FLIGHT SUMMARY REPORT

Flight #: 91-131

Date: 28 July 1991

Sensor Package: Wild-Heerbrug RC-10
Multispectral Atmospheric Mapping Sensor (MAMS)
Advanced Microwave Precipitation Radiometer (AMPR)
Microwave Temperature Profiler (MTS)
Lightning Instrumentation Package (LIP)
High-Resolution Interferometer Sounder (HIS)

Area(s) Covered: Eastern Florida Coast

Investigator(s): Spencer, NASA-MSFC

Aircraft #: 709

Flight Request: 91T245

Julian Date: 209

SENSOR DATA

Accession #:	04260	-----	-----	-----	-----	-----
Sensor ID #:	036	080	105	092	106	083
Sensor Type:	RC-10	MAMS	AMPR	MTS	LIP	HIS
Focal Length:	6" 153.19 mm	-----	-----	-----	-----	-----
Film Type:	Aerial Color SO-242	-----	-----	-----	-----	-----
Filtration:	2.2 AV	-----	-----	-----	-----	-----
Spectral Band:	400-700 nm	-----	-----	-----	-----	-----
f Stop:	4	-----	-----	-----	-----	-----
Shutter Speed:	1/100	-----	-----	-----	-----	-----
# of Frames:	123	-----	-----	-----	-----	-----
% Overlap:	60	-----	-----	-----	-----	-----
Quality:	Excellent	Fair	-----	-----	-----	-----

Remarks:

Airborne Science and Applications Program

The Airborne Science and Applications Program (ASAP) is supported by three ER-2 high altitude Earth Resources Survey aircraft. These aircraft are operated by the High Altitude Missions Branch at NASA-Ames Research Center, Moffett Field, California. The ER-2s are used as readily deployable high altitude sensor platforms to collect remote sensing and *in situ* data on earth resources, celestial phenomena, atmospheric dynamics, and oceanic processes. Additionally, these aircraft are used for electronic sensor research and development and satellite investigative support.

The ER-2s are flown from various deployment sites in support of scientific research sponsored by NASA and other federal, state, university, and industry investigators. Data are collected from deployment sites in Kansas, Texas, Virginia, Florida, and Alaska. Cooperative international scientific projects have deployed the aircraft to sites in Great Britain, Australia, Chile, and Norway.

Photographic and digital imaging sensors are flown aboard the ER-2s in support of research objectives defined by the sponsoring investigators. High resolution mapping cameras and digital multispectral imaging sensors are utilized in a variety of configurations in the ER-2s' four pressurized experiment compartments. The following provides a description of the digital multispectral sensors used for data collection during this flight.

Multispectral Atmospheric Mapping Sensor

The Multispectral Atmospheric Mapping Sensor (MAMS) is a modified Daedalus Scanner flown aboard the ER-2 aircraft. It is designed to study weather related phenomena including storm system structure, cloud-top temperatures, and upper atmosphere water vapor. The scanner retains the eight silicon-detector channels in the visible/near-infrared region found on the Daedalus Thematic Mapper Simulator, with the addition of four channels in the thermal infrared relating to specific water vapor features. The specific bands are as follows:

Daedalus Channel	Wavelength, μm
1	LSBs for Channels 9-12
2	0.45 - 0.52
3	0.52 - 0.60
4	0.57 - 0.67
5	0.60 - 0.73
6	0.65 - 0.83
7	0.72 - 0.99
8	0.83 - 1.05
9	3.55 - 3.93 low range
10	3.55 - 3.93 high range
11	10.3 - 12.1
12	12.5 - 12.8

Sensor specifications are as follows:

IFOV:	5.0 mrad
Ground Resolution:	325 feet (99 meters) at 65,000 feet
Total Scan Angle:	86°
Swath Width:	20 nmi (37 km) at 65,000 feet
Pixels/Scan Line:	716
Scan Rate:	6.25 scans/second
Ground Speed:	400 kts (206 m/second)
Digitization:	8-bit channels 2-8 10-bit channels 9-12

The data will not be archived at EROS Data Center because this is an experimental system with low spatial resolution and unique spectral characteristics. As all scenes will be primarily cloud-covered there would be little terrestrial application for the data. Further information concerning the data can be obtained from principal investigator, Gregory S. Wilson, Atmospheric Effects Branch, George C. Marshall Space Flight Center, National Aeronautics and Space Administration, Marshall Space Flight Center, Alabama 35812-5001.

Advanced Microwave Precipitation Radiometer

The Advanced Microwave Precipitation Radiometer (AMPR) is a scanning passive microwave radiometer operating at frequencies of 10, 19, 37, and 85 GHz. The AMPR is configured to fit into the Q-bay of the ER-2 and scans cross-track +/- 45° to the left and right of nadir. The instrument's principle use is for gathering microwave image data of cloud water and precipitation primarily over the ocean. Some data collected also will be used for studies of vegetation, ground moisture, sea surface state, and snow cover. The AMPR is sponsored by Dr. Roy W. Spencer, NASA-MSFC, ES43, Huntsville, Alabama 35812, FTS 824-1686.

Lightning Instrument Package

The Lightning Instrument Package (LIP) comprises a set of optical and electrical sensors with a wide range of temporal, spatial, and spectral resolution to observe lightning and investigate electrical environments within and above thunderstorms. The instruments provide measurements of the air conductivity and vertical electric field above thunderstorms and provide estimates of the storm electric currents. In addition, LIP will detect total storm lightning and differentiate between intracloud and cloud-to-ground discharges. This data will be used in studies of lightning/storm structure and lightning precipitation relationships. The LIP is sponsored by Dr. Richard Blakeslee, NASA-MSFC, ES43, Huntsville, Alabama 35812, FTS 824-1651.

Microwave Temperature Profiler

The Microwave Temperature Profiler (MTP) uses a passive microwave radiometer to measure thermal emission from oxygen molecules for a selection of elevation angles. Altitude temperature profiles are obtained once every ten seconds. The profile applies to a volume of air that is approximately 3 km deep (along flight path) by 3 km high (centered on A/C) and 1/4 km wide. The observing frequencies are 57.3 and 58.8 GHz. The relationship between "brightness temperature" and elevation angle is converted to a plot of air temperature versus altitude. Lapse rate at A/C altitude is later compared with horizontal gradients of wind speed to derive "potential vorticity." Potential vorticity determinations are used to assign an origin to the air mass being flown through. The MTP is sponsored by Bruce L. Gary at the Jet Propulsion Laboratory in Pasadena.

High-Resolution Interferometer Sounder

The High-Resolution Interferometer Sounder (HIS) measures upwelling infrared spectral radiance at the aircraft altitude with high absolute accuracy using a passive Michelson interferometer and precision onboard blackbody calibration sources. The instrument has a single nadir staring field of view with observed spectra obtained every six seconds. The spectra cover the range 16.6 microns to 3.3 microns with a spectral resolution of 0.3 to 0.5 cm^{-1}. The primary use of the instrument is as an atmospheric sounder of temperature and water vapor. The spectra also contain important information on trace gases and surface properties. The HIS was developed by the University of Wisconsin at Madison and is a prototype instrument for advanced infrared satellite sounders.

Camera Systems

Various camera systems and films are used for photographic data collection. Film types include high definition color infrared, natural color, and black and white emulsions. Available photographic systems are as follows:

- Wild-Heerbrug RC-10 metric mapping camera
  - 9 x 9 inch film format
  - 6 inch focal length lens provides area coverage of 16 x 16 nautical miles from 65,000 feet
  - 12 inch focal length lens provides area coverage of 8 x 8 nautical miles from 65,000 feet

- Hycon HR-732 large scale mapping camera
  - 9 x 18 inch film format
  - 24 inch focal length lens provides area coverage of 4 x 8 nautical miles from 65,000 feet

- IRIS II Panoramic camera
  - 4.5 x 34.7 inch film format
  - 24 inch focal length lens
  - 90 degree field of view provides area coverage of 2 x 21.4 nautical miles from 65,000 feet

The U.S. Geological Survey's EROS Data Center at Sioux Falls, South Dakota serves as the archive and product distribution facility for NASA-Ames aircraft acquired photographic and digital imagery. For information regarding photography and digital data (including areas of coverage, products, and product costs) contact EROS Data Center, Customer Services, Sioux Falls, South Dakota 57198 (Telephone: (605) 594-6151).

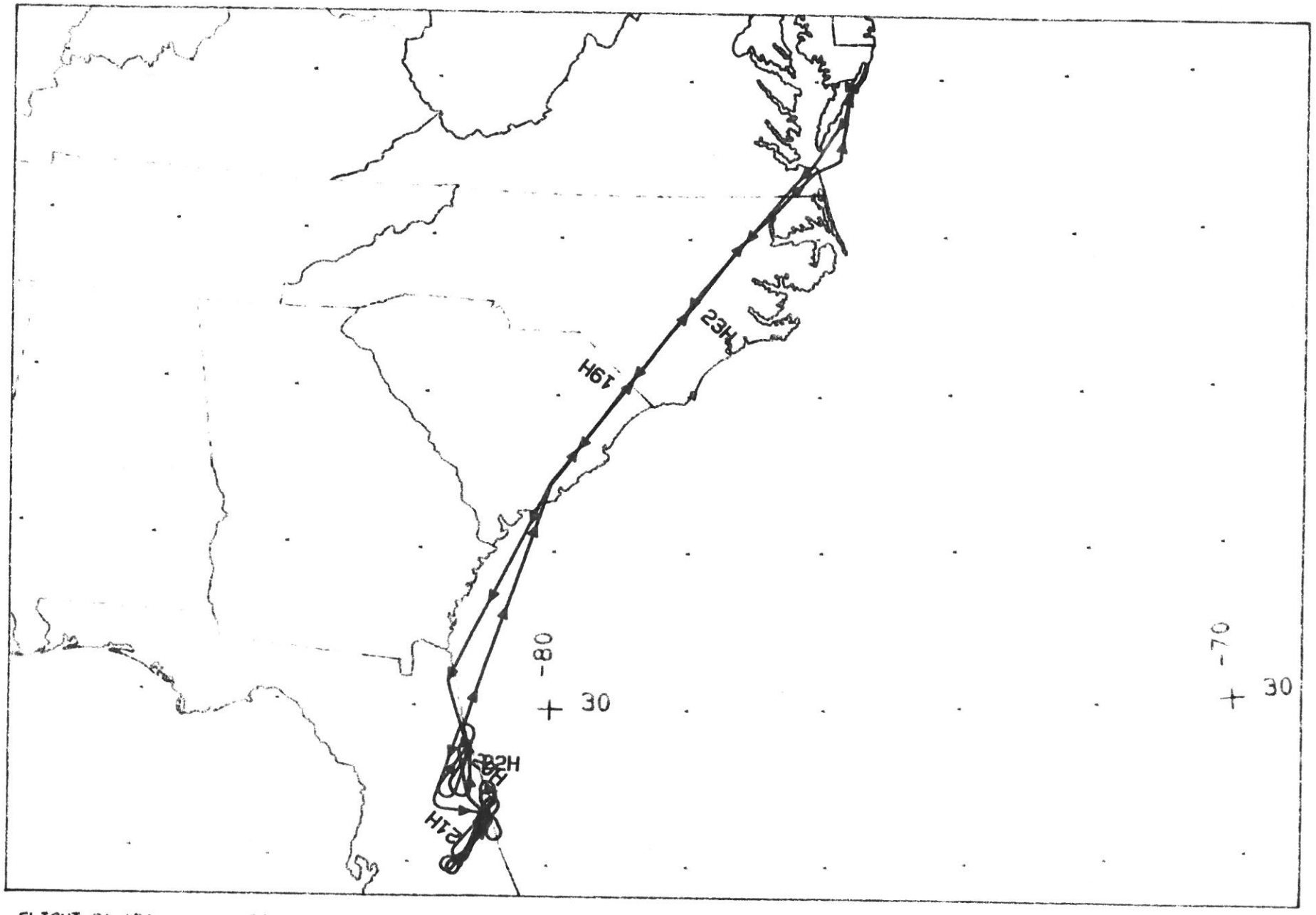
Additional information regarding ER-2 acquired photographic and digital data is available through the Aircraft Data Facility at Ames Research Center. For specific information regarding flight documentation, sensor parameters, and areas of coverage contact the Aircraft Data Facility, NASA-Ames Research Center, Mail Stop 240-6, Moffett Field, California 94035-1000 (Telephone: (415) 604-6252).

CAMERA FLIGHT LINE DATA
FLIGHT NO. 91-131

Accession # 04260

Sensor # 036

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
_____	6621-6627	19:57:02	20:02:38	65000/19800	60-100% cumulus; oblique (frame 6627)
_____	6628-6636	20:06:26	20:13:01	"	70-100% cumulus
_____	6637-6743	20:27:38	22:04:50	"	10-100% cumulus and cirrus; multiple flight lines over developing clould formation interspersed with oblique frames -- camera on continuously



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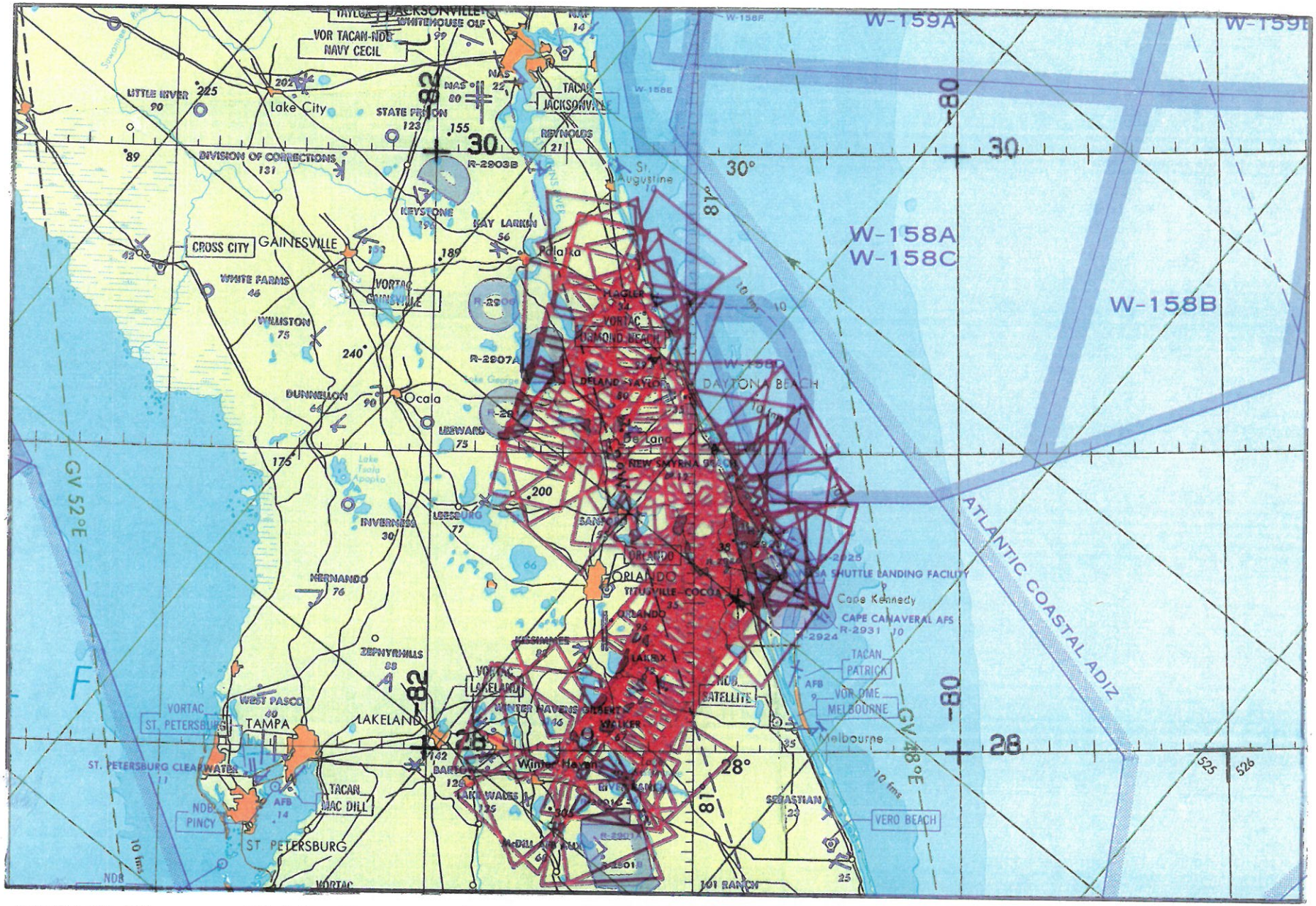

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