

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to: Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.				
1. REPORT DATE (DD-MM-YYYY) 6/16/11	2. REPORT TYPE FINAL	3. DATES COVERED (From - To) 05/01/2010 - 11/30/2010		
4. TITLE AND SUBTITLE High resolution cloud microphysics and radiation studies		5a. CONTRACT NUMBER		
		5b. GRANT NUMBER N00173-10-1-6012		
		5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S) Dr. Piotr Flatau		5d. PROJECT NUMBER		
		5e. TASK NUMBER		
		5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) University of California, San Diego Scripps Institution of Oceanography Climate, Atmospheric Science and Physical Oceanography 9500 Gilman Drive La Jolla, CA 92093-0221		8. PERFORMING ORGANIZATION REPORT NUMBER Final - Fund 26352A		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Naval Research Laboratory Code 7540 7 Grace Hopper Ave., Stop 2 Monterey CA 93943-5502		10. SPONSOR/MONITOR'S ACRONYM(S)		
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION/AVAILABILITY STATEMENT public				
13. SUPPLEMENTARY NOTES				
14. ABSTRACT For this award, SIO deployed the MPL lidar, whole sky camera, and precipitation lidar during the 2010 Cape Weather Measurements Field Project. SIO investigated transition between the liquid and ice phase in the upper level clouds by combining lidar and radar datasets. SIO analyzed the high-resolution data sets to discern the overall structure of the cloud circulations and reflectivity field.				
15. SUBJECT TERMS Cloud microphysics, radiation studies, cloud circulation.				
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES
a. REPORT none	b. ABSTRACT none	c. THIS PAGE none	none	3, incl. cover
			19a. NAME OF RESPONSIBLE PERSON Dr. Piotr Flatau	
			19b. TELEPHONE NUMBER (include area code) 858 534-1025	

Final report: High resolution cloud microphysics and radiation studies
NRL Grant #: N00173-10-1-G012

Principal Investigator: Dr. Piotr J. Flatau

Department: CASPO

Institution: The Regents of the University of California

Scripps Institution of Oceanography

University of California San Diego, San Diego, CA 92093-0221

Phone (858) 534-1025

FAX (858) 534-7452

E-mail: pflatau@ucsd.edu

Period: 5/21/10 – 11/30/10

Project Officer:

Dr. Ted Tsui

Marine Meteorology Division

Naval Research Laboratory

7 Grace Hopper Ave.,

Monterey CA 93943-5502

FAX: (831) 656 4738

E-mail: tsui@nrlmry.navy.mil

Results

We have deployed the MPL lidar, whole sky camera, and precipitation lidar during the 2010 Cape Weather Measurements Field Project to characterize fine scale microphysics characteristics of mid level altocumulus clouds and upper level visible and subvisual cirrus clouds. The MPL lidar provided information about the temporal evolution of clouds, cloud base, and cloud top, volume extinction coefficient, and the backscatter/extinction lidar ratio. We investigated

20110808213

transition between the liquid and ice phase in the upper level clouds by combining lidar and radar datasets. We participated in the co-located balloon, lidar, and radar study of cirrus and altocumulus clouds to further investigate the presence of multi-cloud and nearly cloud-free layers within any given stratiform cloud system and to characterize their thickness. We analyzed the high-resolution data sets to discern the overall structure of the cloud circulations and reflectivity field. The MPL lidar was used for continuous monitoring of clouds and aerosol profiles in stand-alone mode. The system was networked through TCP/IP to local computer and operated with pre-installed software with real time data display in an eye-safe mode. The whole sky camera operated in visible light and panoramic pictures of several cloud cases were collected. The MPL lidar was enhanced before the field experiment with co- and cross-polarization channels to provide information about the temporal evolution of clouds, cloud base, and cloud top, volume extinction coefficient, and the backscatter/extinction lidar ratio. One of the achieved goals was to provide a coherent high-resolution data set of the clouds and thermodynamic structure to build a mesoscale and LES test-bed for cirrus and altocumulus cloud layers. The project was completed through a collaborative effort with NRL Monterey. A Ph. D. student Dariusz Baranowski participated in the field project. We released all the data after the experiment including analyzed lidar data. We analyzed the 2009 Cape Weather Measurement Field Campaign. In Spring 2010, we prepared the instrumentation including upgrades to environmental enclosure and updates to lidar. In Summer 2010, we participated in the 2010 Cape Weather Measurement Field Campaign. In the Fall 2010, we performed post analysis of the 2010 Cape Weather Measurement Field Campaign.