GOES Aviation Weather and Hazard Assessment

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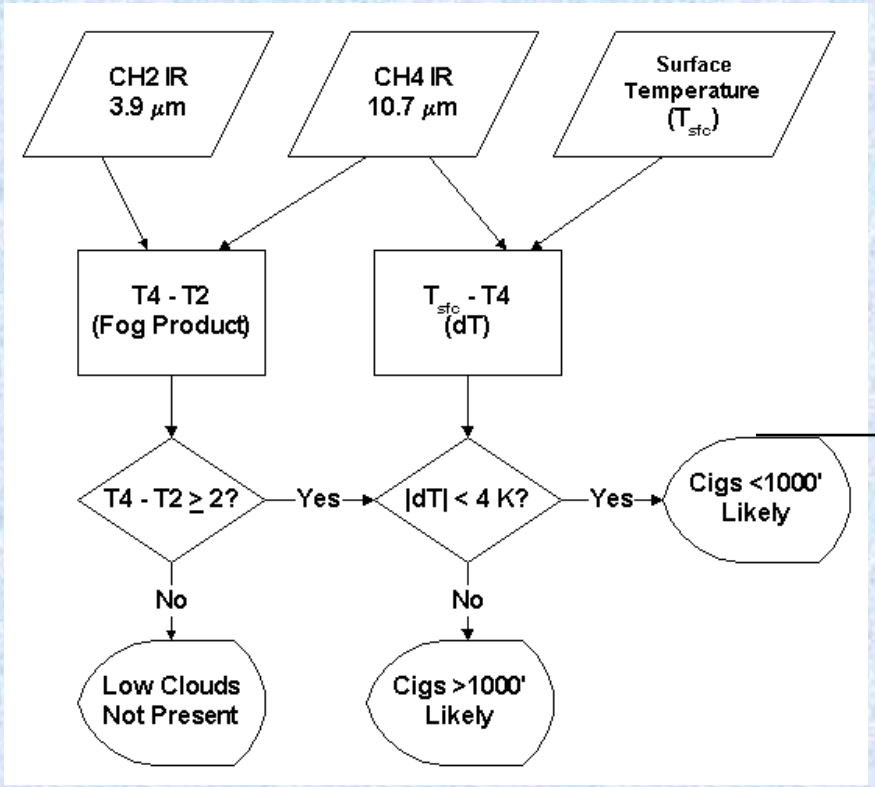
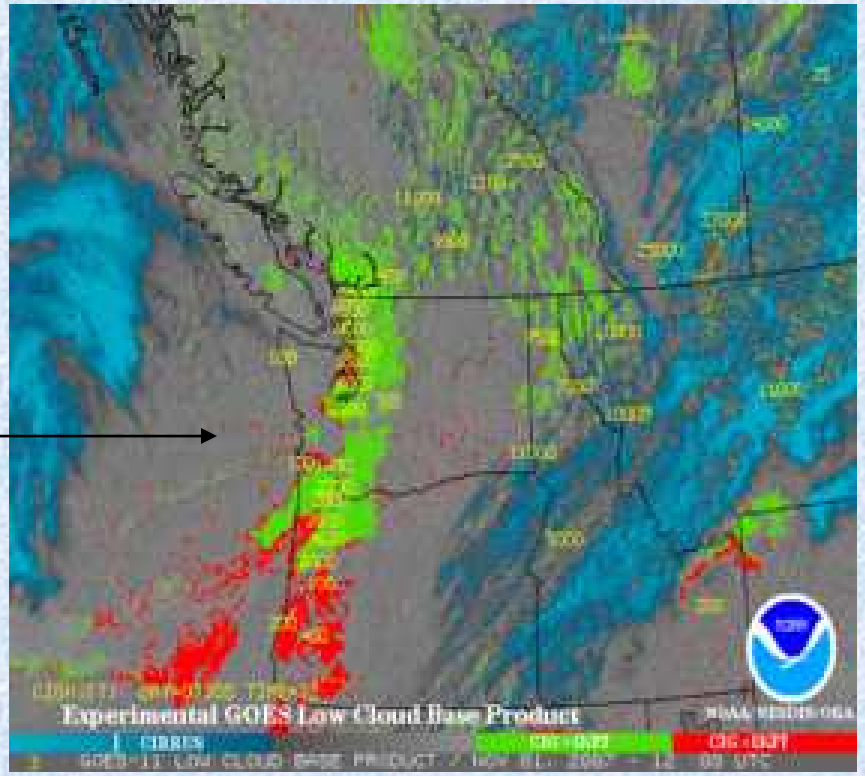
Overview

- Current research and product development includes applications of GOES imager and sounder data to detect and nowcast aviation weather hazards including:
  - Fog
  - Icing
  - Volcanic ash clouds
  - Downbursts and Microbursts

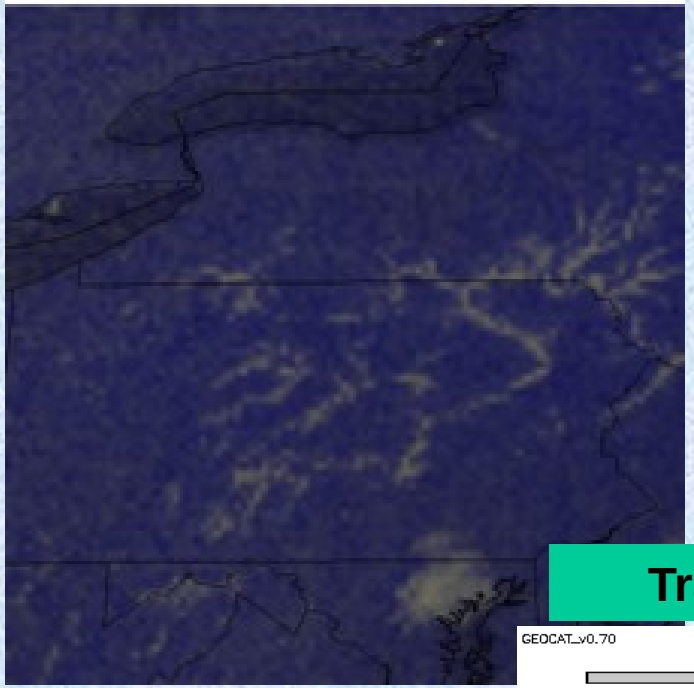
Fog Detection



Fog detection and low cloud base height algorithm



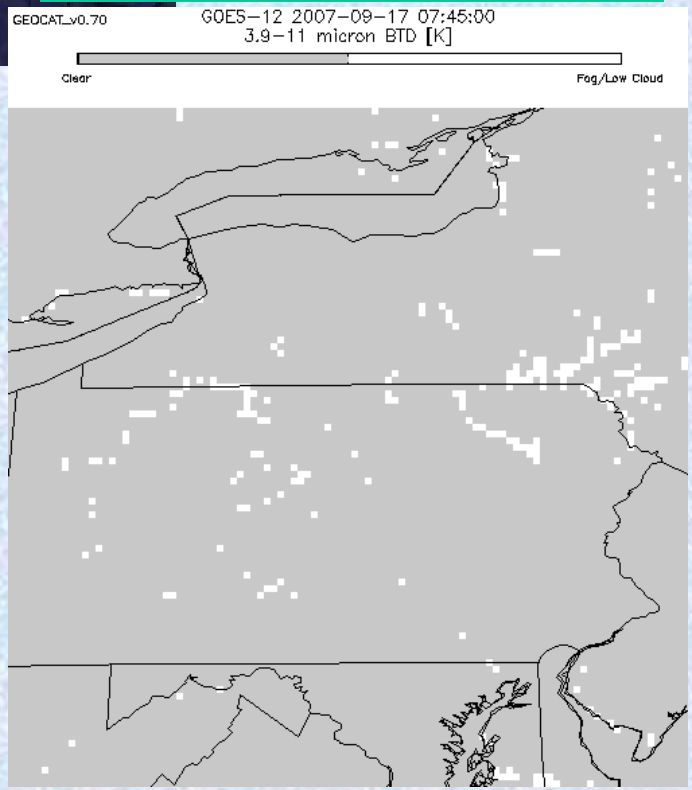
Output image product



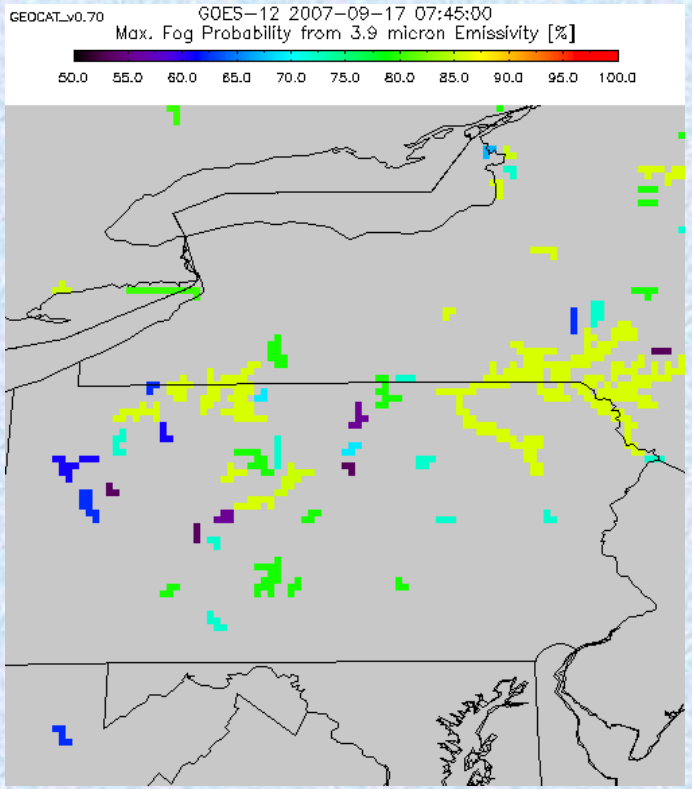
GOES-R Fog Detection: A New Approach

- **Traditional fog detection methodologies produce numerous false alarms and cannot accurately depict small-scale valley fog events**
- **A new cloud object-based probabilistic approach addresses these short-comings**

Traditional Method



New Method



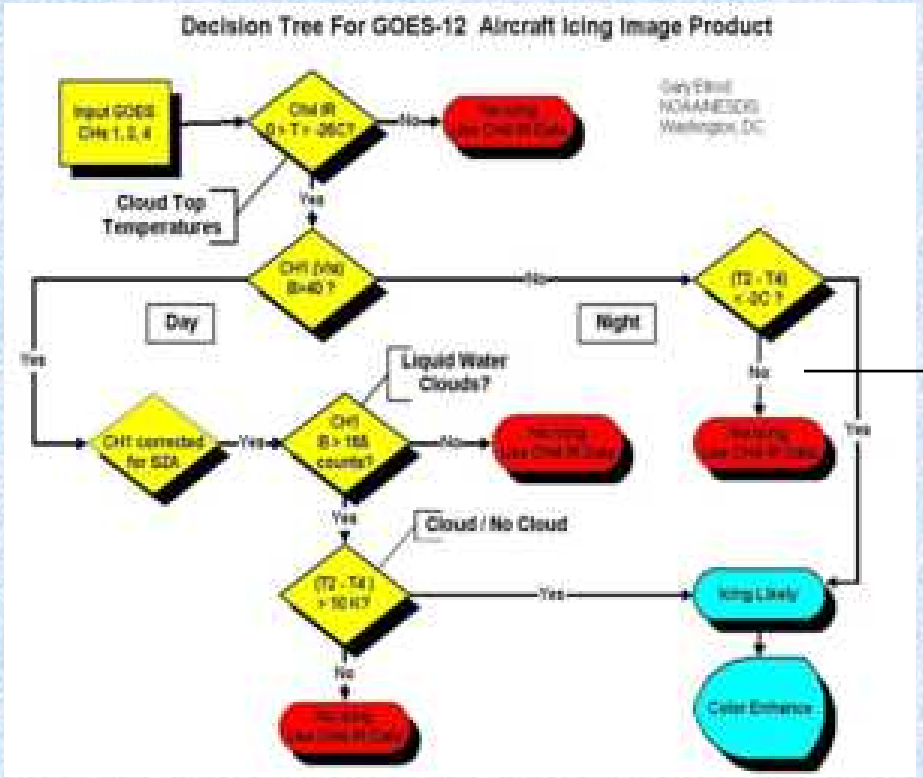
This new methodology can be applied to current GOES as well

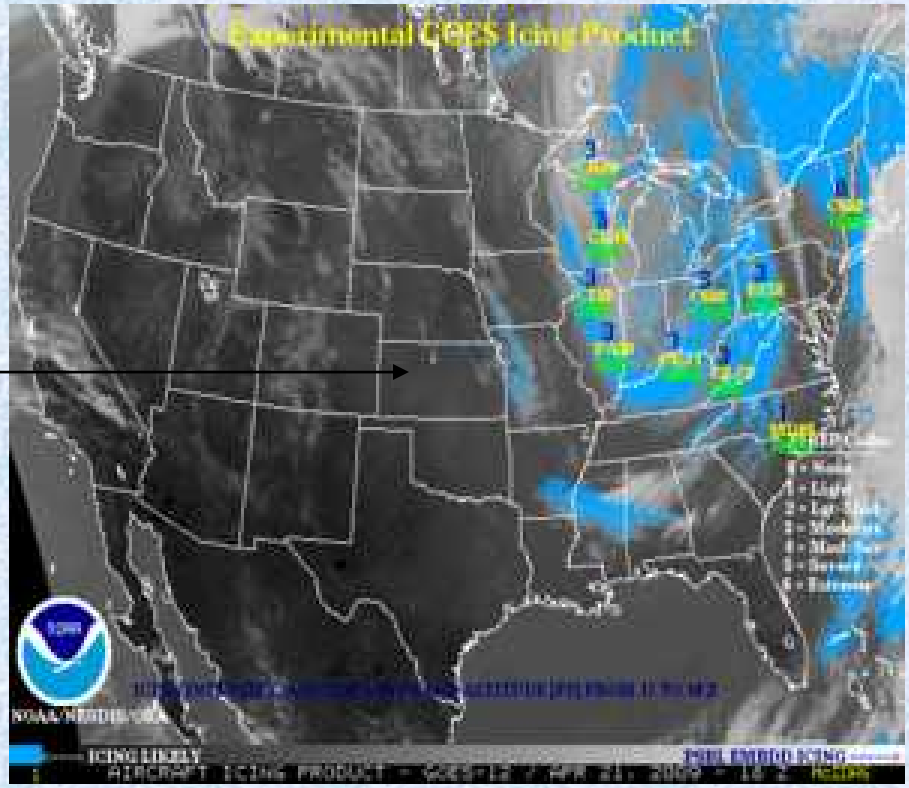
Credit: M. Pavolonis and C. Calvert

Aircraft Icing

- In-flight icing is the accretion of supercooled liquid water (SLW) on the airframe. This SLW can be in the form of cloud droplets or freezing rain/drizzle.

Icing Detection





Icing detection algorithm

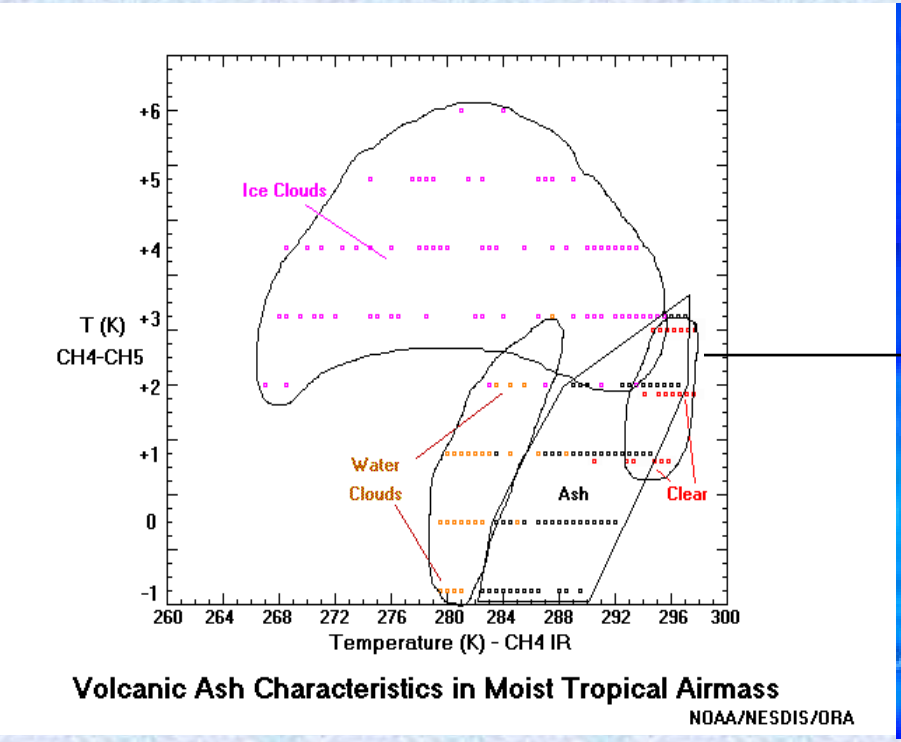
Output image product

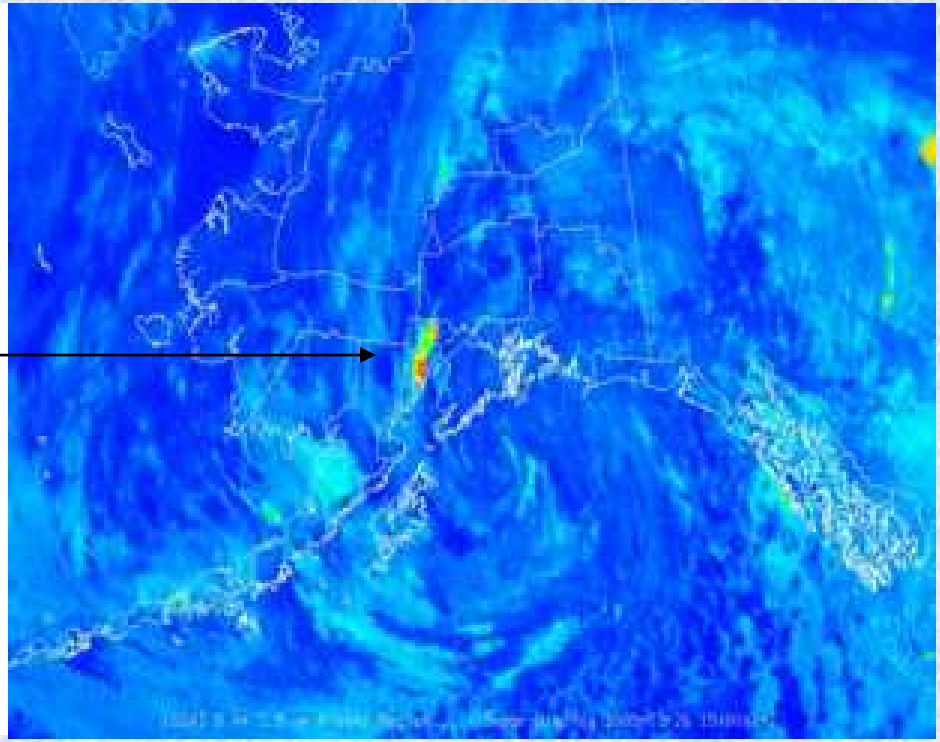
Volcanic Ash

- In addition to damaging the leading edge surfaces of aircraft, ash ingested into jet engines results in loss of performance, and possibly complete shutdown.

Mt. Redoubt, AK 1750 UTC 26 March 2009
Taken from Diamond Ridge near Homer, AK

Volcanic Ash Detection





Volcanic ash detection algorithm

Output image product

Automated Ash Cloud Warning and Retrieval System

- First ever satellite-based automated volcanic cloud warning and retrieval system
- This AVHRR-based system is being transitioned to NESDIS operations

Text Warning

Delete Reply Reply All Forward New Get Mail

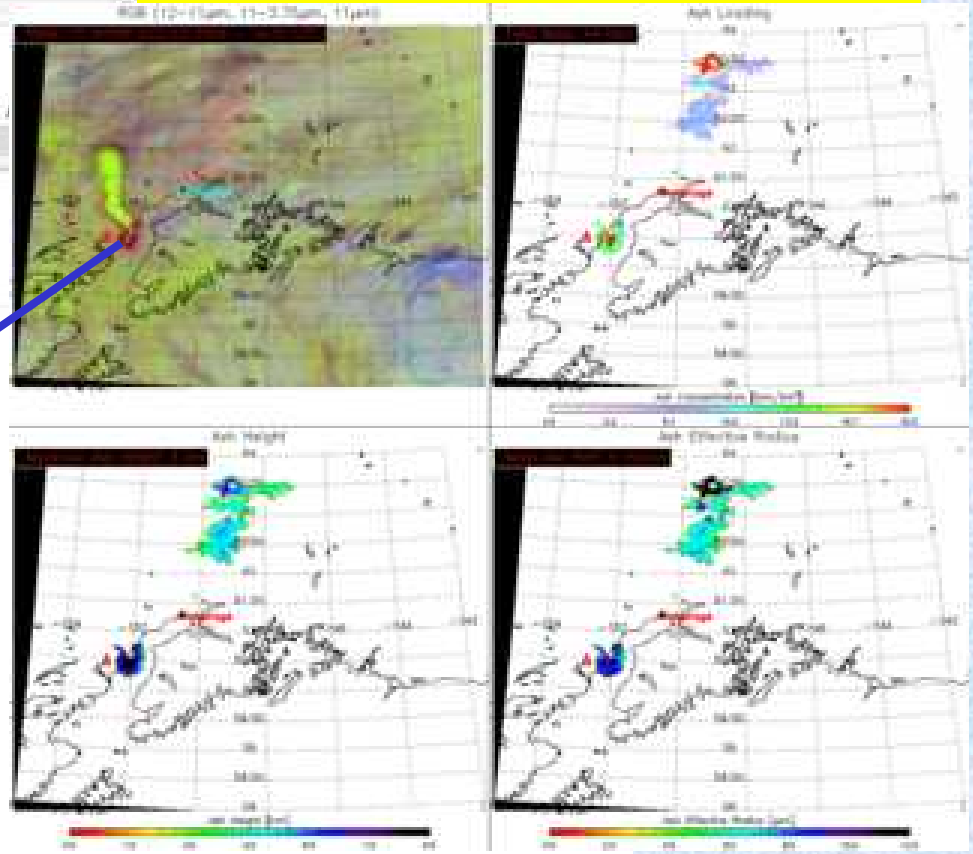
From	Subject
Matthew Sitkowski	Special Talk Today
Toni Sumner-Beebe	This Week in AOS
Zhaohui Cheng	wrap up for Cloud and volcanic
Mike Pavolonis	VOLCANIC CLOUD(S) FOUND

From: Mike Pavolonis
Subject: VOLCANIC CLOUD(S) FOUND
Date: November 2, 2009 10:20:22 AM CST
To: Mike Pavolonis

DATE: 3/23/2009
TIME: 13:27 UTC
SATELLITE: NOAA-18 AVHRR
L1B FILENAME: NSS.HRPT.NN.D09082.S1327.E1341.B1978787.GC

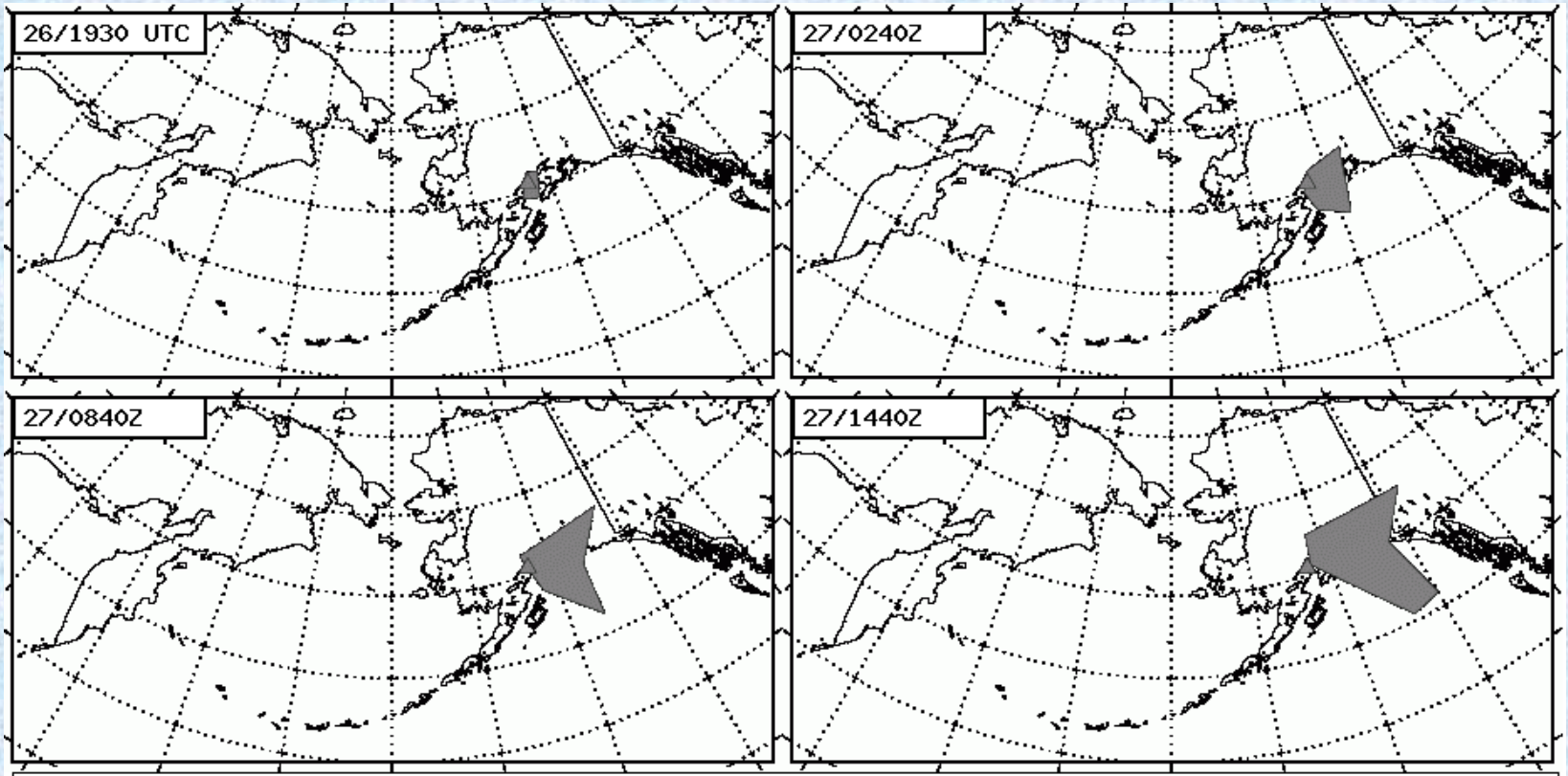
VOLCANIC ASH CLOUD FOUND
Radiative Center (Lat, Lon): 60.347, -152.057
Nearby Volcanoes:
Redoubt(40.73 km)
Iliamna(87.09 km)
Spurr(106.55 km)
Augustine(133.72 km)
Hayes(145.26 km)
False Alarm Potential: 8 out of 10073
Maximum Height: 8.6 km
Median Effective Radius: 9.58 micron
Total Mass: 2.12 ktons
Total Mass of Fine Ash: 0.00 ktons
Total AREA: 140.00 km^2

Product Quick-look



Credit: M. Pavolonis, J. Sieglaff, and A. Parker

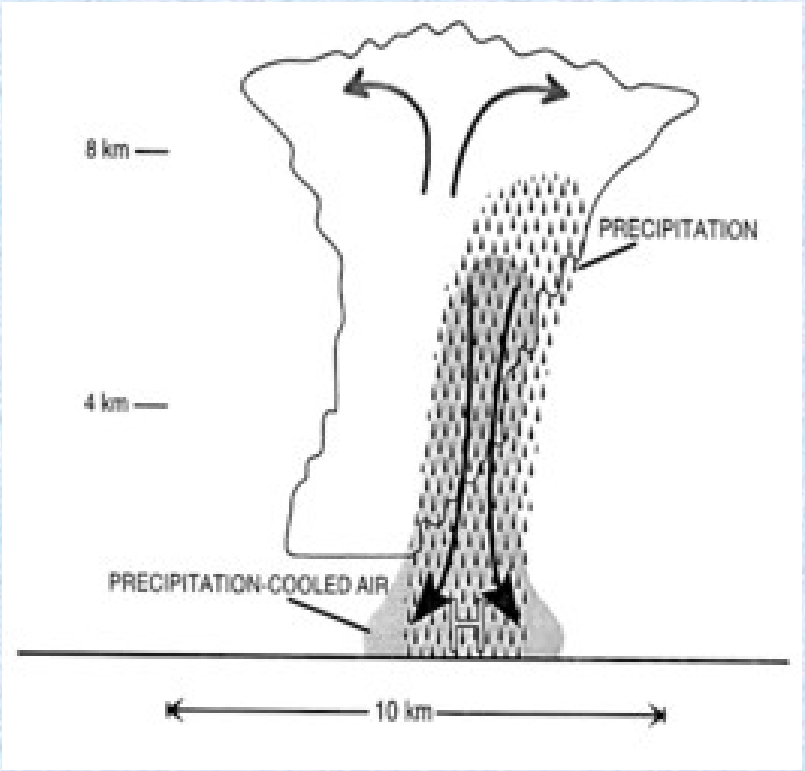
Volcanic Ash Detection



VOLCANIC ASH ADVISORY
DTG: 20090326/2040
VAAC: ANCHORAGE
VOLCANO: REDOUBT 1103-03
AREA: SOUTH CENTRAL ALASKA
SUMMIT ELEV: 10198ft (3109m)
ADVISORY NUM: 2009-18

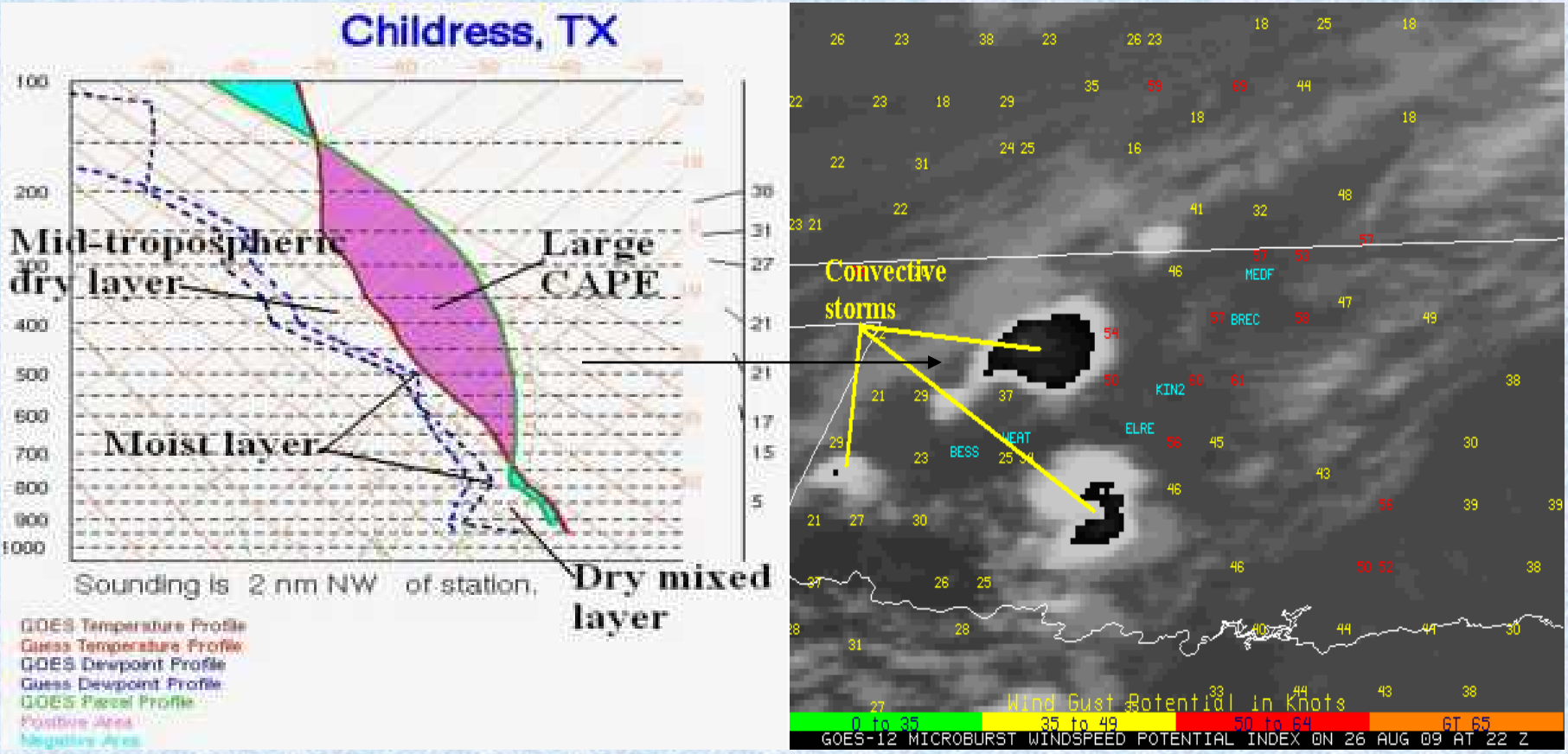
INFO SOURCE: POES/GOES/AVO/PILOT REPORT/RADAR
ERUPTION DEAILS: EXPLOSIVE ERUPTION AT 26/1724 UTC
REMARKS: LIGHT ASHFALL REPORTED AT HOMER BY TRUSTED OBSERVER.
NEXT ADVISORY: 20090327/0240Z

Downburst and Microburst Prediction

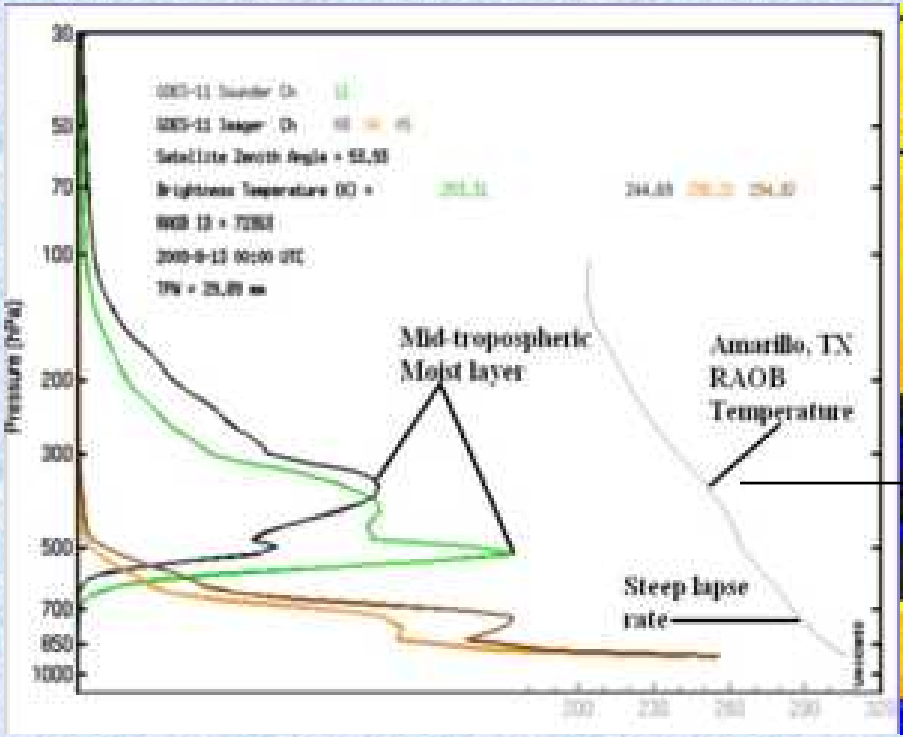


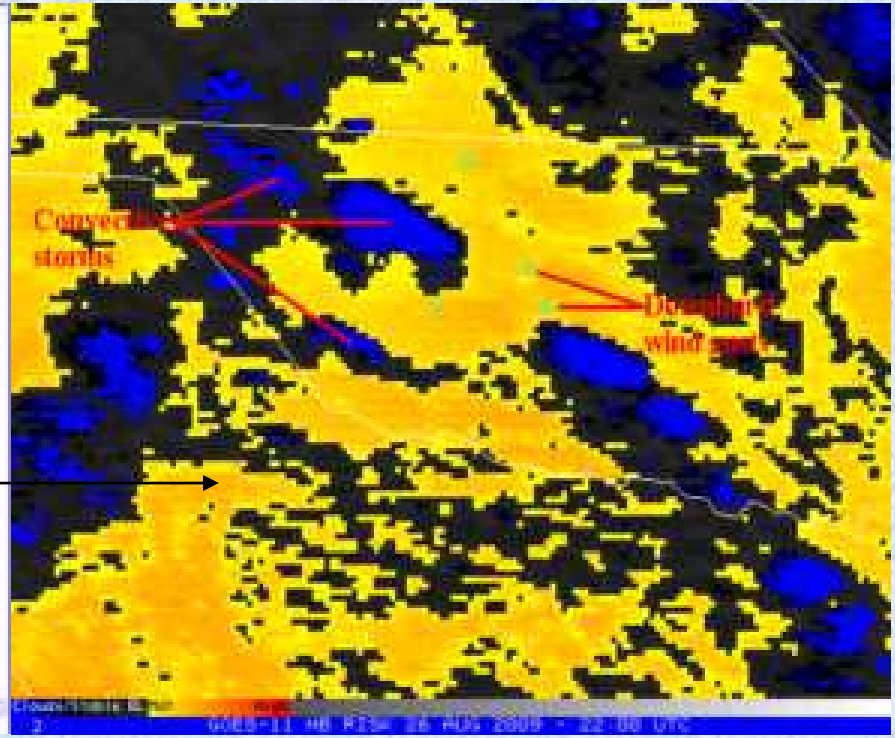
- Strong downdraft produced by a convective storm (or thunderstorm) that causes **damaging winds** on or near the ground.
- Due to the resulting **intense wind shear**, downbursts are a **hazard to aircraft** in flight, especially during takeoff and landing.

GOES Sounder Products



GOES Imager Product





Future NESDIS-CREST Collaboration

- Directed/guided student research:
  - Algorithm validation:
    - Learn and apply basic meteorological and remote sensing concepts, and research methods.
    - Understand and appreciate connection between research and operational utility of algorithms.
  - Technology transfer:
    - **Virtual Institute for Satellite Integration Training (VISIT) lessons, web-based tutorials, publication of research**
- Successful student mentorships can result in the accomplishment of both NESDIS and student research objectives:
  - Opportunities for professional growth for both NESDIS and the student.