

Quarterly Report

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Cloud Scene Radiances: Satellite and Lidar Measurements to Aid in Global Predictions and Model Simulations

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1 Preliminary Analysis of Sub-tropical Cirrus Data

Between Sept 5 and Sept 22, 1996 both University of Wisconsin Lidars were employed to observe sub-tropical cirrus clouds from a site located in Everglades City, Florida. This experiment included observations by the University of Massachusetts millimeter wave radar, multi-spectral radiometers carried on the NASA WB-57 aircraft, satellite observations, special local radiosonde launches, and the Aeromet Lear jet aircraft. The experiment site was selected to allow observations of cold, high altitude cirrus clouds typical of the tropics without incurring the expense of transporting systems to an off-shore location..

The site provided excellent weather conditions. Initial inspection of the data showed that cirrus clouds were observed in 20 of 24 data collection periods scheduled during 19 days of the experiment. Tropopause temperatures are typically much lower in the tropics than at mid-latitude locations. Ice crystal habit and particle size distribution are sensitive to temperature. Thus, high altitude tropical cirrus are likely to differ from mid-latitude clouds. The experiment was successful in observing low temperature clouds. Tropopause temperatures of less than -70°C were measured in all cases with one case of -78°C . Cirrus top altitudes up to 16.2 km were measured. Figure 1 presents a comparison of a temperature sounding measured during the experiment with the mean-annual sounding from a site in the deep tropics. Clearly, the Florida sounding on this day provides tropopause temperatures similar to those found in the tropics.

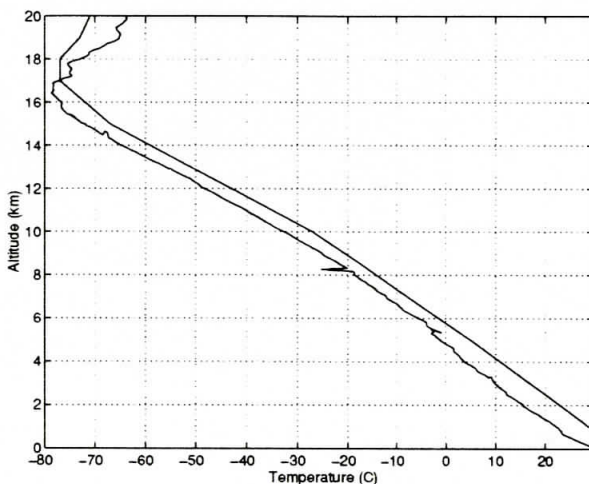


Figure 1. The temperature profile measured above Everglades City, Florida on 5 September 1996 (jagged line) compared with the mean-annual temperature profile measured at Diego Garcia (smooth line).

The Florida cirrus was observed at higher altitudes than we have measured in Wisconsin. Figure 2 presents a quick look plot of cirrus cloud top altitudes plotted as a function of cloud base altitude. Values of cloud top vs. cloud base measured in a year long lidar climatology compiled in Madison, Wisconsin occurred in the shaded area.

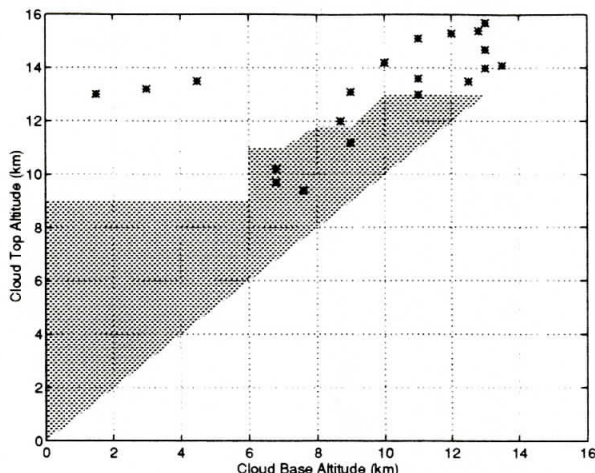


Figure 1. Cloud-top vs. cloud base altitudes for measured by lidar during the Florida experiment (data points) and in 1994 Wisconsin lidar climatology. (shaded area)

Initial processing of data acquired during the Florida experiment has begun. Raw High Spectral Resolution Lidar (HSRL) data has been processed to create quick look images of the backscatter cross section and depolarization for all experiment days. This data is now available on our Web site: <http://lidar.ssec.wisc.edu>. Temperature, humidity and wind profiles from all radiosonde launches are also now available on the WEB site. In addition, we have included MPEG animations of the visible, infrared, and water vapor weather satellite images recorded by the GOES satellite on the WEB site.

We have completed first-look processing of Volume Imaging Lidar (VIL) data for a two hour period centered on 12:14 UT on 9/20/96. The processed data includes cloud top, base, optical thickness and 3-dimensional fields of backscatter cross section. A CD-ROM of containing these products has been supplied to Joe Shanks of Photon Research Associates for use in evaluating the CLOUDSIM model.

We have also extracted VIL image data for the period around 23:45 UT on September 21 in order to assist Don Wylie in his investigation of discrepancies between lidar derived cloud altitudes and those obtained from CO₂ slicing analysis of GOES 8 data.

Examination of the CDROM HSRL data archive prepared for the Florida data showed that some of the calibration coefficients stored on the disks were generated using a climatological temperature profile instead data of from our radiosonde launches. We have therefore regenerated these CDROMs with corrected calibration coefficient files. A CDROM archive of the HSRL data is now complete.

Don Wylie is in the process of making a detailed comparison of cloud frequency data in his HIRS satellite CO₂ slicing climatology and observations acquired with the SAGE-II satellite instrument. SAGE-II generally reports higher frequencies of clouds than the HIRS climatology. The largest differences were in the winter hemisphere where SAGE-II reported total cloud coverage which is larger by 12% to 22%. This appears to result from differences in instrument threshold sensitivities and spatial resolutions. A scientific paper describing these results in detail is nearly completed.

2 Other activities

2.1 Computer Integration

We have continued to work on replacing the Sun Sparc II computer on the HSRL with the new DEC Alpha. The new computer is expected to provide at least a factor of ten increase in data processing speeds. The modification and recompilation of the Sun code for the use on the Alpha has been more time consuming than expected. The public domain software we employ to compile code for the embedded HSRL data acquisition computer (an Intel I960) did not recompile correctly on the Alpha which uses a different byte ordering and longer word lengths than the Sun. This code has been patched to eliminate the problems and it now works correctly. Recompilation of the display, processing, and operator interface code has proceeded rather smoothly and most data processing can now be carried out on the Alpha.

2.2 PDAC

We have examined the presentation of UW lidar data on the PDAC web page and worked with PDAC personnel to improve the descriptions and indexing of the PDAC versions of our data.

3 Participants

Edwin Eloranta Principal Investigator
Don Wylie Co-Principal Investigator
Barry Hinton Associate Scientist
Dan Forrest Programmer
Jim Hedrick Instrumentation Specialist
Walter Wolf Research Specialist
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