

# Lidar's solar background light for retrievals of cloud optical depth ("one person's garbage may be another person's gold")

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Warren Wiscombe, GSFC*

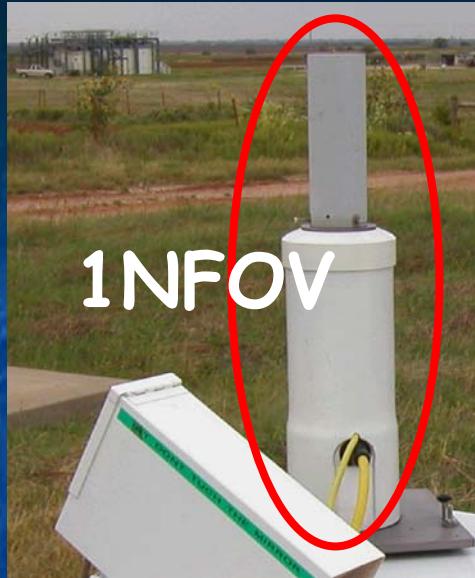
*Thanks to  
Judd Welton, Sandra Valencia, Dave Turner, Diana Petty*



**Micropulse lidar  
(MPL)**



**Raman lidar**

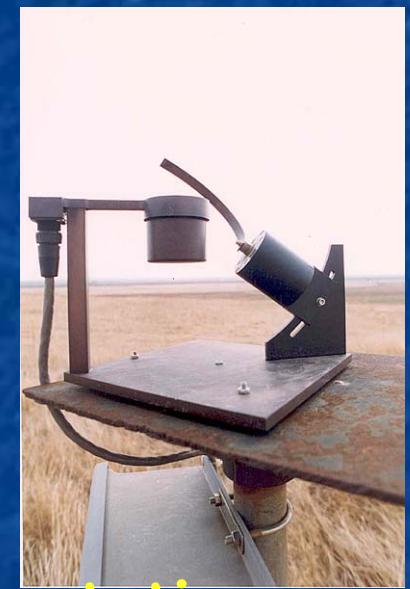


ARM 1-channel **Narrow-  
Field-Of-View** radiometer:  
 $5.7^\circ$  FOV, 870 (NIR) nm

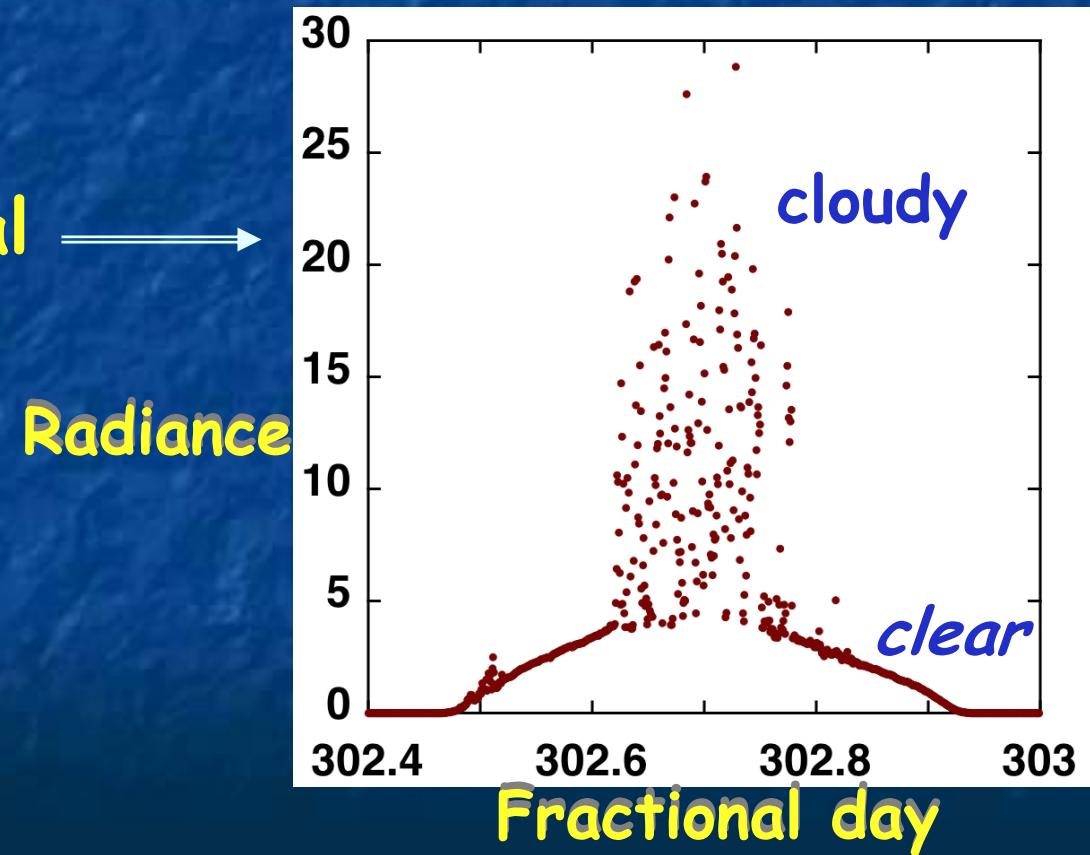
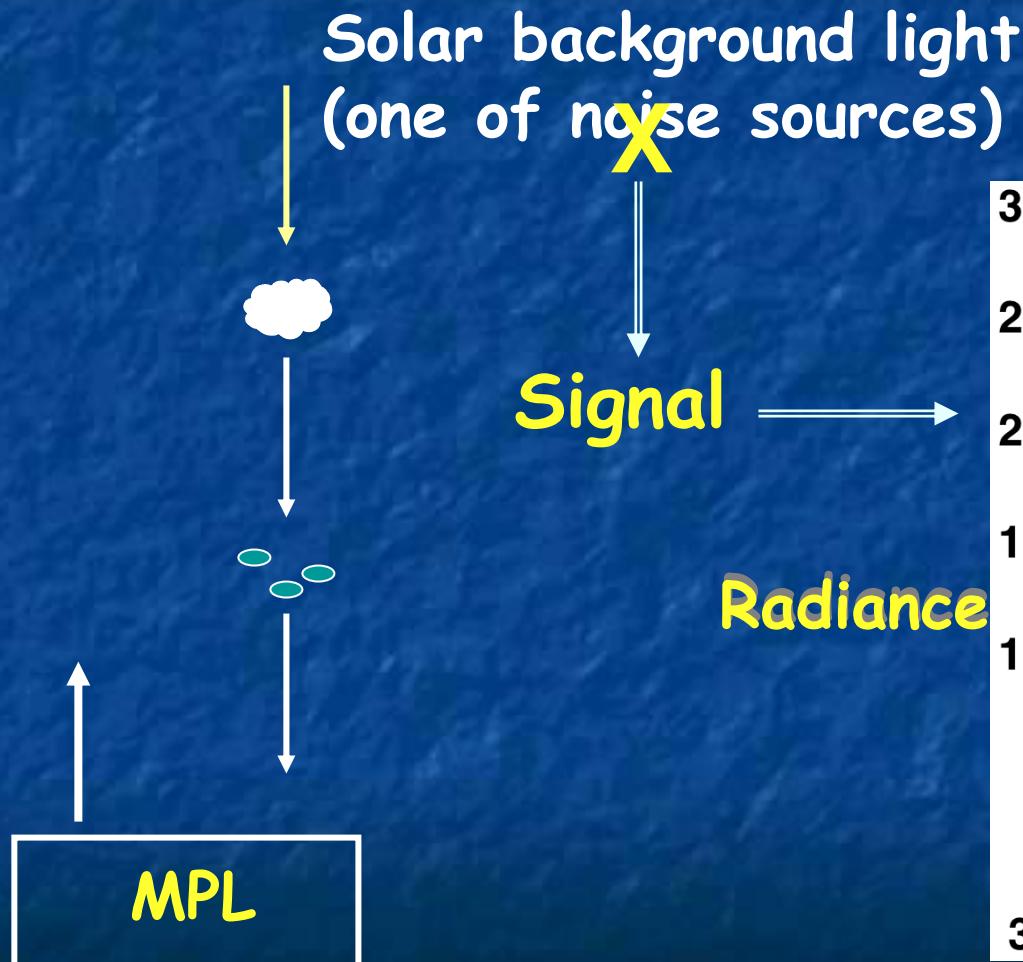
Chiu et al. , IEEE  
Geosci. Remote  
Sens. Lett.



Multi-filter rotating  
shadowband radiometer  
(MFRSR)

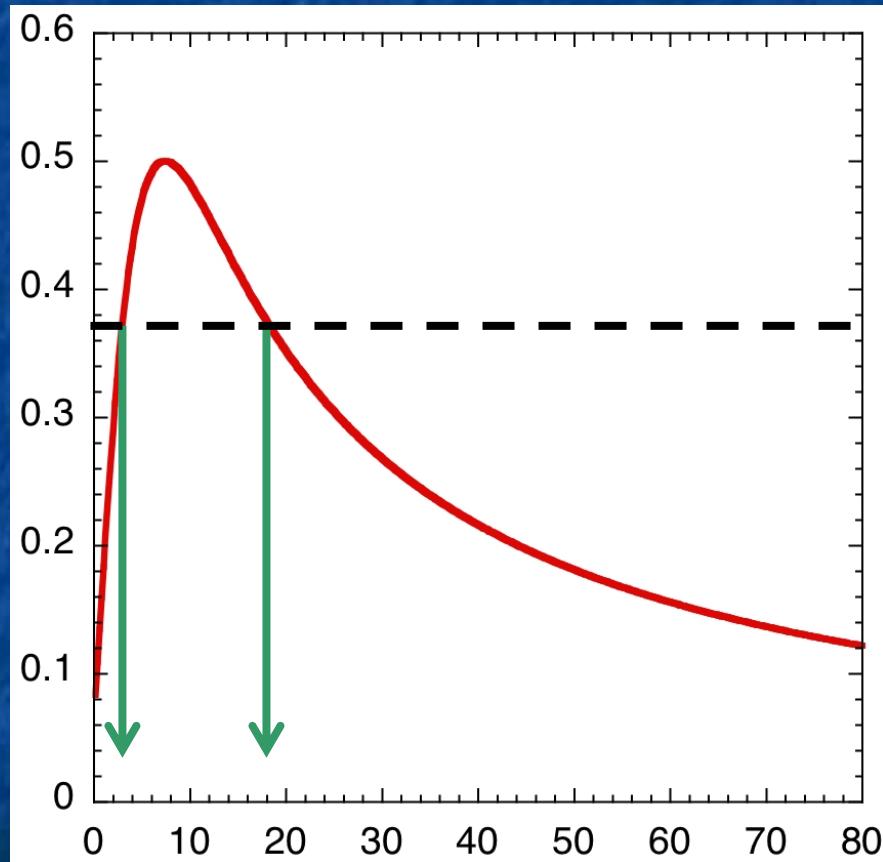


# Micropulse Lidar (MPL) -- 523 nm



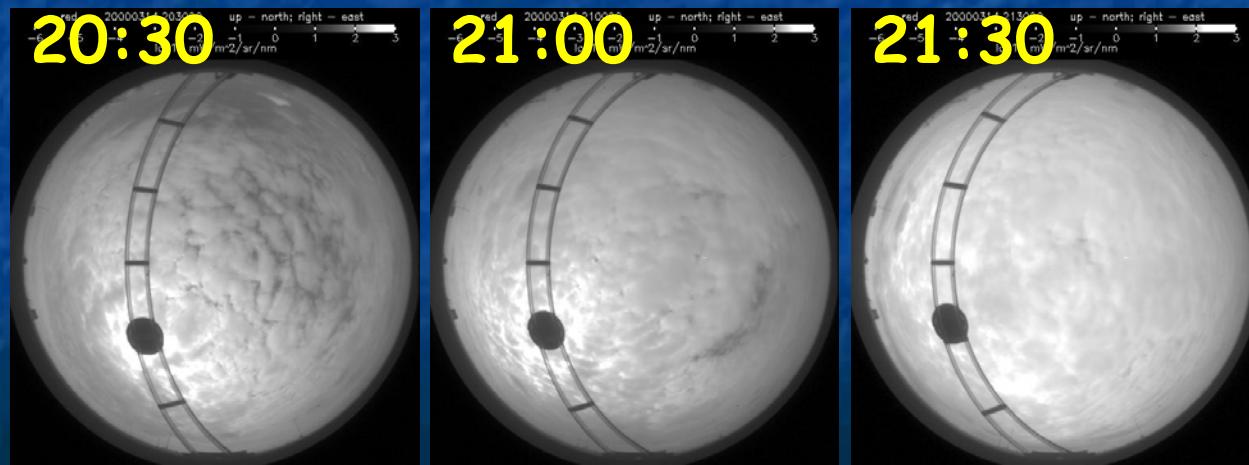
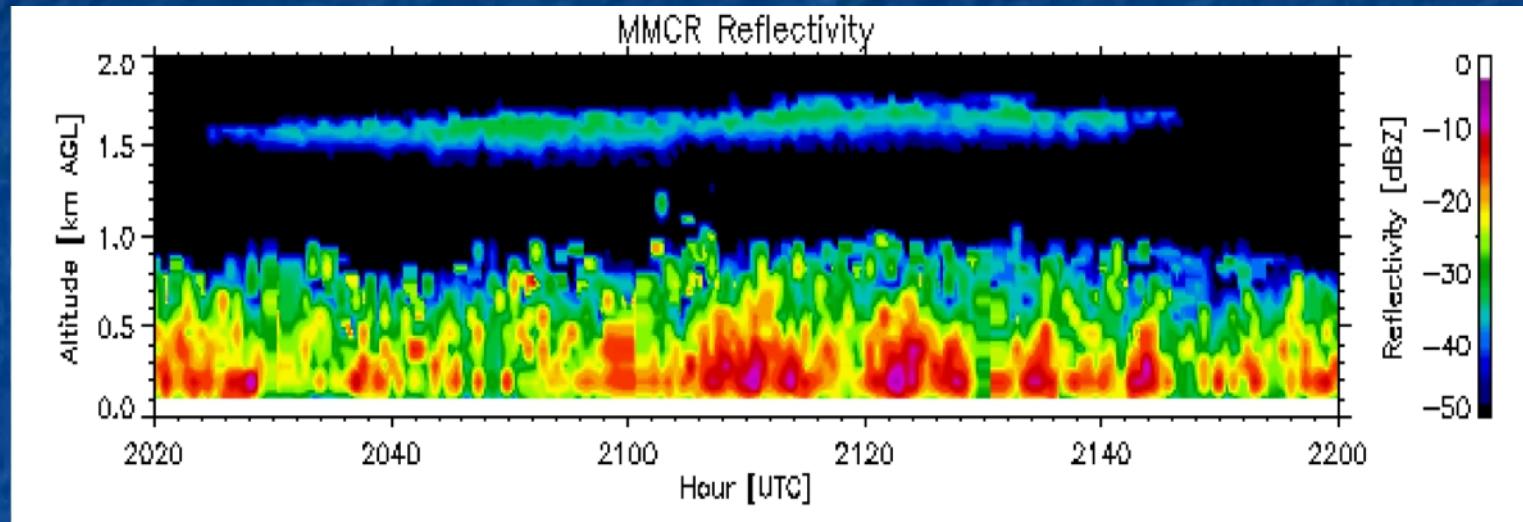
# How to retrieve cloud optical depth from one-channel radiance?

Radiance



Cloud optical depth

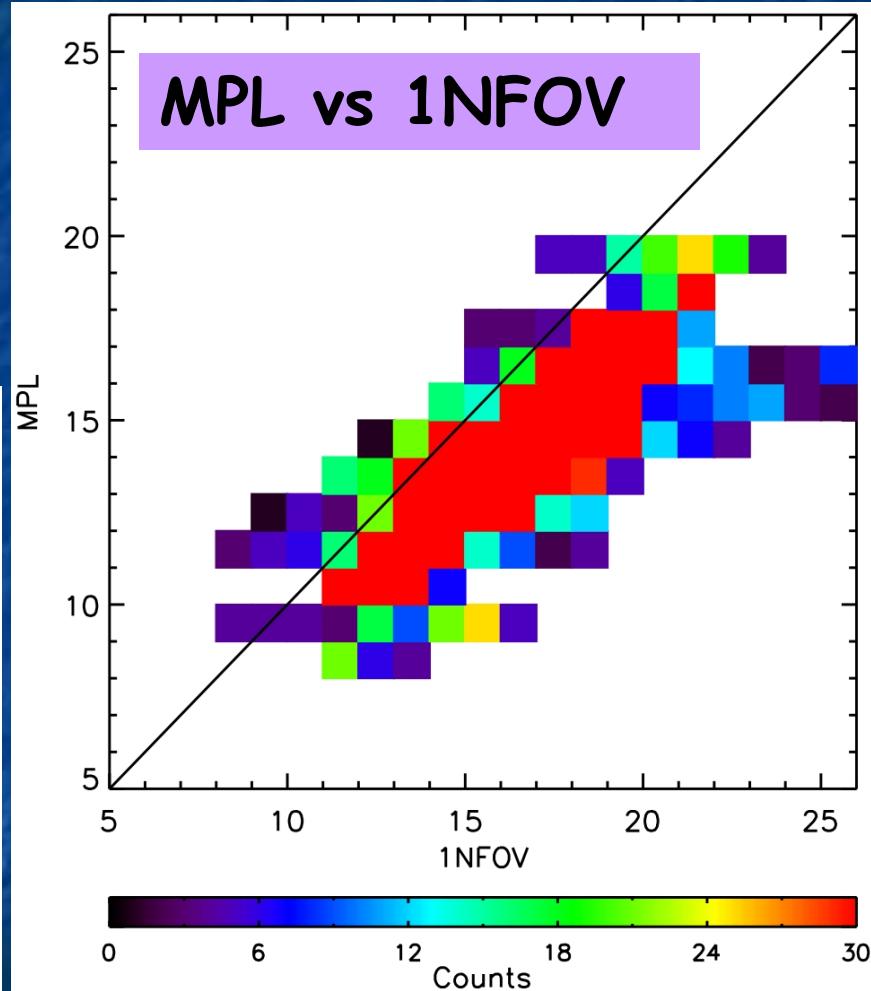
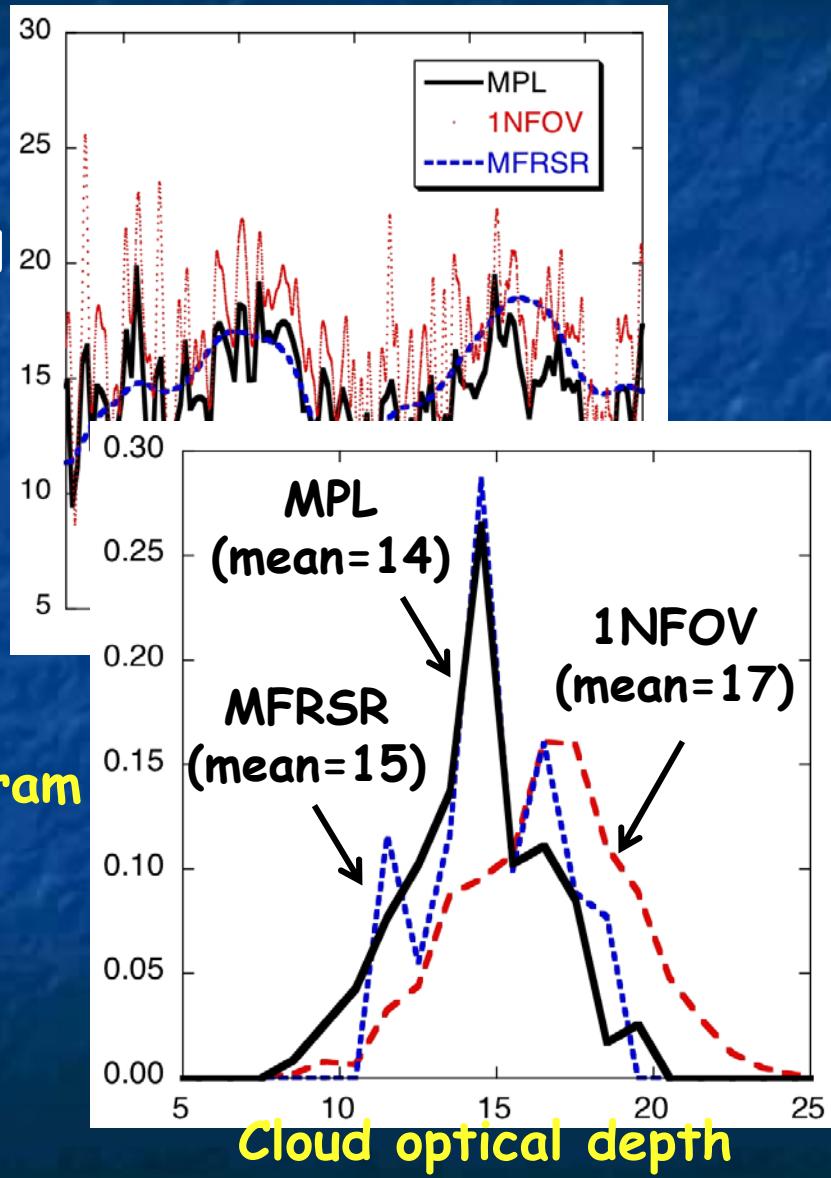
# CLOWD case 1 -- March 14, 2000



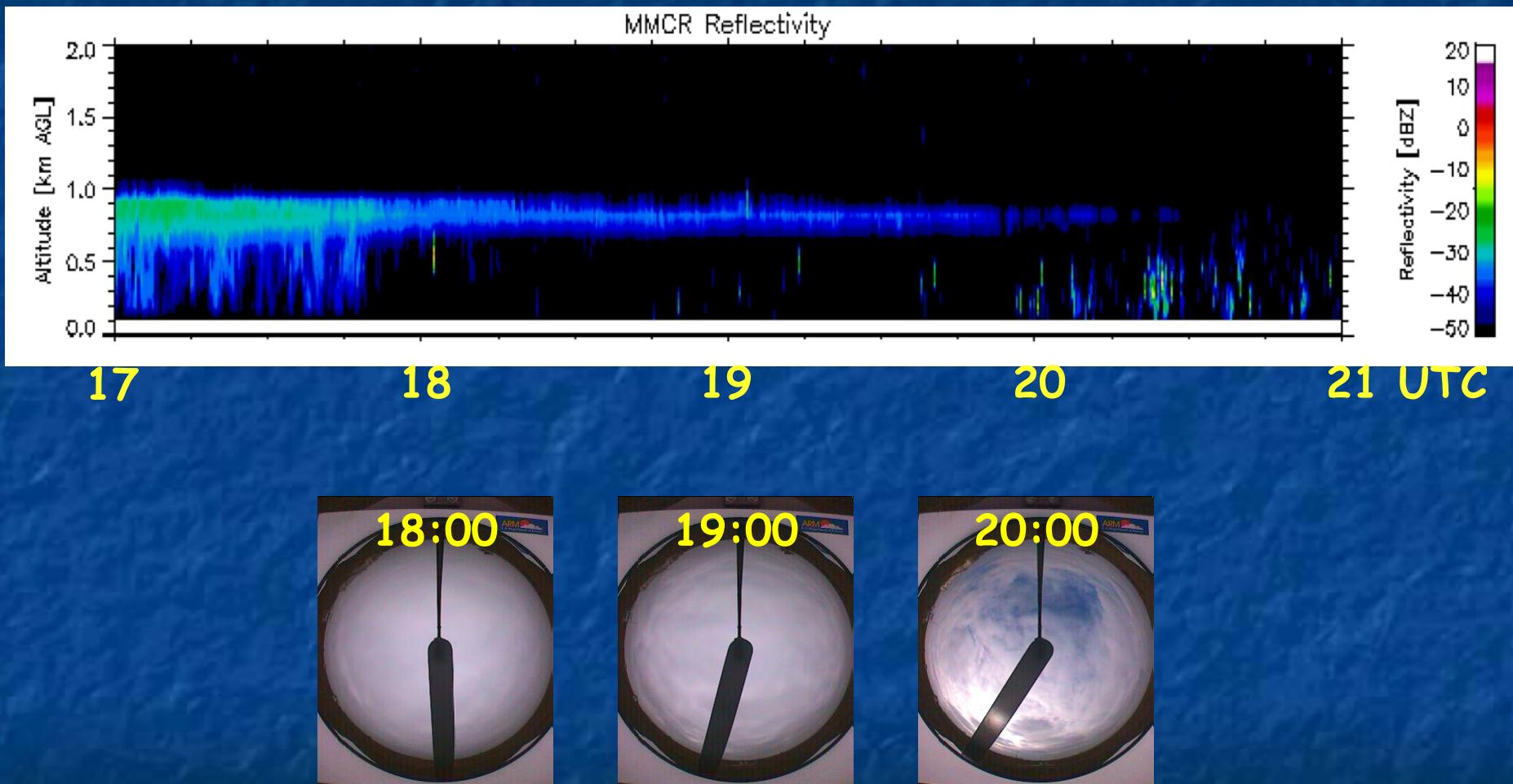
*Turner et al.,  
BAMS, 2006*

# Retrievals for March 14, 2000

Cloud  
optical  
depth



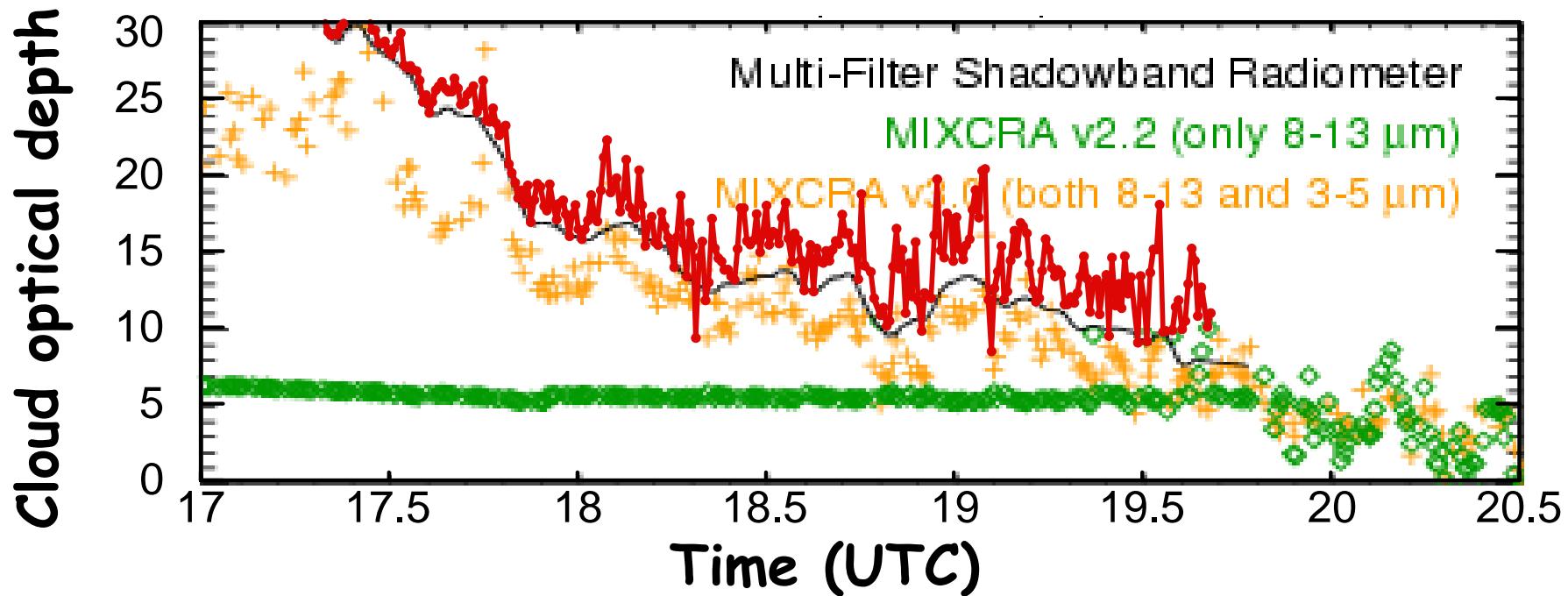
# CLOWD case 2 -- Nov. 6, 2000





## CLOWD case 2 -- Nov. 6, 2000

### Retrievals from MPL

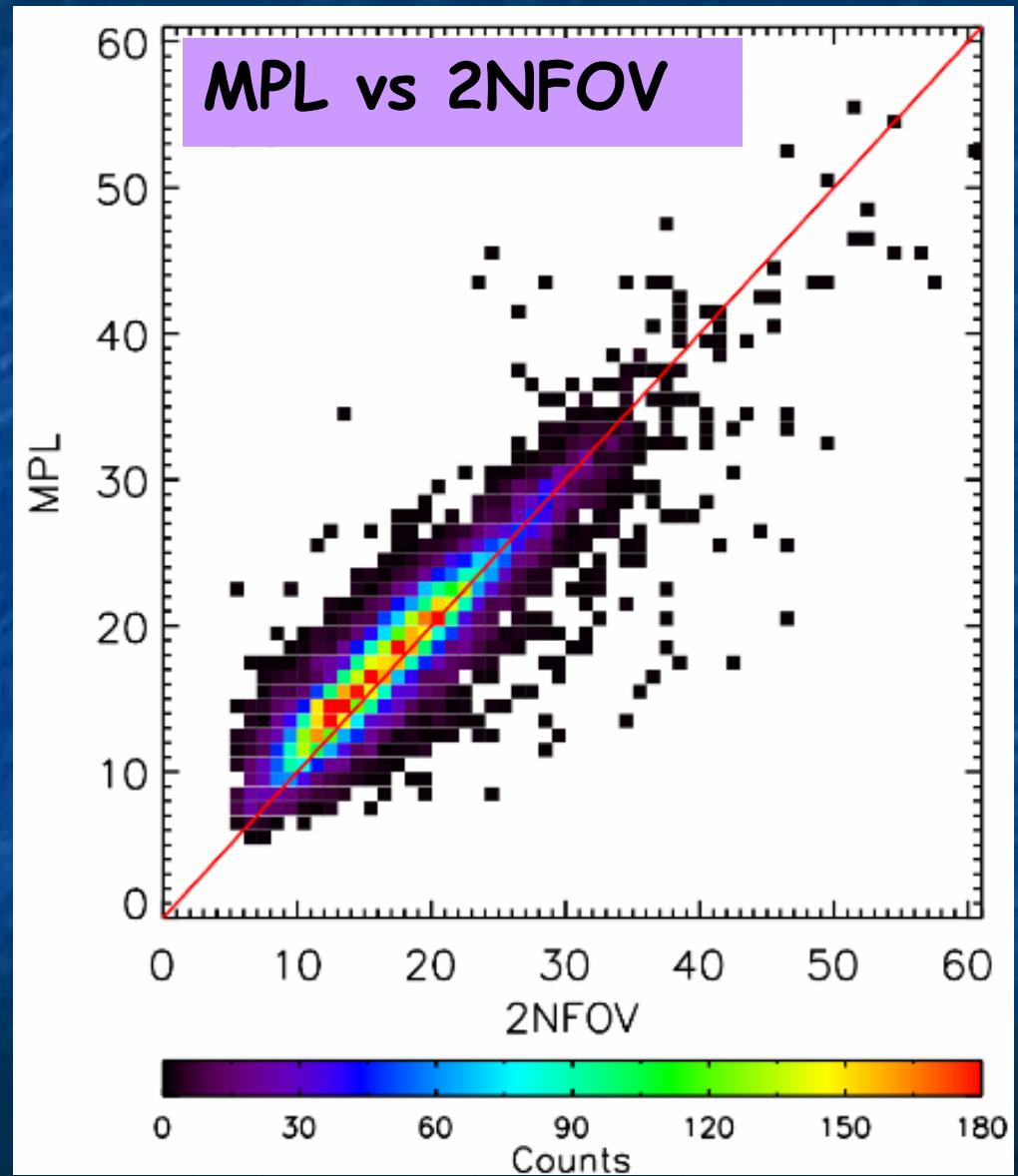


# Pt. Reyes experiment -- June-Sep. 2005

Overcast cases:



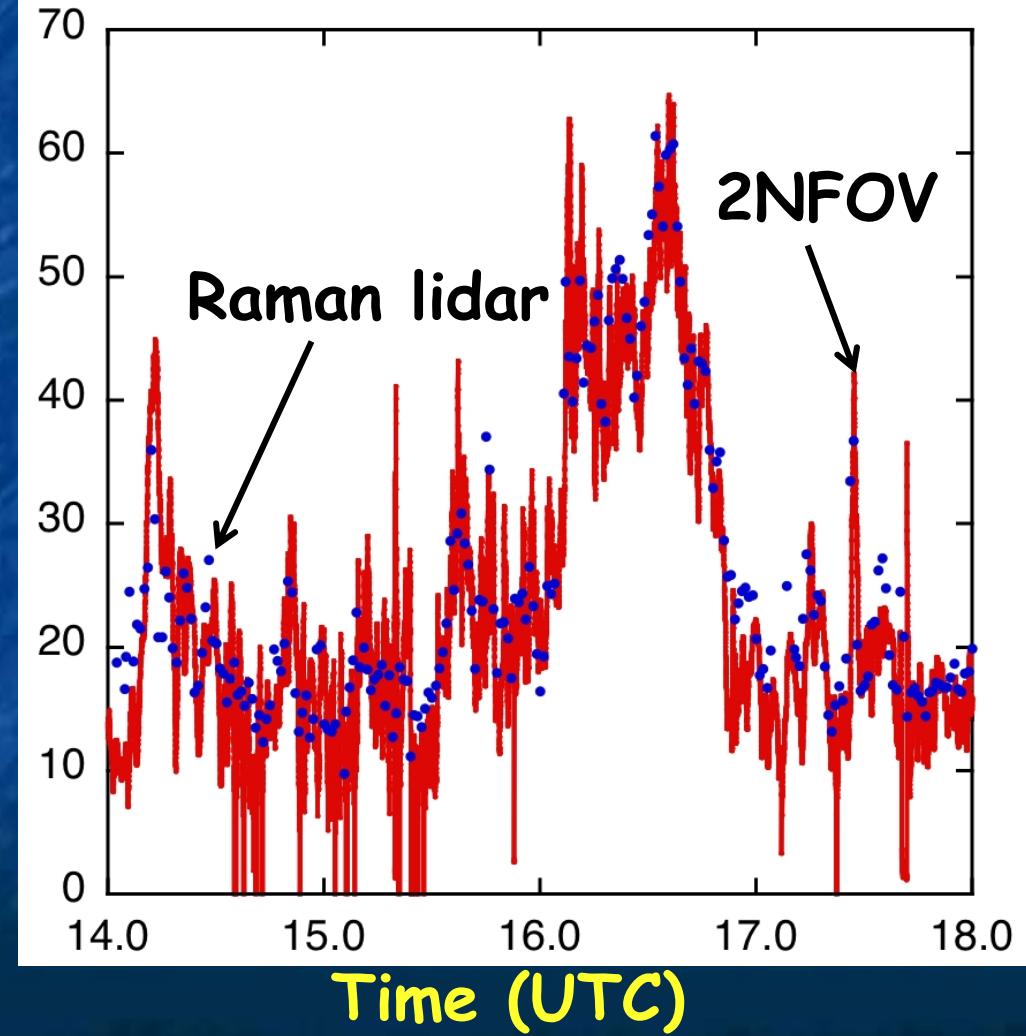
20050807 21:21



# Retrievals from Raman Lidar for 2004/11/11 (preliminary)



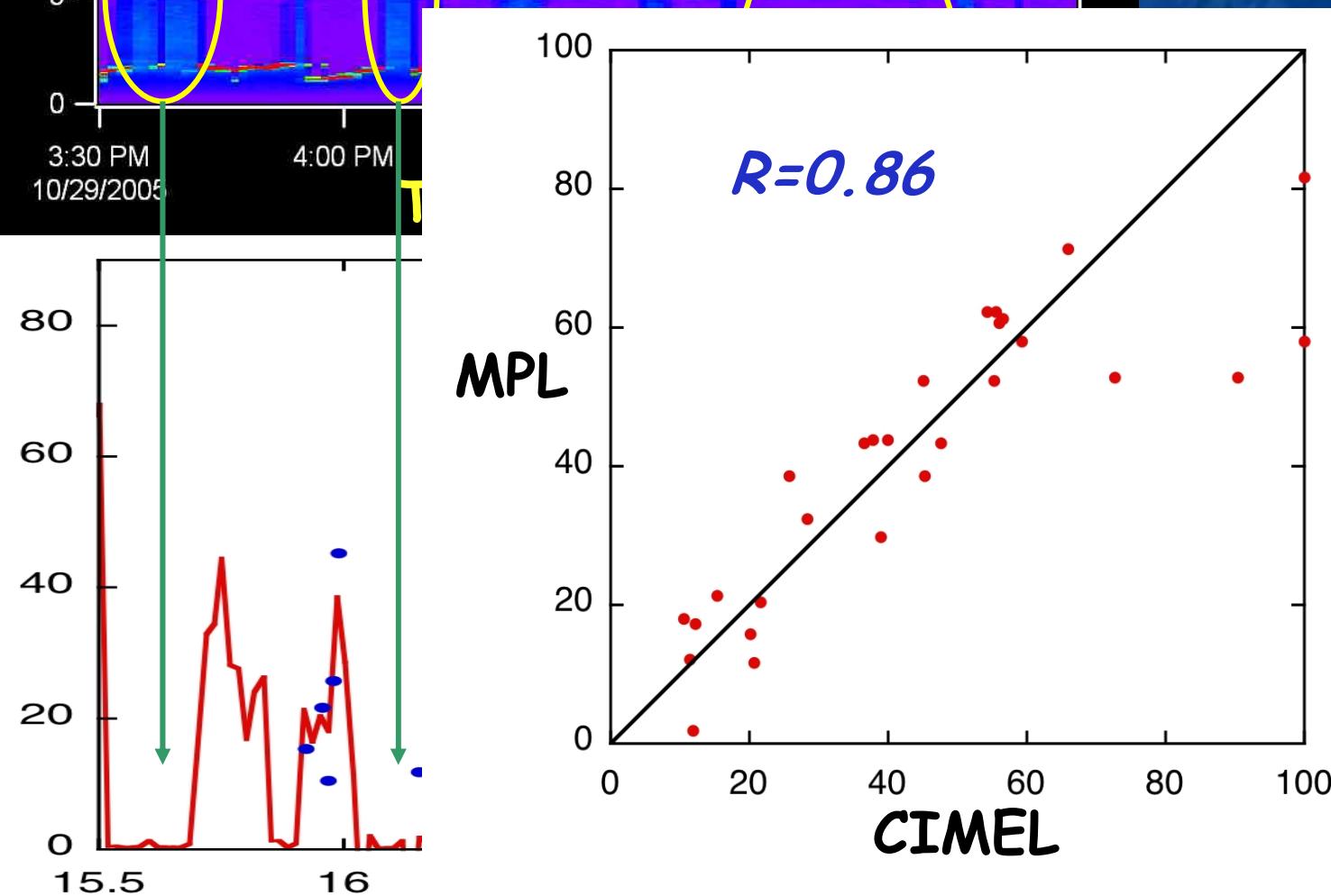
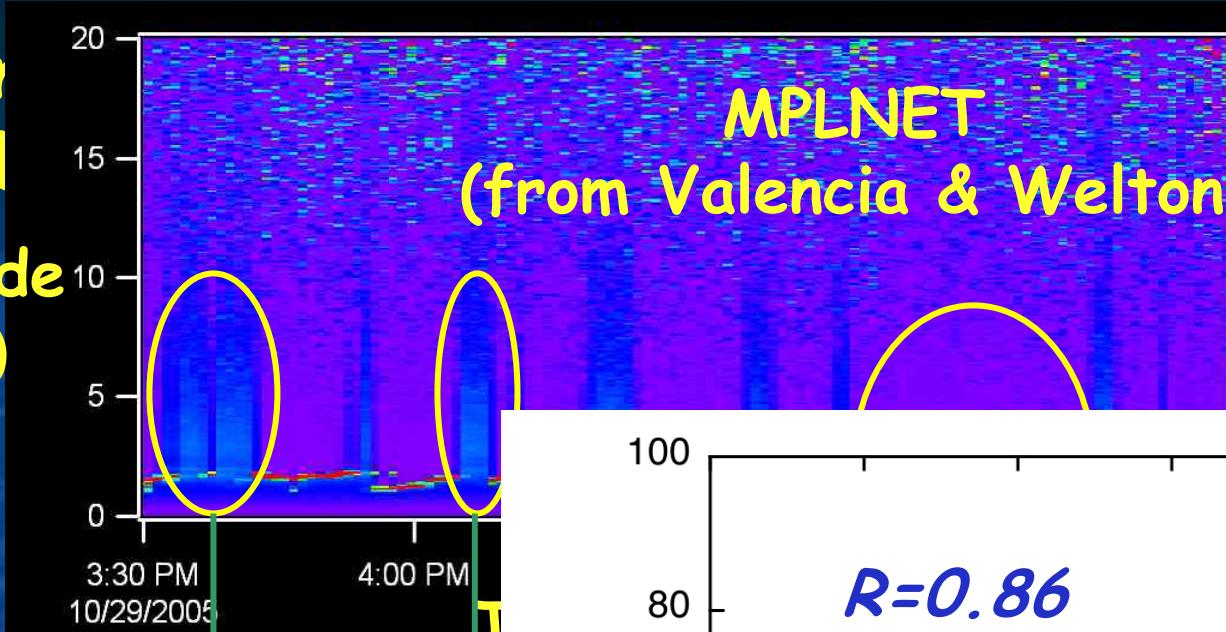
Retrieved cloud optical depth



Broker  
MPLNET

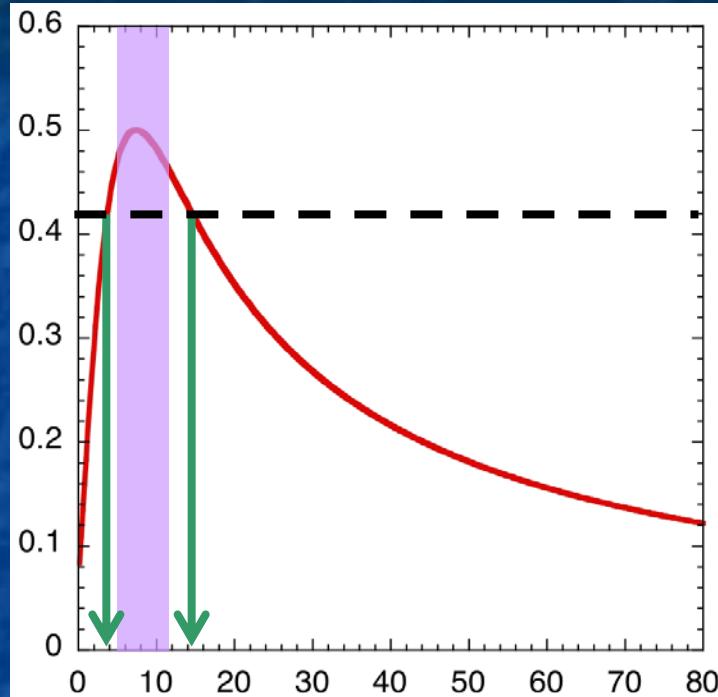
Altitude  
(km)

Retrieved  
cloud  
optical  
depth

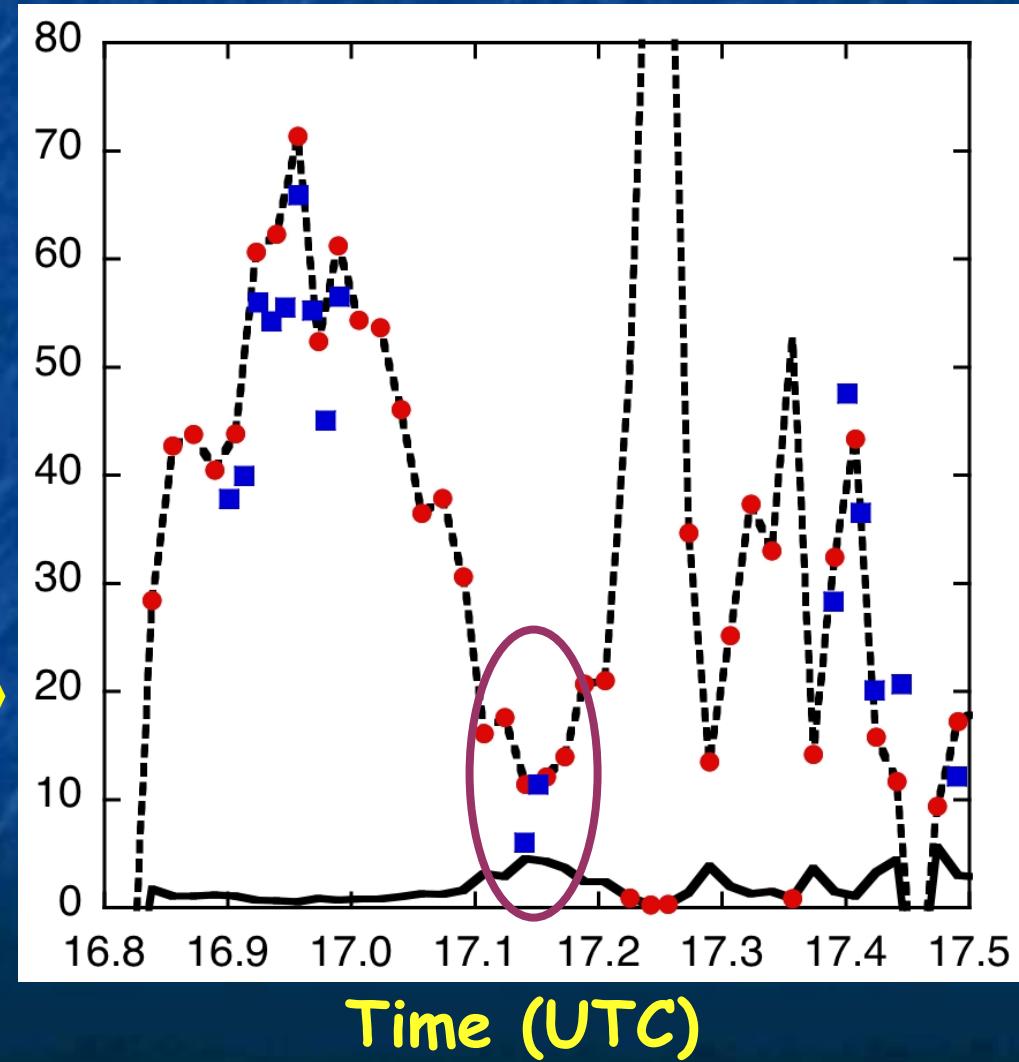


# Problem

Radiance



Cloud optical depth →



# Summary

- Lidars can retrieve optical depths of thick clouds using solar background light as a signal.
- This indicates that, in general, it is possible to retrieve BOTH aerosol and cloud properties using a single lidar.
- Lidar observations have great potential to study interactions between clouds and aerosols.

# How to retrieve cloud optical depth from one-channel radiance?

