National Weather Service
Melbourne, Florida

Subtropical Weather Investigation and Forecaster Training

The Swift Boat Storybook with Pictures

Introduction

A NOAA Corp commissioned officer with sea experience was assigned to the Melbourne NWSO in January 1993 to work with office personnel and other agencies to help in the development of the WSR-88D as a marine forecasting tool. To accomplish this task there was an obvious need to better understand marine weather features and the WSR-88D's depiction of these features. The problem was identified as twofold. First meteorologists had very little experience in the marine area, and second there were few data sources from which to draw upon to analyze these features in the detail needed. The logical solution was to interrogate features observed with the WSR-88D concurrently with surface observations made over the water. These observations would have to be made in and around radar observed features in real-time.

In March of 1993 a proposal was drafted which set the framework for a project. This proposal suggested borrowing one of NOAA's law enforcement vessels (cigarette type speed boats) to provide marine training for NWS personnel while also interrogating offshore weather features observed with the WSR-88D. In November 1993 the project was approved and funded by the NWS Southern Region Headquarters and the NWS Office of Meteorology (OM). This project would incorporate the use of existing resources to enhance data over the offshore area of radar coverage for a brief period, thus allowing for surface truth measurements while providing offshore marine experience in a "small craft" to NWS employees.

PROJECT OBJECTIVES

The goal of the project was to find out as much as possible about the WSR-88D, especially in the area relating to its usefulness as a marine forecasting tool. This was to be done while providing marine familiarization to forecasters. Within these broad objectives several specific items were identified as possible areas of interest:

- Familiarize meteorologists with the coastal and intracoastal forecast and warning areas of responsibility from a "small craft" perspective.
- Collect meteorological observations in and around marine weather features to investigate:
  -Life cycle of offshore convective cells
  -Convective outflow boundaries
  -Cloud streets and shear lines
  -Convection in areas with strong sea surface temperature (SST) gradients
  -Life-cycle of waterspouts
  -Oceanographic features including rip currents, sea surface discontinuities (shear lines, current eddies), and the Gulf Stream.

- Evaluate the utility and accuracy of products produced by the WSR-88D by comparison with other observations, especially:
  -Rainfall rate
  -Offshore and intracoastal surface wind speed and direction
  -Convection and non-convective boundary identification

- Provide video and photographic documentation of the intracoastal waterway and Atlantic seaboard near Melbourne
- Collect video and photographic documentation of Ponce de Leon, Cape Canaveral, Sebastian, Fort Pierce, St. Lucie, and Jupiter Inlets
- Develop marine training video for forecasters and mariners

- Evaluate the reception range of NOAA Weather Radio and survey the utility of NWR to the local marine community

PROJECT DESIGN

This project was named SWIFT BOAT (Subtropical Weather Investigation and Forecaster Training using Boat Observations and Atmospheric sampling to marine Truth the WSR-88D). Like other weather field research projects, great detail in planning was needed to prepare the equipment and personnel for their task of interrogating weather features of opportunity. There were added difficulties over operating on land, namely the offshore environment would be very demanding on equipment, personnel, and was unforgiving. There were also benefits over operating on land. Having a fast vessel would allow for the interrogation of weather features from various positions not being limited to roadways or hindered by geographical obstruction. The planning document defined an operational area which extended from the coast to approximately 50 miles from shore between the area from Cape Canaveral to Sebastian Inlet, Florida. A five nautical mile grid was developed and affixed to the operational chart of the area on the boat and a corresponding WSR-88D background map developed to simplify coordination between the radar operator and the boat and prevent errors in offshore navigation and communication.

The SWIFT BOAT project was divided into two periods of field operations: winter and summer. This was done to sample weather features associated with two distinctly different weather regimes over Florida. Within the plan a detailed organizational and operational structure was established to facilitate complete collection of data in and around offshore features viewed with the WSR- 88D, while maintaining a high level of safety. Tasks were divided between a field and office team each day while the specific duties associated with overall project accomplishment were overseen by individual NWSO staff members. Field operations were carried out using existing staff members without incurring additional expenses. The vessel was loaned to the project from the NOAA Aircraft Operations Center (AOC). The only expenses incurred were fuel, communications, maintenance, and other miscellaneous operational expenditures.

EQUIPMENT

The Project Manager (PM) developed an operational plan that identified a vessel and the equipment needed to complete such a project. A vessel was then borrowed from the NOAA AOC. This boat was a fast cigarette type boat confiscated by the government and refurbished and used to enforce federal fisheries regulations. The vessel was outfitted with meteorological instruments, a GPS navigation system, onboard marine radar, cellular telephone, VHF radio, an optical rain gauge, and computer. The SWIFT BOAT project would not have been possible without the cooperation of NOAA's Aircraft Operations Center and the foresight of the National Weather Service (NWS) Southern Region Headquarters (SRH) who provided the initial funding for the project, with additional funding provided by the NWS Office of Meteorology and instrument funding and supplies from NASA's Tropical Rainfall Measuring Mission (TRMM).

During the winter portion of the project (January 7 - March 2, 1994) the research teams interrogated marine features during 23 daily missions, making up 110 vessel operating hours. During the summer portion of the project (August 8 - September 22, 1994) 12 missions and 50 hours of operation were accomplished.

The SWIFT BOAT Storybook

A high-speed law enforcement type boat with twin 454's capable of exceeding 50 knots was used for marine familiarization and training and storm chasing to calibrate the Melbourne WSR-88D in this one of a kind project. The vessel was outfitted with GPS navigation, radar, optical rain gauge, and weather instrumentation. Operating out of the Cape Canaveral Coast Guard Base, SWIFT BOAT attained virtually all its goals. Most of the Melbourne staff and some from surrounding NWS office's received valuable marine experience. Twenty three missions were run in the winter period and 12 were completed in the summer period. 297 marine observations were made during missions covering much of NWS Melbourne's marine warning area. The WSR-88D operator at the Melbourne office communicated with SWIFT BOAT with a cellular phone and vectored SWIFT BOAT to targets using a grid that was on the radar background and the marine charts the crew used. Although conditions during active weather on radar were rigorous SWIFT BOAT proved the concept of a chase boat for radar correlations.

Melbourne staff ran the four major inlets along our coastal waters during the winter study period to better understand what mariners have to deal with during hazardous inlet traverses. Ponce De Leon Inlet - Sebastian Inlet - Ft. Pierce Inlet - Jupiter Inlet. Forecasters also gained a serious appreciation of what different heights of seas really mean- and what the implications of a marine forecast being a feet off can feel like! SWIFT BOAT could only make speed in relatively flat waters and the crew and equipment took a beating trying to make speed in rough seas. This was perhaps the greatest limitation to covering ground to reach radar signatures. The importance of various navigation aides and limitations were also observed by the staff. The SWIFT BOAT crews also observed the whole spectrum of marine activity in Melbourne's area of responsibility and became much more aware of different users concerns. Significant SST gradients across water boundaries off Cape Canaveral were observed firsthand. A variety of marine life was observed by and attracted to SWIFT BOAT.

The summer period was characterized by calmer seas, hotter days, and a lot of convective weather. Primary goals for the summer were documenting life cycle of marine cumulus, observations of sea breeze/land breezes, comparing SWIFT BOAT marine rainfall measurements to WSR-88 estimates, observing the development of waterspouts, and providing ground truth for WSR-88D observations of convective boundaries and Doppler wind speed. Despite considerable mechanical difficulty, that limited the number of missions, SWIFT BOAT succeeded in most of the summer goals. SWIFT BOAT penetrated many active showers and came close to many thunderstorms, but using on board radar and coordinating with the WSR-88D operator at the office with access to real-time lightning detection equipment allowed for a perfect safety record. Clearly, lightning is the greatest threat to boaters in the summer. Gulf Stream convection was documented. During the summer of 1994 many derelict Cuban rafts that had drifted north on the Gulf Stream were encountered off Cape Canaveral. Some of the rafts were quite well made, others not so seaworthy. We hoped that the people who left on the many rafts we saw were rescued in south Florida.


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JAN. 13 1994


AM10:40
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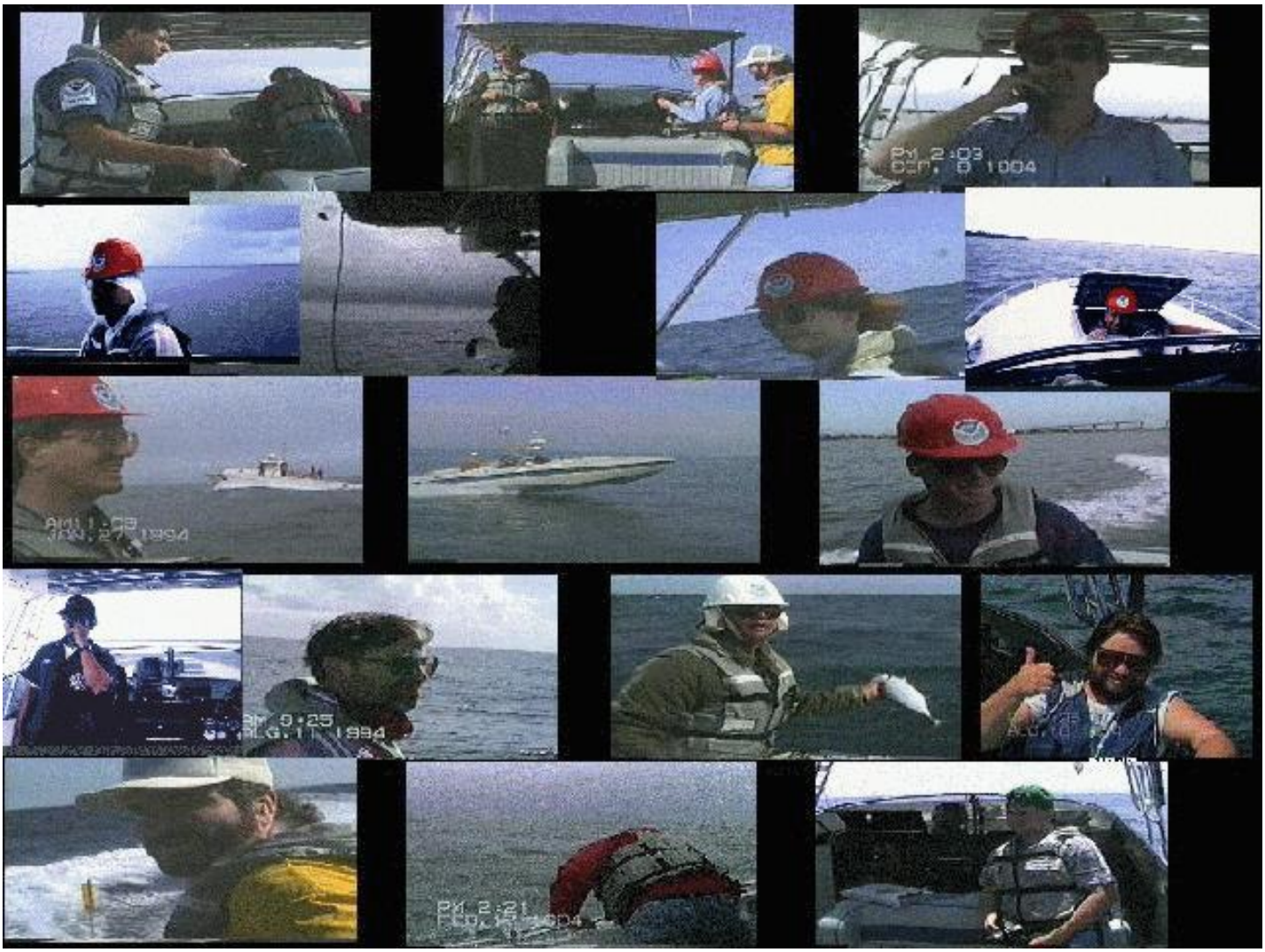
AM11:10
JAN.13 1994
AM11:42
SEP. 8 1994

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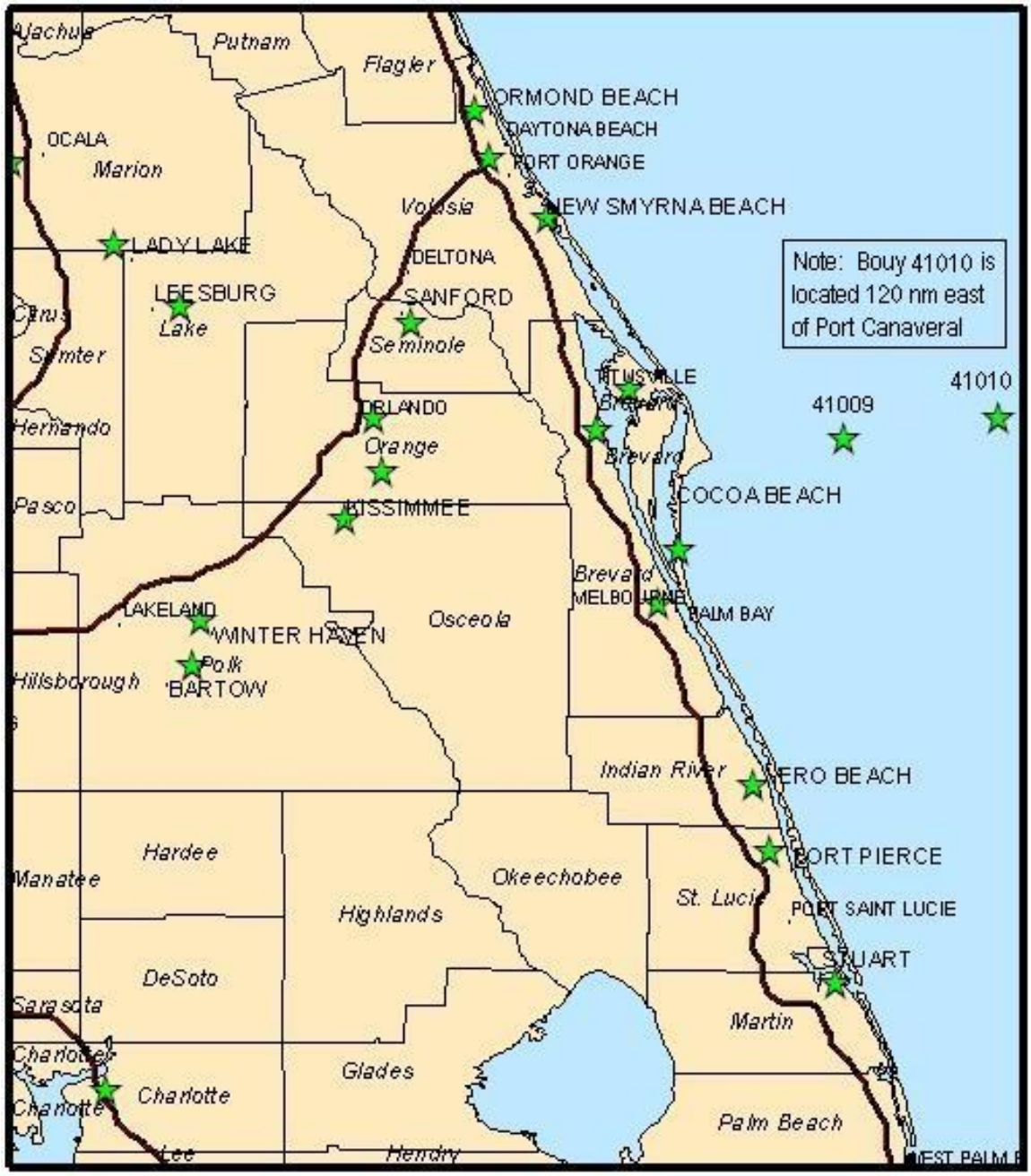
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LEESBURG
SANFORD
Lake
Seminole
Sumter
Hernando
ORLANDO
Orange
Brevard
TITUSVILLE
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41010
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KISSIMMEE
COCOA BEACH
Brevard
MELBOURNE
PALM BAY
LAKELAND
WINTER HAVEN
Osceola
Polk
Hillsborough
BARTOW
Indian River
VERO BEACH
Hardee
Manatee
Okeechobee
PORT PIERCE
St. Lucie
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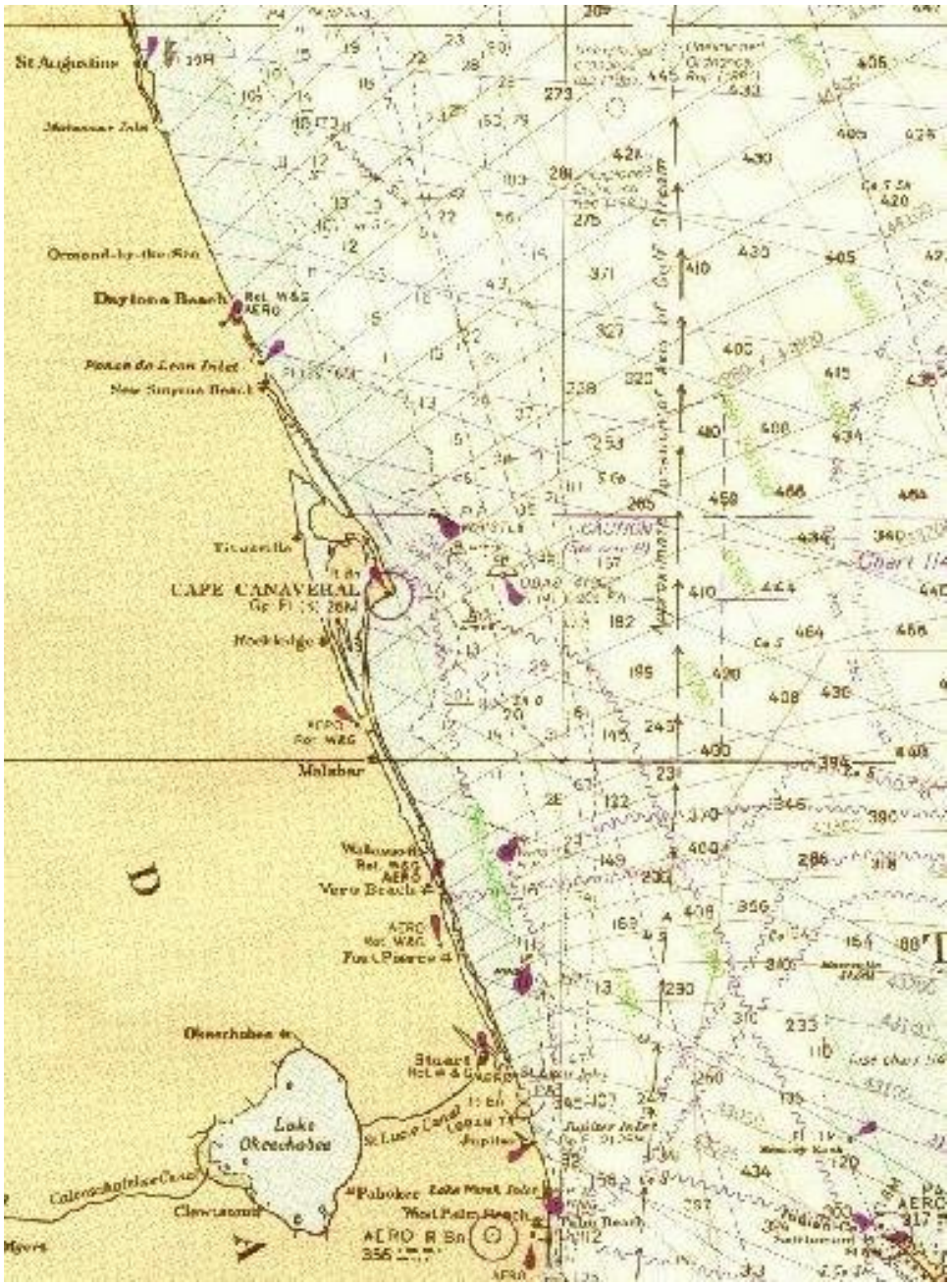
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Stuart
Lake Okeechobee
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PM12:20
JAN,10 1994


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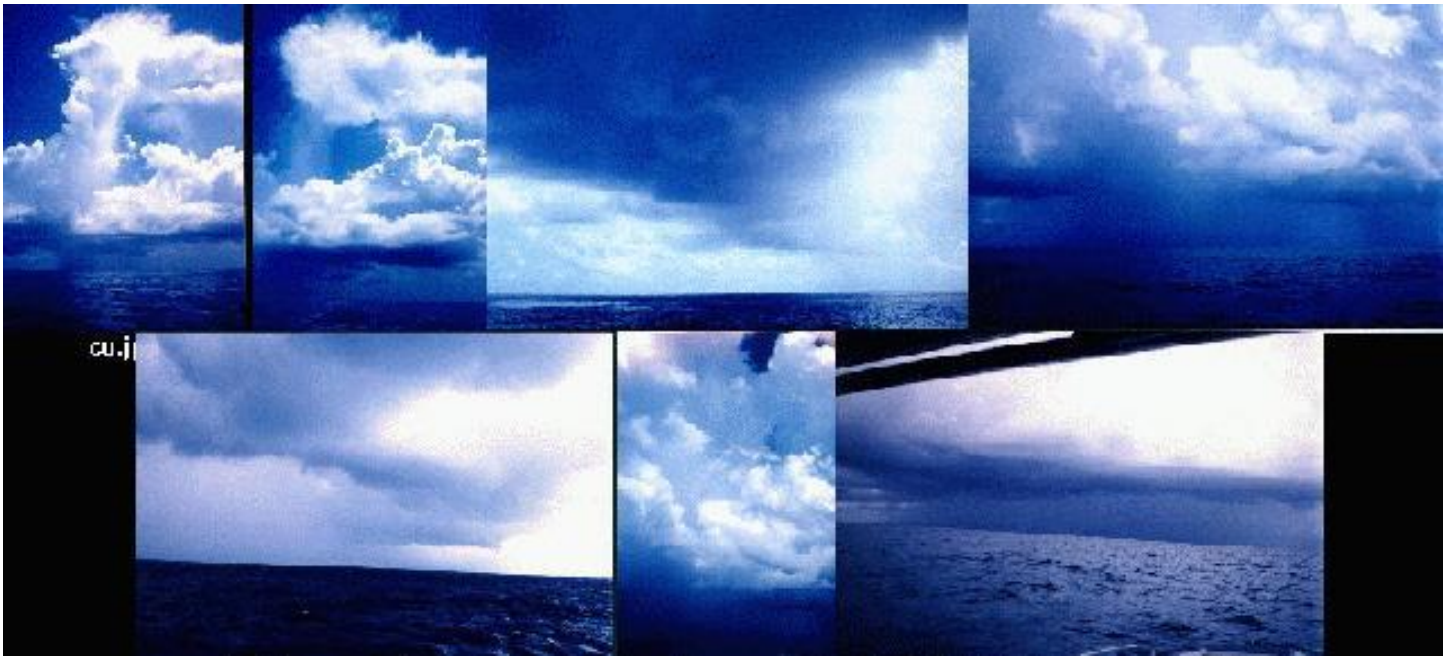


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