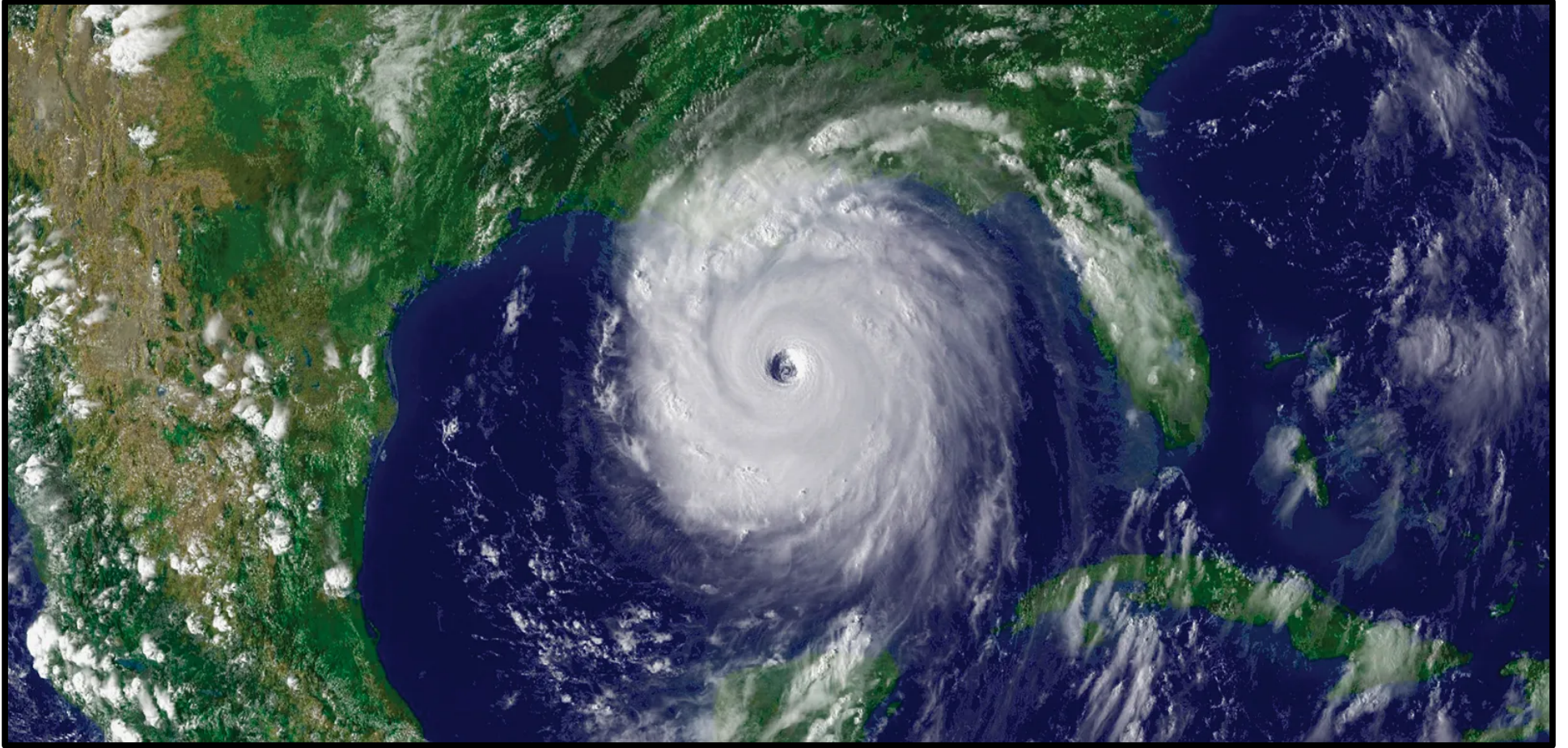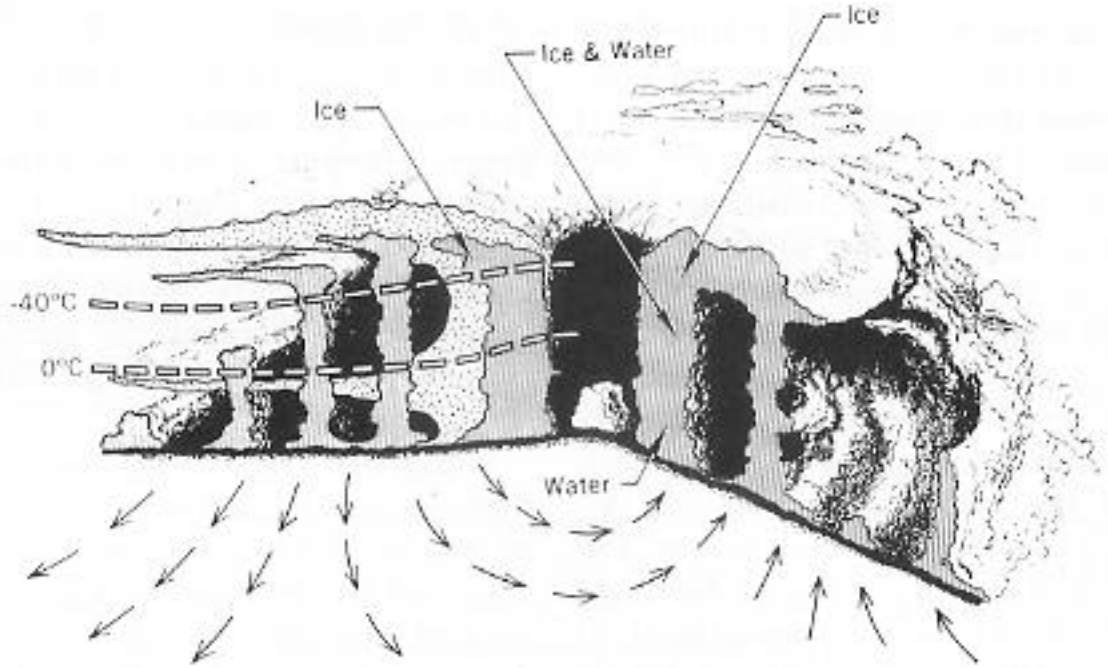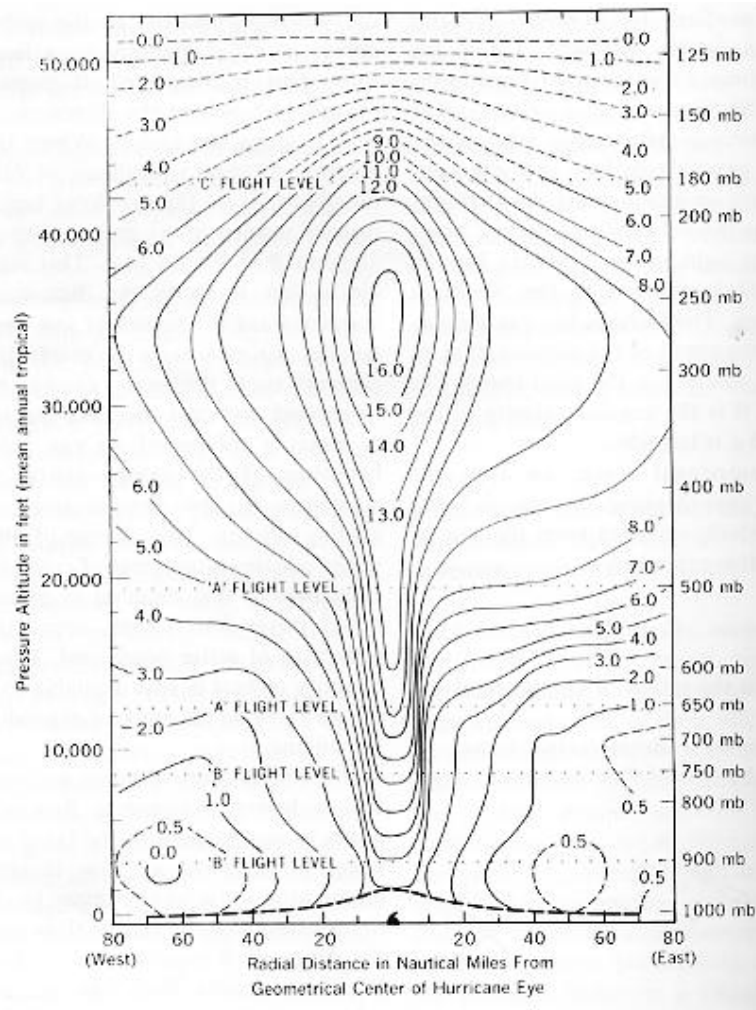# Hurricane Modification

NOAA satellite image of Hurricane Katrina, taken on August 28, 2005
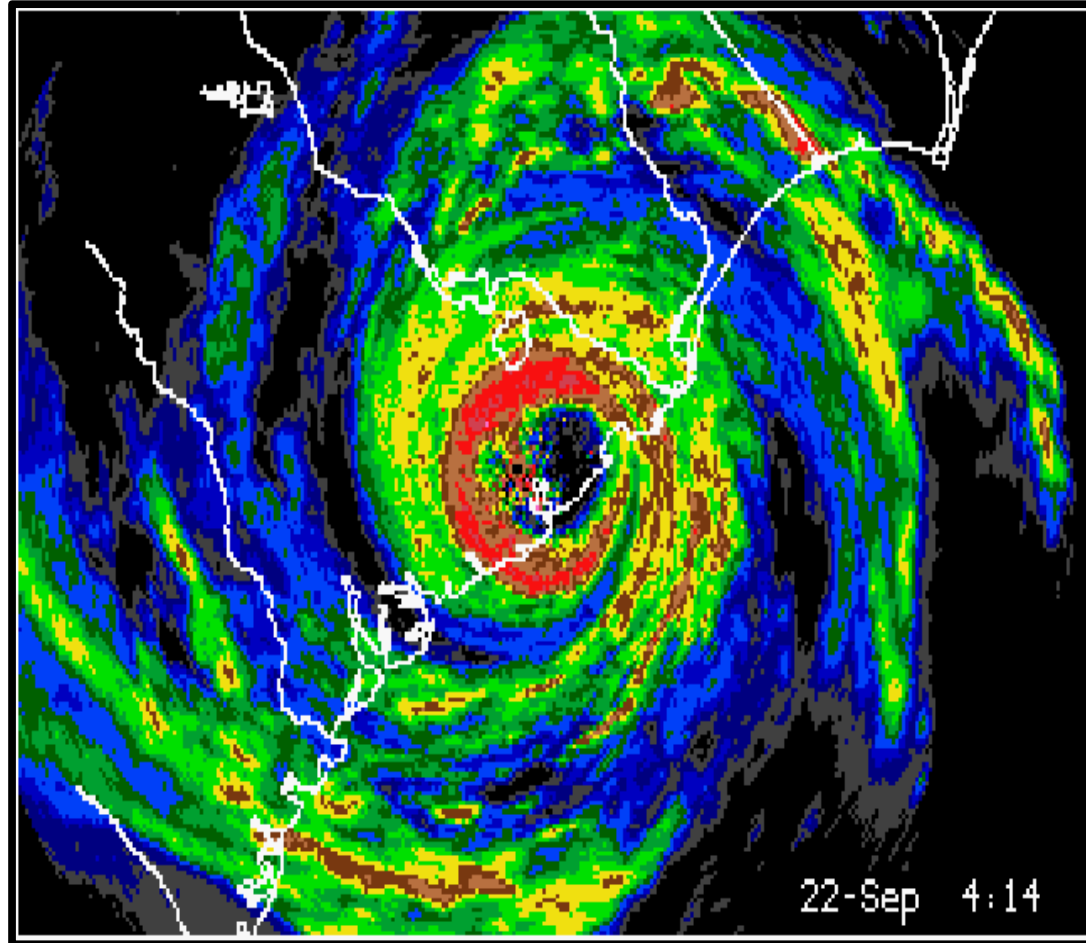
Hurricane Formation

- Hurricanes (called typhoons in the eastern Pacific) form from tropical waves.

- These storms require warm ocean waters.

- Storm energy comes from latent heat of condensation.

- They are warm core systems.

Temperature and Storm Structure
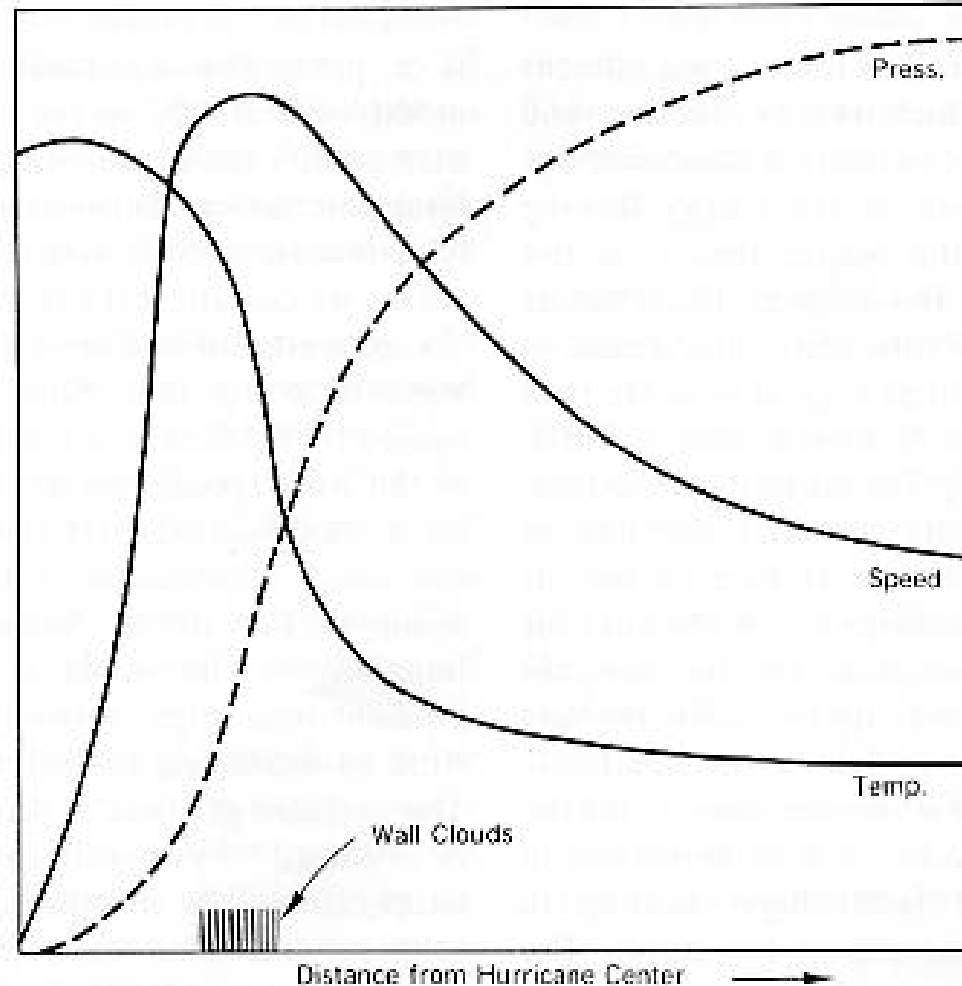

- Key Features:
  - Eye, Eye Wall, Spiral Bands, and Outflow Cirrus

Hurricane Irma (Radar Loop)

22-Sep   4:14

Radial Profiles of Temp., Pressure, and Wind

# Hurricane Damage Sources

- Wind

- Storm Surge

- Rain

- Tornadoes

# Hurricane Modification Hypothesis

- Primary release of latent heat is in eye wall

- If energy is released outside of eye less will be available to lower pressure

- Eye wall will expand and maximum winds will decrease

- Seed with glaciogenic material in spiral bands, releasing latent heat of fusion

Modification Aircraft Operations
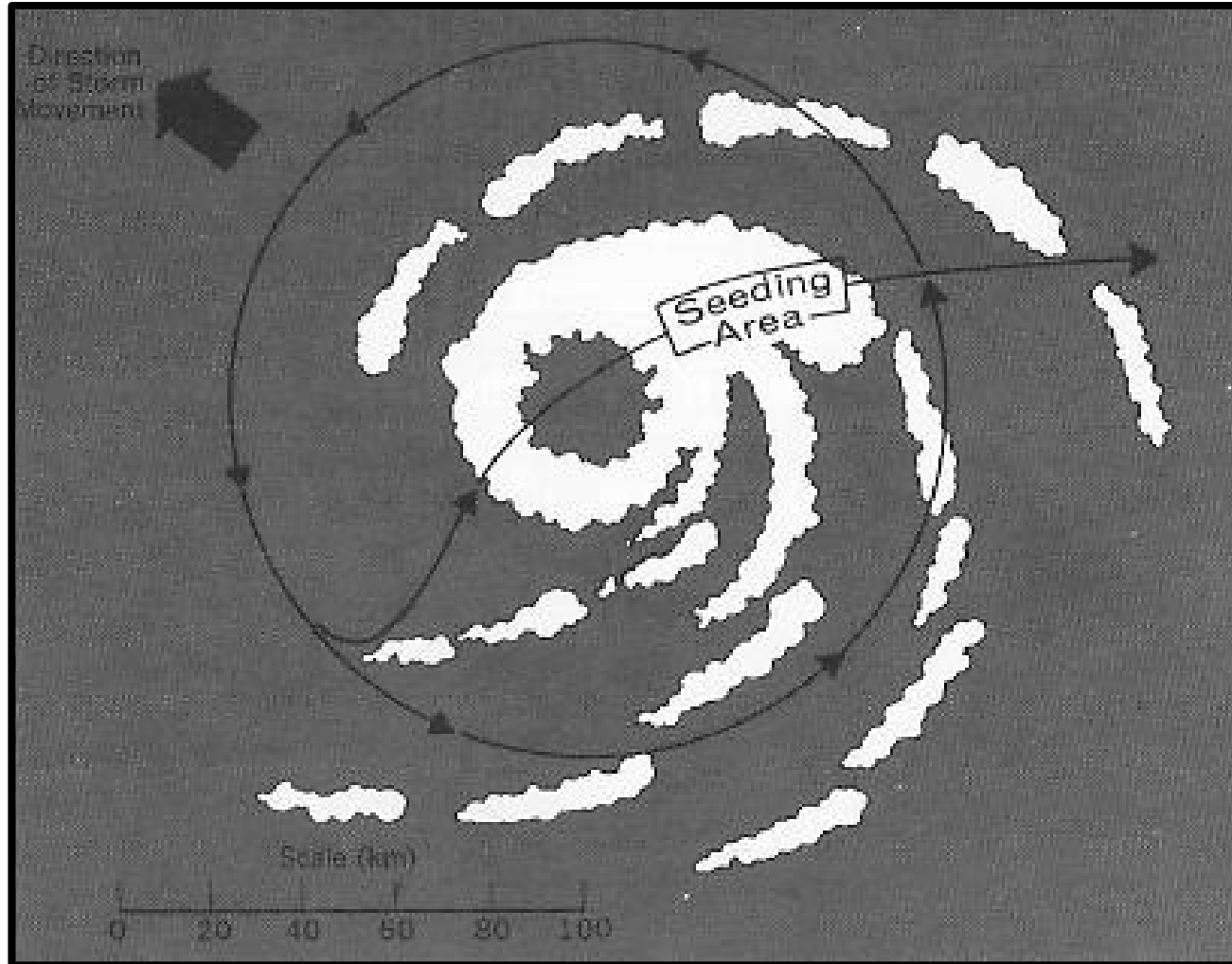
Project Stormfury

- Conducted in 1960s

- Actually seeded several hurricanes

- Possible results noted

"Project STORMFURY"
Hurricane "Debbie"
Modification Experiment
August 20, 1969
Wind Speeds
(12,000 feet)
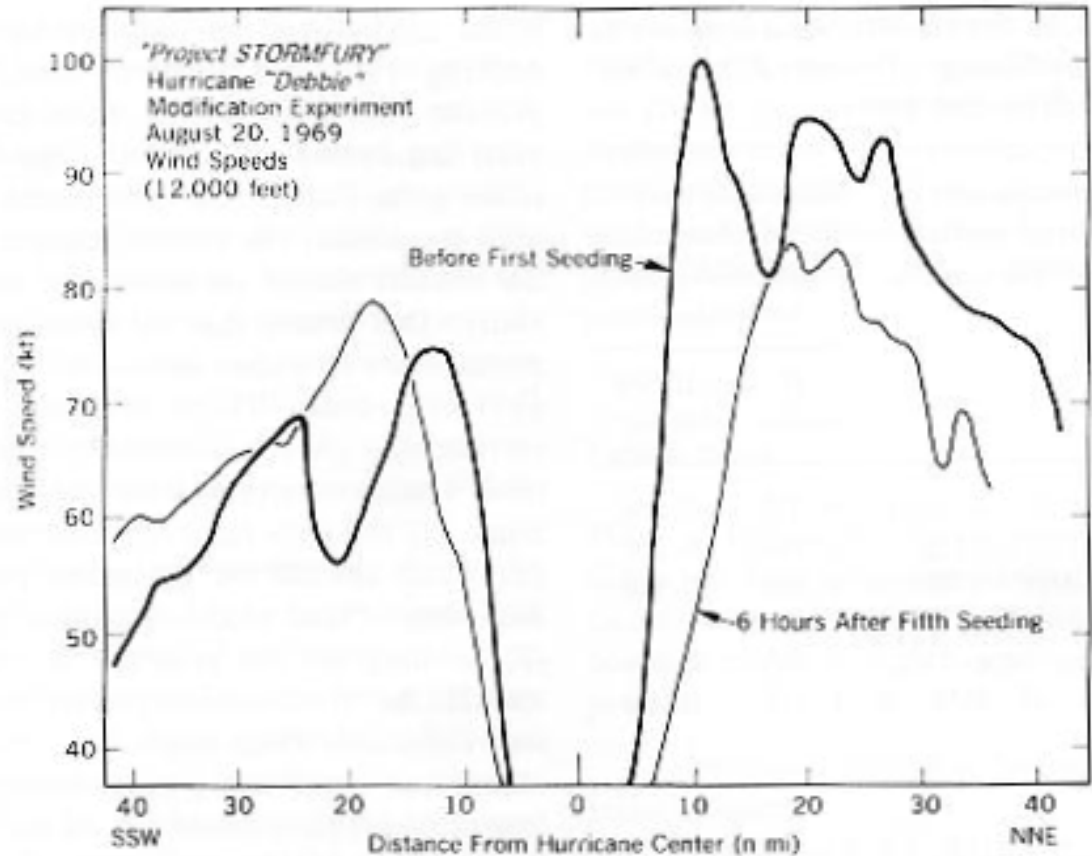
Project Stormfury Problems

- Hurricanes don't really contain much supercooled water

- Hurricanes naturally go through life cycle changes like those observed in seeded storms

Other Hypotheses

- Cooling the ocean with cryogenic material or icebergs.

- Retardation of surface evaporation with monomolecular films.

- Changing the radiational balance in the hurricane environment by absorption of sunlight with carbon black/

- Blowing the hurricane apart with hydrogen bombs.

- Releasing huge quantities of moisture-absorbing gel (Dyn-O-Gel) into the storm, removing water.

Issues with Hurricane Modification

- Delivery of seeding material.

- Storms occur far from land.

- Lots of material required.

- Liability.

- Possible test cases limited.

- Hurricane rains are also beneficial.

Tropical Cyclone Modification and Myths