Atmospheric Monitoring with Tunable UV Lasers

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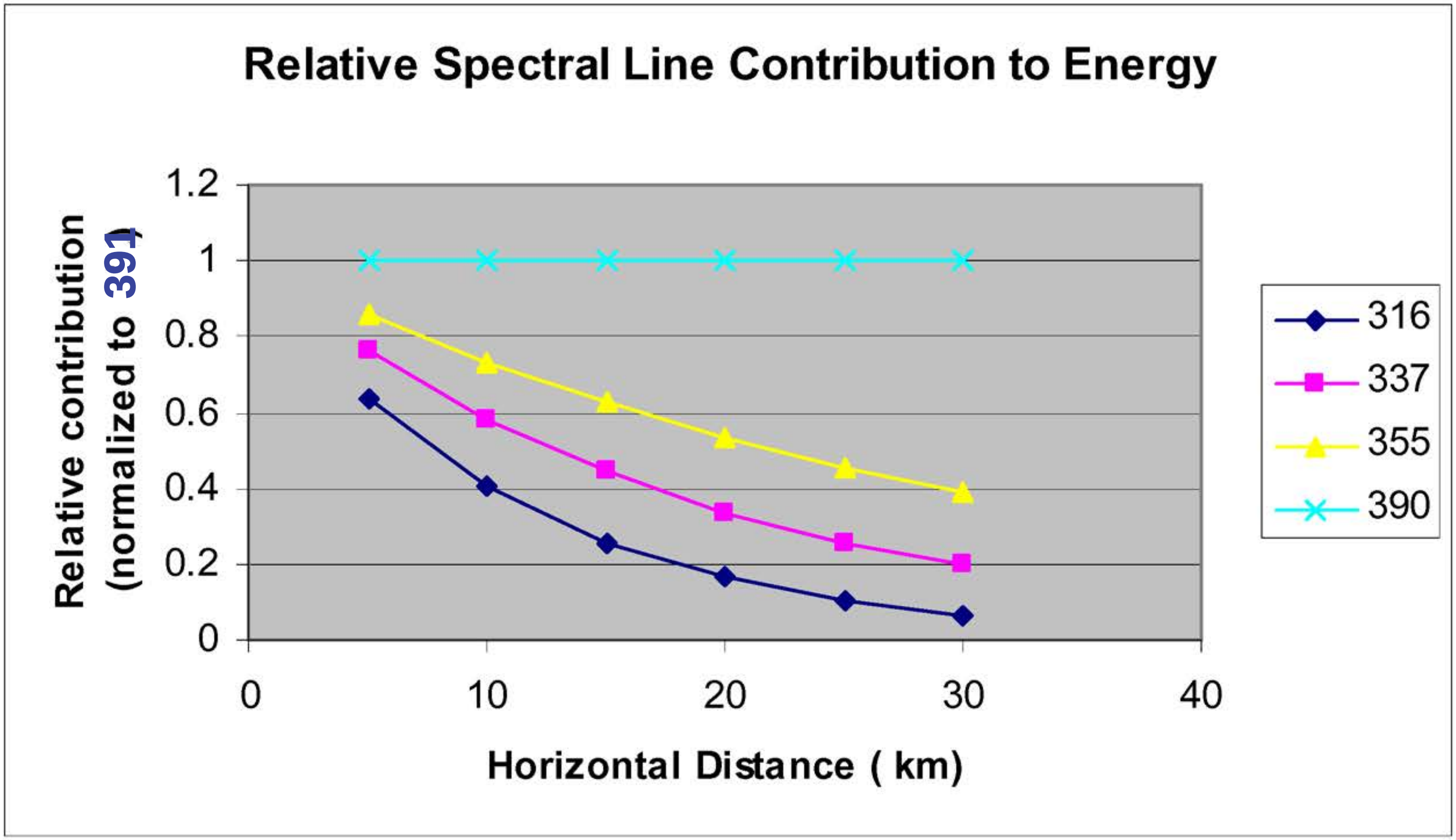
Atmospheric Transmission Correction to Fluorescence Signal

- Air fluorescence signal is in the wavelength range: 300nm to 420nm
- Transmission of this light is reduced by molecular (Rayleigh) and aerosol (Mie) scattering
- As the scattering **decreases** at longer wavelengths fluorescence light near 400nm is significantly less attenuated than light near 300nm
- **This wavelength variation must be monitored!**

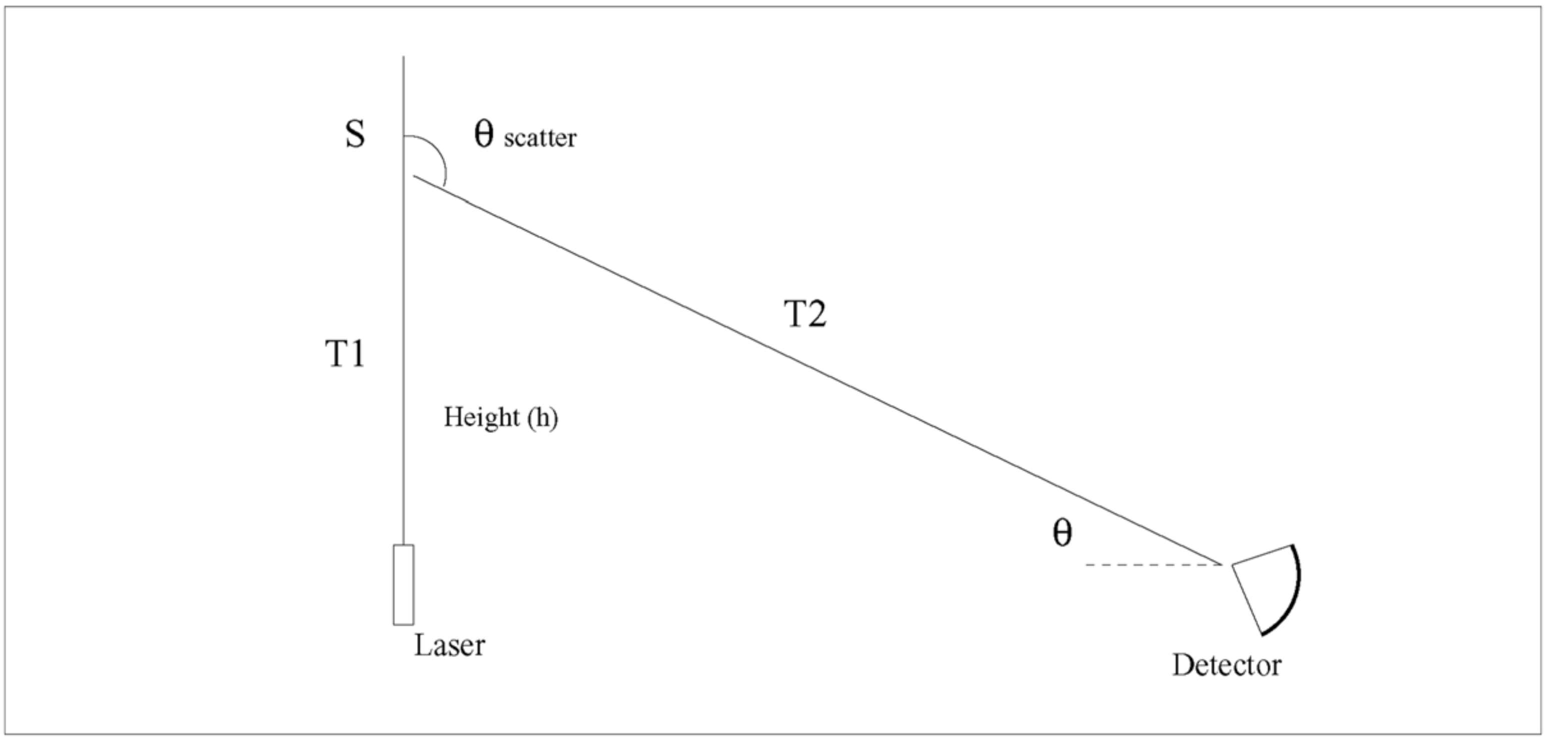
Relative Contributions of Different Spectral Lines at Different Horizontal Distances



Aerosol Optical Depth Measurement

- A vertical laser beam is located ~30km from the fluorescence detector
- Comparison of the *predicted* to *observed* scattered light intensity by the fluorescence detector measures the aerosol vertical optical depth: AVOD(h)
- This must be done at >1 wavelength!

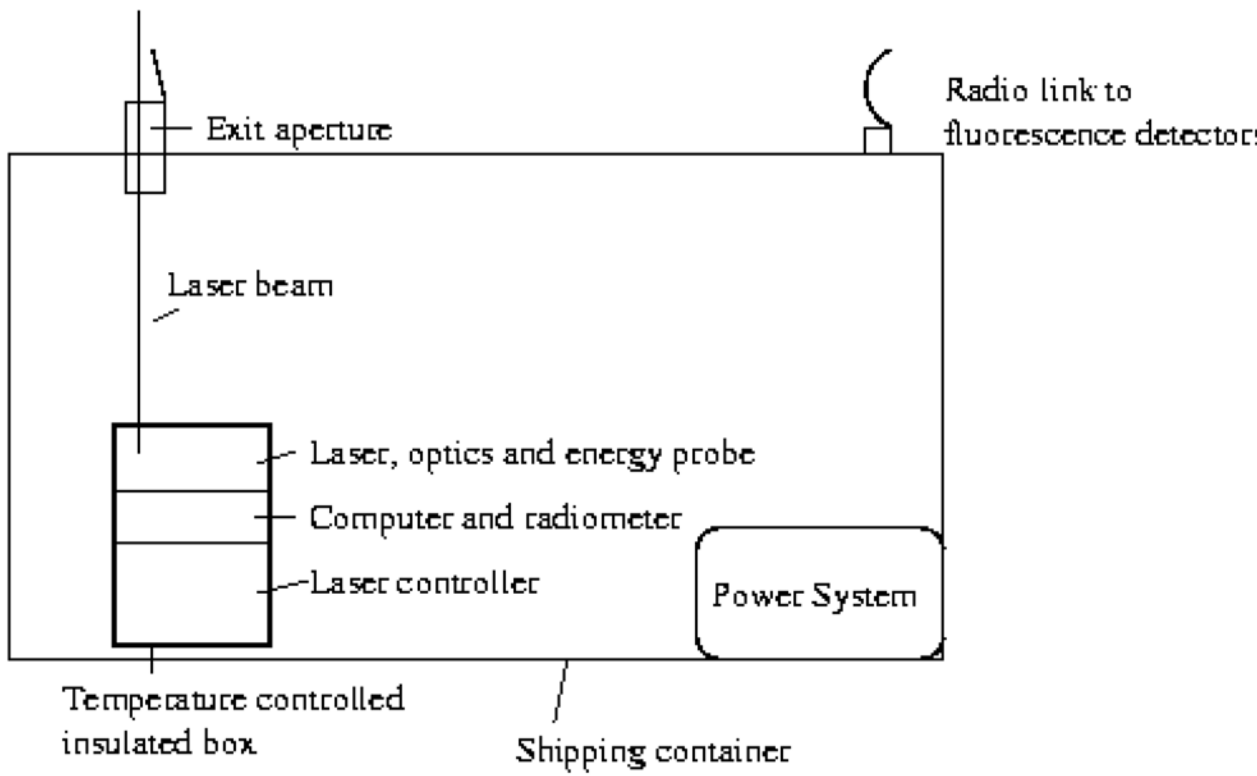
The light measured at the detector from height ``h'' is determined by the vertical transmission (T1), by the scattering (S) and by the transmission (T2) back to the detector



R&D for *tunable* UV lasers

- Most of the atmospheric monitoring for TA will use frequency tripled 355nm YAG lasers
- What is needed is **another** laser matched to the fluorescence lines near 390nm and 400/406nm
- **Tunable, dye lasers provide a good candidate with the desired energy of 5 ~ 10 mJ/pulse and ~1mrad beam divergence**

The laser, monitoring and control electronics are housed in a *refurbished* shipping container



At 355nm the UNM group already has done this with the *Central Laser Facility* for Auger

What is needed now is to learn how to operate *tunable* lasers in harsh, desert, field-conditions!