

FIRE II Cirrus

Mission Summary



Date: November 17, 1991
Julian Day: 321
Experiment Day: 5

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Mission Scientist: David Starr
 Deputy Mission Scientist: None

Mission Objective:

Cirrus Cloud Radiative and Microphysical Properties

Mission Description:

In situ microphysical and shortwave radiation measurements in cirrus cloud in close coordination with ground-based Doppler lidar, Doppler 8.6 mm radar, volume scanning lidar, 3 mm radar observations and a variety of passive radiative measurements.

Weather Synopsis:

Cold front passed through Coffeyville during the early morning hours ending the major rain event of the previous day. Temperatures abruptly dropped from mid 60's to mid 50's at about 2 a.m. Winds shifted from SE to W but turned again to southerly by midday. Broken to scattered low, middle and high clouds were observed during the morning hours. By noon, Coffeyville was located exactly on the back edge of a cloud system. The rest of day, blue skies were visible to the west and an overcast of high and middle level clouds was to the east with rain reported just to the east. Bands of cirrus and/or alto clouds protruding from the main cloud mass moved over the site from the SSW to the NNE at about 50 knots through the afternoon. Sun dogs and halos were occasionally seen. Surface temperatures reached about 60 F.

Synoptic Situation:

By sunrise, Coffeyville was in the dry slot of a surface low centered over northcentral Kansas. The deep low pressure center that brought large amounts of snow to the Rockies Saturday moved northeastward through northern Kansas to Iowa during the day. The trailing frontal system remained just to the east of Coffeyville and extended southward to the southern Texas Gulf coast. Significant convection was noted from the Texas Gulf coast through Louisiana, Arkansas, and Missouri throughout the day. Strong clearing occurred behind this system with extremely dry conditions aloft. The cut-off low aloft opened up and moved to the north. However, a shortwave trough axis remained over central Kansas at the end of the day. Winds aloft were generally weak and southerly over Kansas.

Aircraft	Depart	Land	Notes
NASA ER-2			No flight
NCAR King Air			No flight
NCAR Sabreliner	13:13 CST	15:09 CST	Radiation, cloud physics mission
UND Citation			No flight

Satellite	Hub Overpass Time	Zenith Angle	Azimuth Angle	RAOB
NOAA-11	21:14:41	35.91	259.47	yes
	09:39:12	11.45	104.35	yes
NOAA-12	14:48:12	38.51	287.48	yes
	02:08:11	52.02	262.06	yes

Rawinsonde Operations:

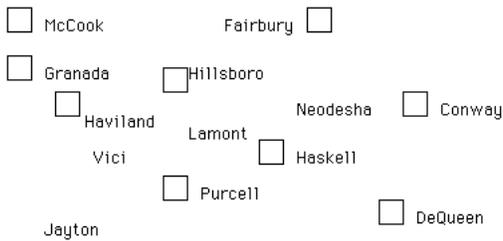
- Inner NWS stations (Type A): Routine @ 12 and 00 UTC
- Outer NWS stations (Type B): Routine @ 12 and 00 UTC
- Hub CLASS station: Satellite overpasses @ 14, 21, 02, 10 UTC
- Remote CLASS stations: No launches
- Hub GSFC/WFF station: RAOB launches @ 18, 20, 23, 02, 04 UTC
- CSU Parsons station: Single launch @ 18 UTC

FIRE Profiler Status:

- CSU 405 MHz @ Parsons: Continuous operation (no RASS)
- PSU 50 MHz @ Coffeyville: Not operational
- NOAA 405 MHz @ Coffeyville: Not operational

NWS Wind Profiler Status:





SPECTRE Operations:

Raman lidar collected an excellent dataset overnight. Excellent observations of a warm moist boundary layer with very dry clear sky conditions aloft. A replacement mirror was installed for daytime operations on the Raman lidar. SIRIS taking first spectra (0.1 cm-1 resolution). Failure of the 50 Mhz RASS has forced a greater use of sondes to construct wind fields. SIRIS and the Raman lidar are experiencing 50 Mhz interference.

Aircrew/Mission Scientist Debrief Notes:

- **SABRELINER, GOOD TEST MISSION:** Obtained good SPEARAD observations in very tenuous cirrus along with ice particle samples. Noted problems with shadowing of SPEARAD by nose-boom. This will affect design of future flight track orientations. Racetrack patterns were flown along 120deg.-300deg. radial centered on Hub at 33K and 29K (10 and 9 km).
- **OTHER:** CO2 lidar observed specular reflection at times during this mission. Sun dogs and halos were occasionally seen by surface observers. VIL saw optically thin and highly variable cirrus patches in the layer from 9.9 to 10.5 km which showed cellular structure and virga. VIL and CO2 observed the cirrus/alto cloud layer from about 7.5 to 9 km. The base of the cloud layer was extremely uniform with no indication of fall streaks - possibly indicating a predominance small crystals. At times the cloud was clearly liquid phase, at other times just as clearly ice and sometimes multilayered with cirrus over alto within this 7.5 to 9 km layer.

Significant Hardware Problems:

- Hub CLASS winds continue to have problems at low levels.
- U. Utah and U.Wisc HSR lidars not operational.
- PSU 50 MHz profiler/RASS not operational.
- NOAA 405 MHz profiler not operational.
- Sabreliner TDDR radiometer not ready.

Highlights of FIRE Operations:

- Good first test flight of CSU SPEARAD radiometer.
- U. Wisc. Volume Imaging Lidar is now operational and takes first data in support of mission.

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Instrument Logs

Active Sensors

Active Sensor	UTC Hour																								Notes	
	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11		
Utah Lidar H																										TESTING
LaRC Laser Ceilometer H	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Wisc HSR Lidar H																										TESTING
Wisc Vol Image Lidar						X			X	X																
GSFC RAMAN Lidar H													X	X	X	X	X	X	X	X	X	X	X	X	X	EXCELLENT DATA
NOAA CO2 Lidar H						X	X	X	X	X																
NOAA Radar H				X	X	X	X	X	X	X																
PSU Radar H				X	X	X	X	X	X	X																
PSU Laser Ceilometer H	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
PSU 50 MHZ Wind Prof H	X	X	X	X	X	X	X	X	X	X	X	X	X													
PSU/NOAA 50 MHz RASS H																										NOT OPERATIONAL
NOAA 405 MHz RASS H																										NOT OPERATIONAL
LaRC Lidar P					X	X	X	X	X		X	X	X	X												
CSU Wind Prof/RASS P	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	WIND PROFILER ONLY
CSU Laser Ceilometer P	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

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Passive Sensors

Passive Sensor	UTC Hour																								Notes	
	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11		
NOAA μ-wave Radiometer H	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NO OBSERVATIONS
NOAA Sun Photometer H						X			X																	
NOAA H20 Photometer	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
NOAA IR Flux Radiom. H	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

