

# **Satellite-Derived Cloud Properties During PACS Cruise**

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# Introduction

- Retrieve cloud properties using VISST(Visible Infrared Solar-infrared Split-window Technique)
- Satellite cloud retrievals need validation with ship data
- Preparing to run analysis on data from 1996 - 1999

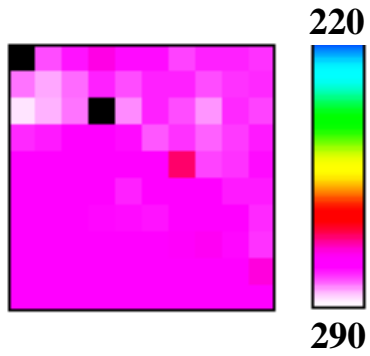
# Methodology

- **Visible Infrared Solar-infrared Technique (VISST)\***
  - 0.65, 3.9, 10.8, 12.0  $\mu\text{m}$  channels
  - Utilizes parameterization of theoretical radiance calculations for 7 water and 9 ice crystal size distributions
  - Retrieves cloud optical properties( $\tau$ ,  $R_e$ , LWP, IWP, Phase) by matching calculations to observations
- **Use in-situ soundings from ship or island**
- **Analyze a 10 by 10 pixel box centered on the ship**
- **Use GOES-8 4-km resolution pixels for retrievals**

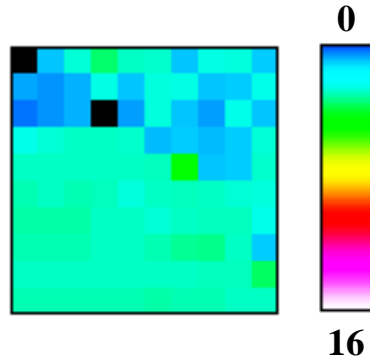
Ref: Minnis et al., 1995, NASA RP 1376, pp135-164

# VISST Products

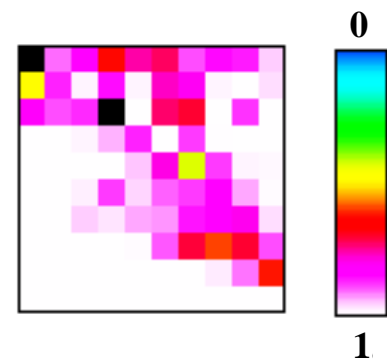
## Cloud Temperature (K)



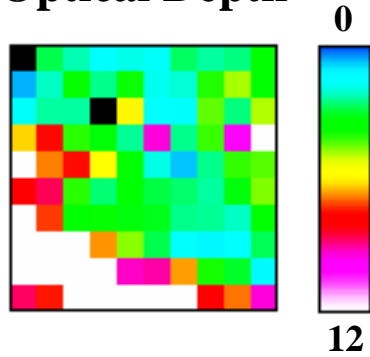
## Cloud Top Height (km)



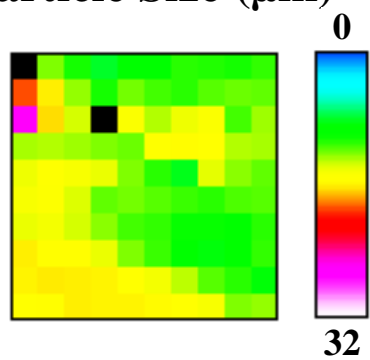
## Cloud Emittance



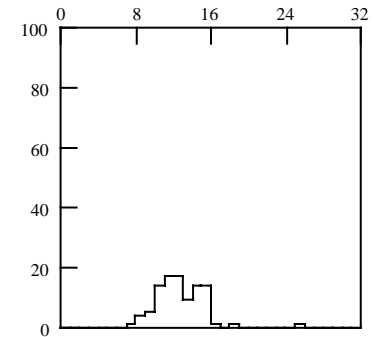
## Optical Depth



## Particle Size ( $\mu\text{m}$ )



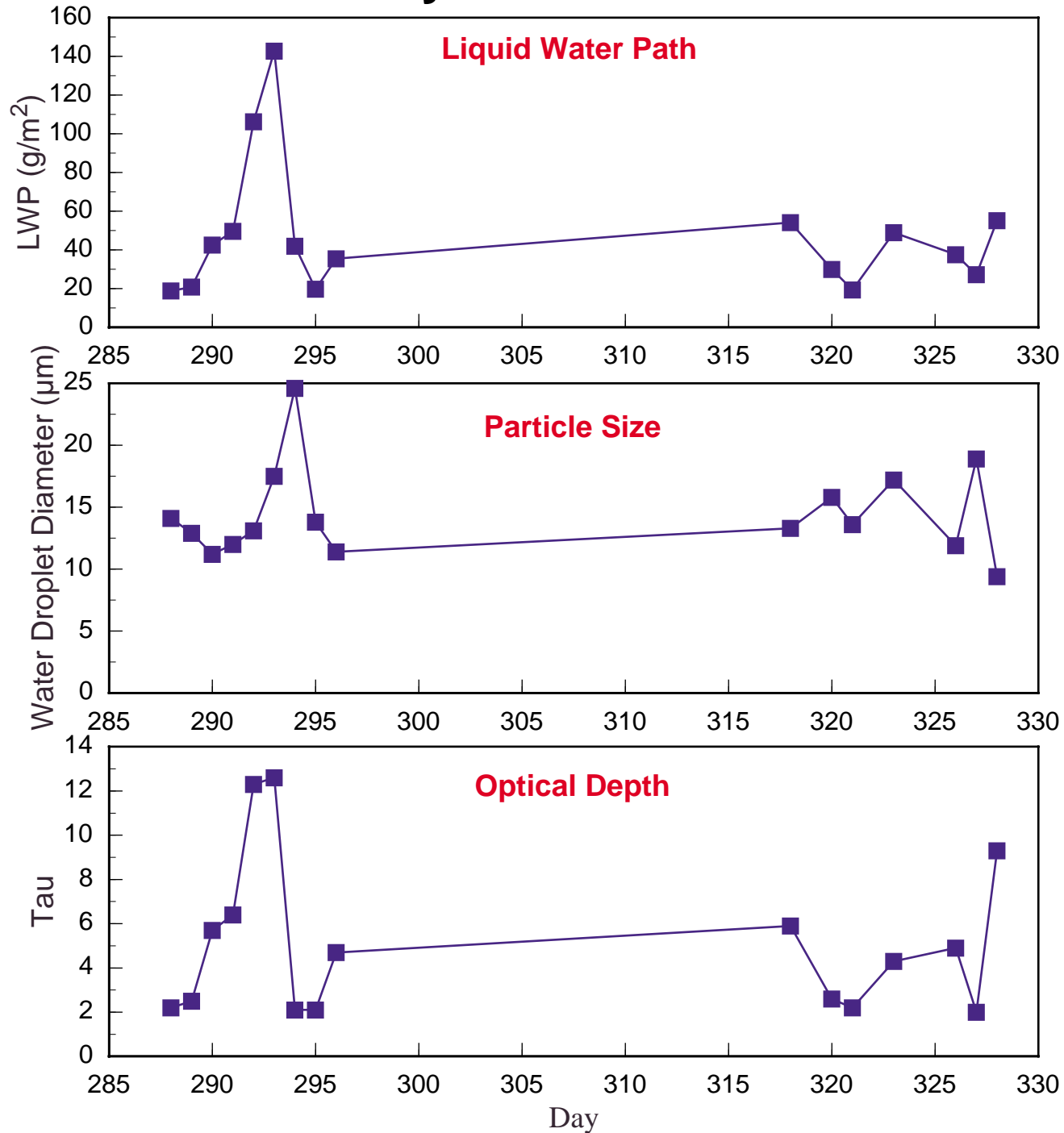
## Particle Size Histograms



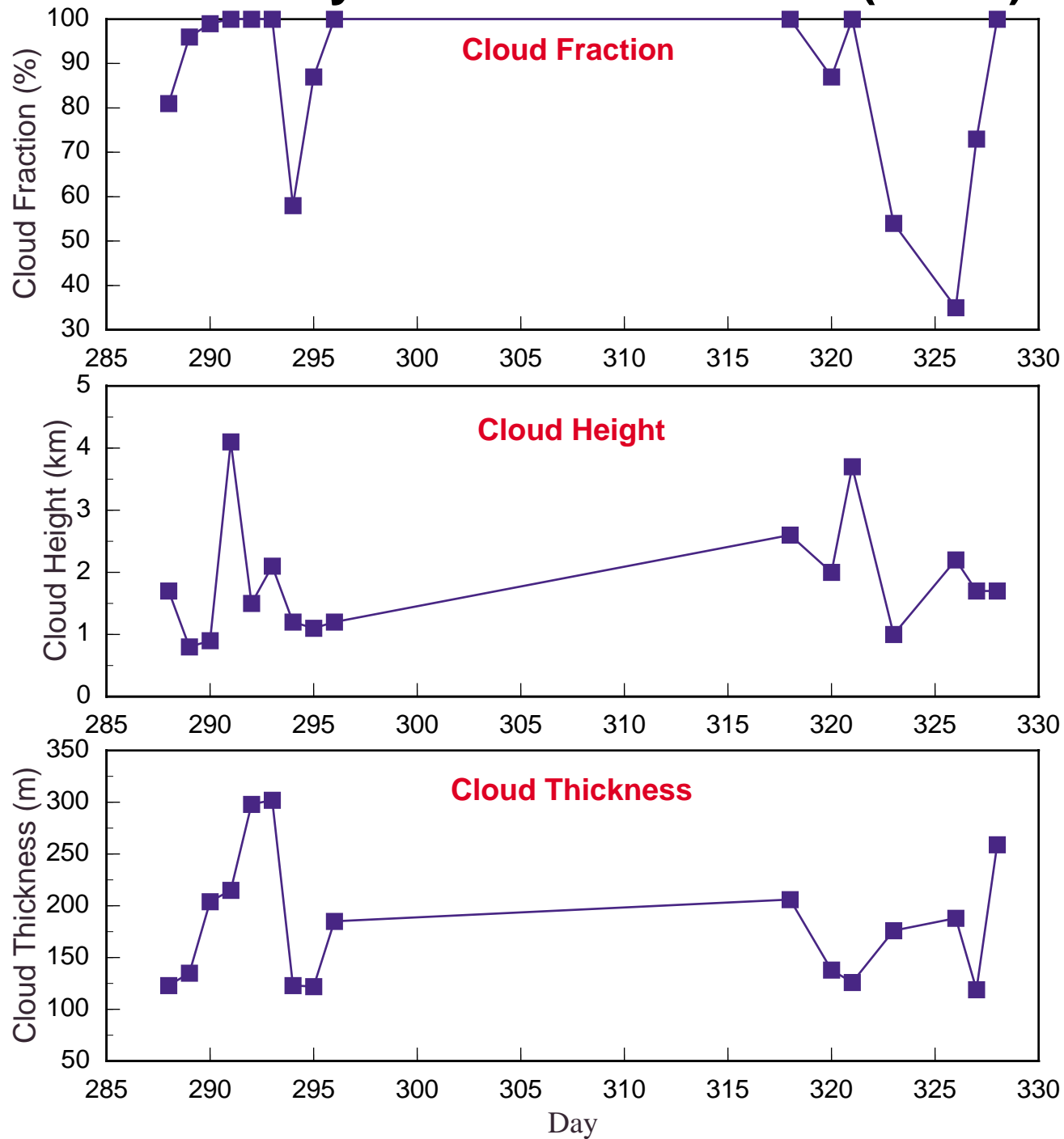
**Summary of Cloud Retrievals from the GOES-8 17:45 UTC Image  
for the PACS Cruise**

<b>Date</b>	<b>Ship Location</b>	<b>LWP (g/m<sup>2</sup>)</b>	<b>Optical Depth</b>	<b>Re (μm)</b>	<b>Cloud Height (km)</b>	<b>Cloud Thickness (m)</b>	<b>Cloud Temp. (K)</b>	<b>Cloud Fraction (%)</b>	<b>Clear Ocean Temp. (K)</b>
10/15/99	27.0 S, 71.0 W	18.9	2.2	14.1	1.7	123	280.3	81	285.5
10/16/99	27.0 S, 72.0 W	20.9	2.5	12.9	0.8	135	285.2	96	285.5
10/17/99	27.0 S, 74.6 W	42.6	5.7	11.2	0.9	204	280.6	99	285.0
10/18/99	27.0 S, 77.4 W	49.7	6.4	12.0	4.1	215	274.1	100	285.0
10/19/99	26.4 S, 80.0 W	106.3	12.3	13.1	1.5	298	279.2	100	285.5
10/20/99	27.0 S, 82.1 W	142.8	12.6	17.5	2.1	302	282.5	100	288.0
10/21/99	27.0 S, 85.1 W	42.0	2.1	24.6	1.2	123	284.6	58	288.0
10/22/99	27.0 S, 88.9 W	19.8	2.1	13.8	1.1	122	286.7	87	289.5
10/23/99	27.0 S, 92.4 W	35.5	4.7	11.4	1.2	185	283.7	100	288.5
11/14/99	28.2 S, 106.7 W	54.2	5.9	13.3	2.6	206	280.1	100	290.5
11/16/99	30.9 S, 96.4 W	30.0	2.6	15.8	2.0	138	280.4	87	291.0
11/17/99	31.2 S, 91.1 W	19.4	2.2	13.6	3.7	126	273.3	100	290.5
11/19/99	33.4 S, 80.4 W	49.0	4.3	17.2	1.0	176	287.4	54	288.5
11/22/99	33.2 S, 75.1 W	37.6	4.9	11.9	2.2	188	281.7	35	288.5
11/23/99	33.3 S, 75.2 W	27.3	2.0	18.9	1.7	119	283.9	73	288.5
11/24/99	33.0 S, 71.9 W	55.2	9.3	9.4	1.7	259	284.1	100	288.5

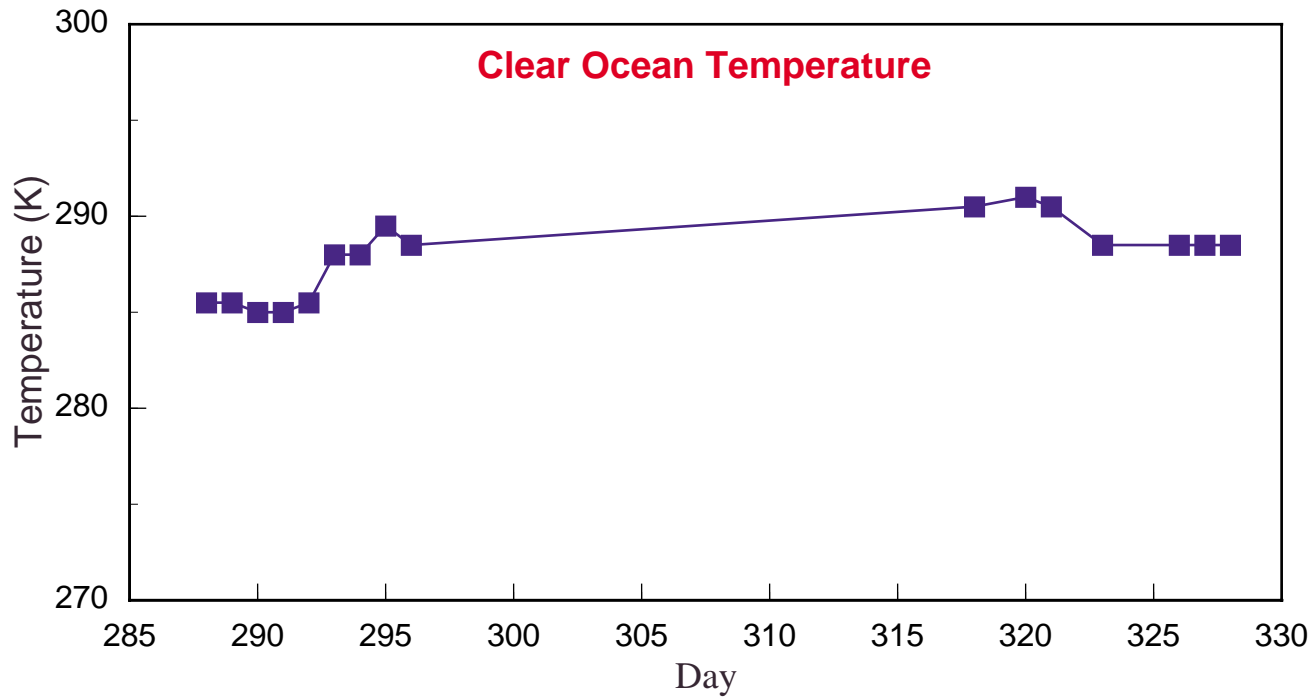
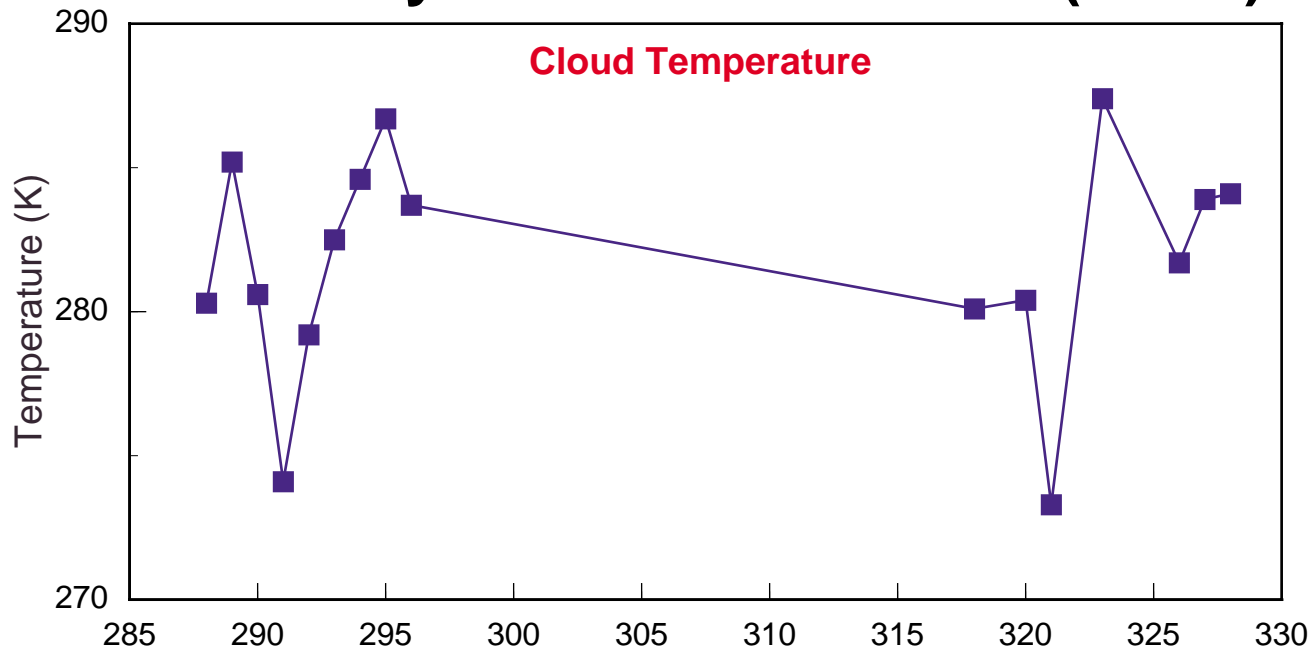
# Summary of Cloud Retrievals



# Summary of Cloud Retrievals (Cont.)



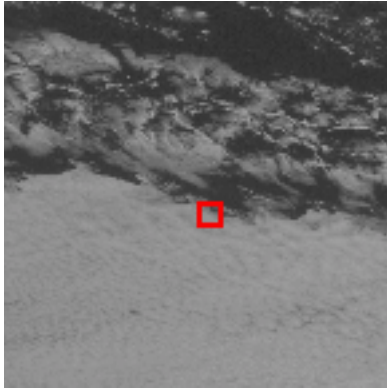
# Summary of Cloud Retrievals (Cont.)



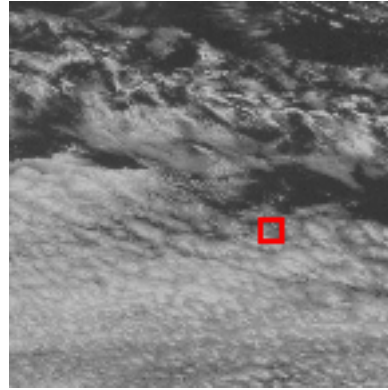


# Summary of Results for November 14, 1999

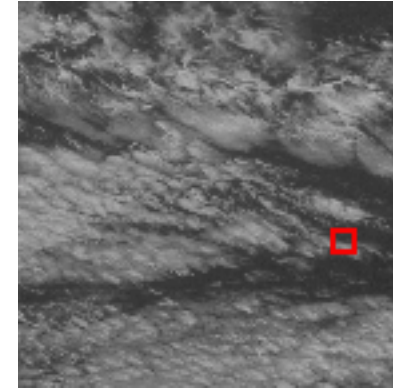
14:45 UTC



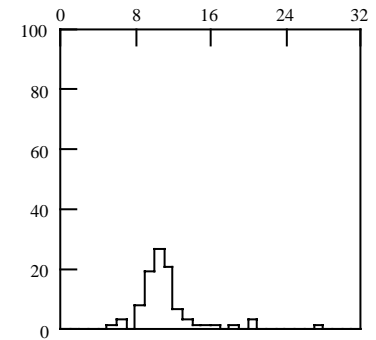
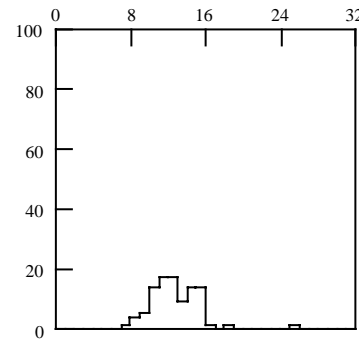
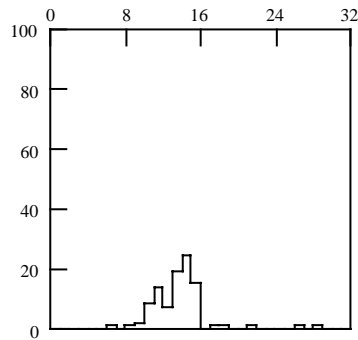
17:45 UTC



20:45 UTC



## Water Droplet Radius Histograms



## Microphysical Properties

Mean Droplet Size	14.2	13.3	11.9
Mean Tauvis	19.1	5.9	9.6
Mean Cloud Temperature	280.1	280.1	278.6
Mean Cloud Height	2.8	2.6	2.9
Mean LWP	183.8	54.2	73.8

## Future Work

- Compare satellite retrievals with ship measurements
- Develop real-time large scale high resolution product on web
- Analyze large-scale climatology (1996-1999) for comparison with model results
- Contact [p.minnis@larc.nasa.gov](mailto:p.minnis@larc.nasa.gov) for information