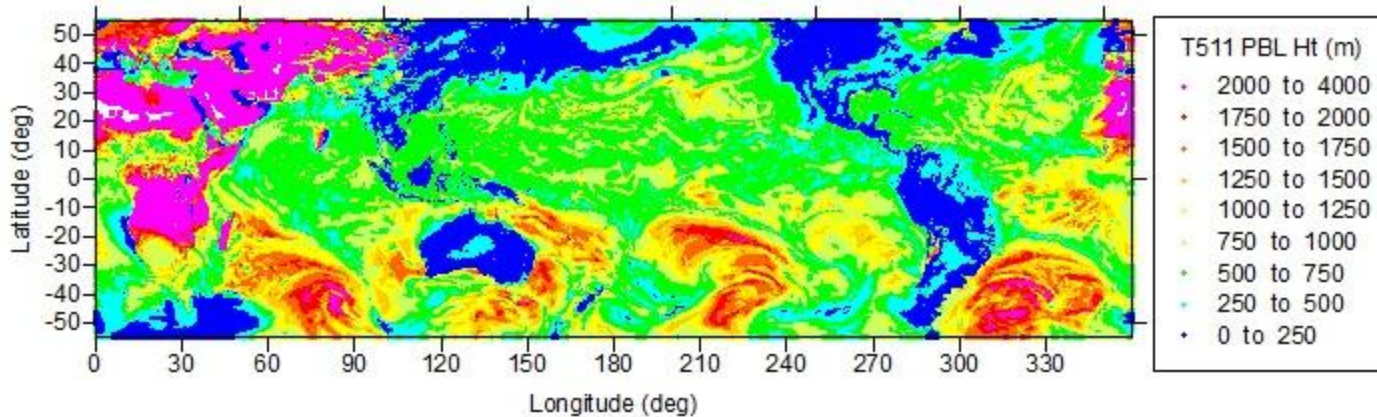
Rationale for change

- A more physically realistic representation of aerosol distributions in the vertical recognizes that the PBL is a 1st order concentrator of aerosols generated at the earth's surface.
- The new Nature Runs output a PBL depth which can be used to represent a well mixed layer of aerosols.

ECMWF T511 PBL Heights for July 7, 2005 00Z



ECMWF T511 PBL Heights for July 7, 2005 12Z



Underlying assumptions

- For a given instance, the distribution of aerosols will be reasonably described by a well mixed layer of constant backscatter defined by the model's PBL with a rapid transition to the background (or enhanced) backscatter values.

Model Rules

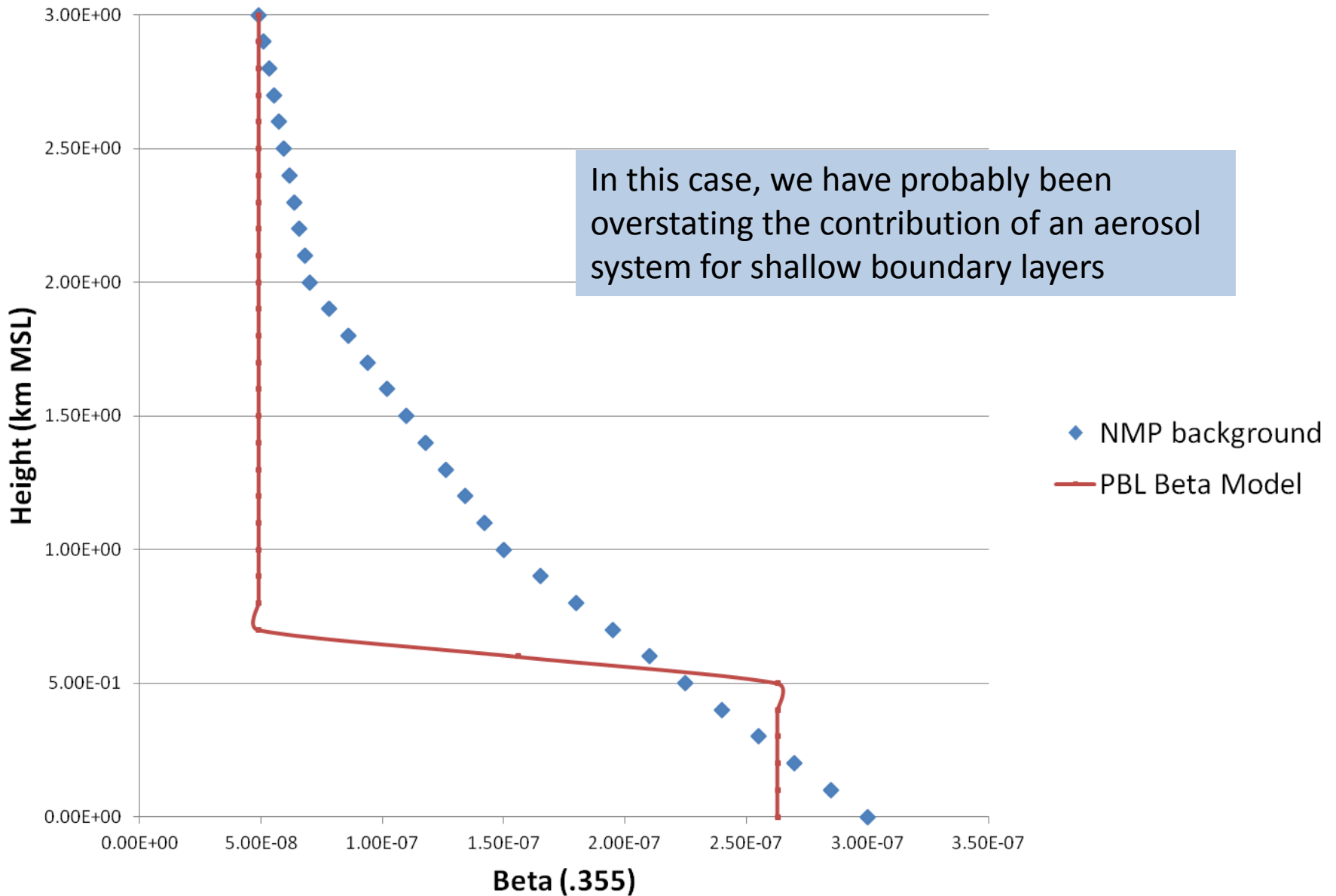
- Four layer model
 - PBL
 - From surface to a stability cap
 - Transition layer
 - From top of PBL to a height of $1.5 * \text{PBL depth}$
 - Global “BL cap”
 - The backscatter value published for 3km
 - Mid/Upper Tropospheric layers
 - Region above 3km

Model Rules

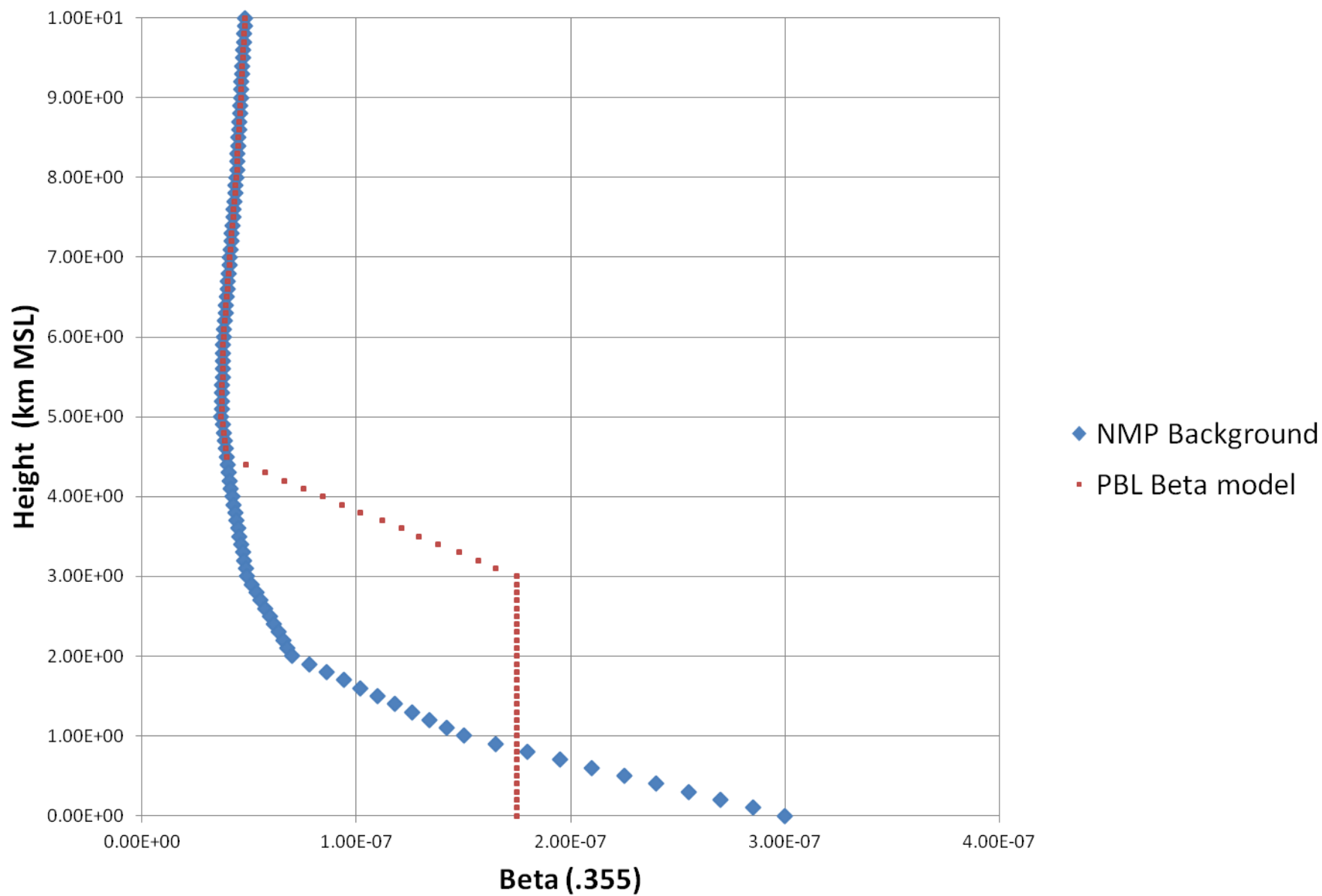
- $\text{PBL Beta} = (\text{PBL Beta top} - \text{PBL Beta Bottom})/2$
 - This is the average beta computed from the NMP profiles
- Transition height” $1.5 * \text{PBL depth}$
 - Backscatter is linearly interpolated between the top of the PBL to the transition height.
- Between transition height and 3km, backscatter is kept constant at the 3km Beta value.
- Should the transition height be greater than 3km then the value from the profile at that height is used in the PBL – Transition height interpolation.

500 m PBL over ocean

In this case, we have probably been overstating the contribution of an aerosol system for shallow boundary layers

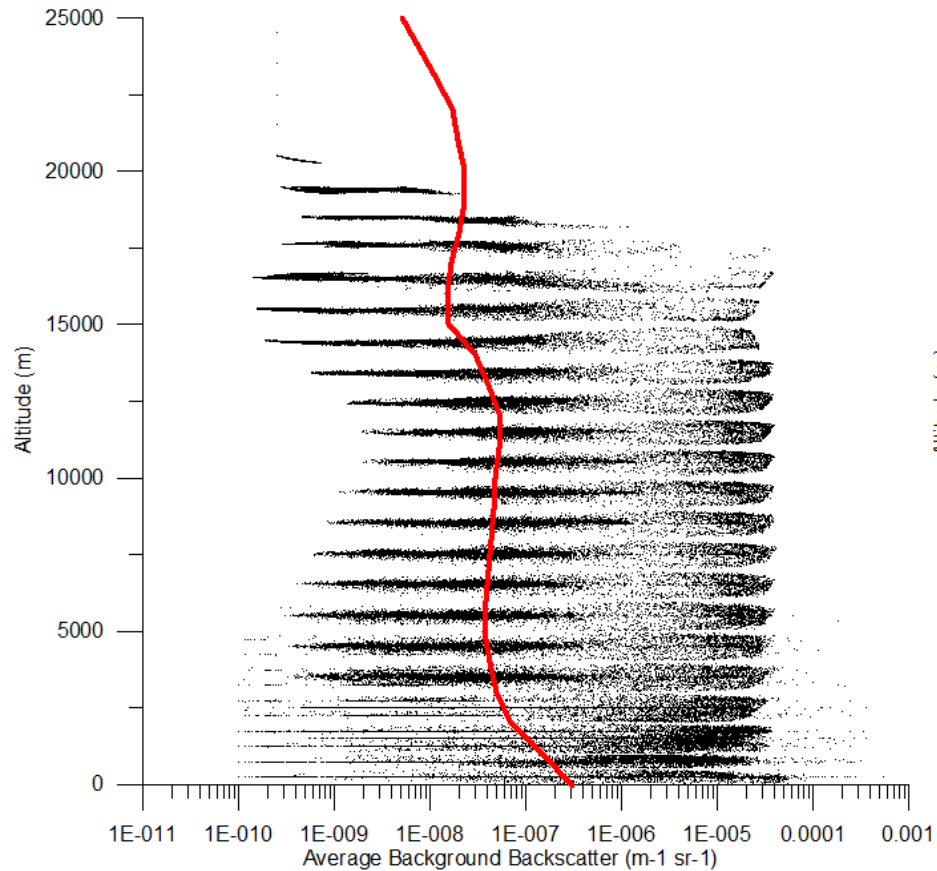


3 km PBL over oceans



Volume Averaged Aerosol Backscatter for a 24 Hour Simulation of OAWL

T511 NR Dependent Background Backscatter



T511 NR Dependent Enhanced Backscatter

