



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

August 17, 2021

Specialist's Factual Report

METEOROLOGY

WPR21FA272

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A. ACCIDENT

Location: Dinsmore, California
Date: July 15, 2021
Time: 1154 Pacific daylight time (1854 UTC)¹
Aircraft: Type – Mooney M20J; Registration – N4474H

B. METEOROLOGIST

Mike Richards
Senior Meteorologist
Operational Factors Division (AS-30)
National Transportation Safety Board

C. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's meteorological specialist did not travel in support of this accident investigation and gathered all weather data remotely. Unless otherwise noted, all times are in Pacific daylight time (PDT) for July 15, 2021 (based upon the 24-hour clock), directions are referenced to true north, distances are in nautical miles and heights are above mean sea level (msl). The accident site was located at about: 40.492028° north latitude; 123.59822° west longitude at an elevation of about 2,390 feet.

This report provides information on the weather conditions and forecasts applicable to the accident time and location.

D. WEATHER INFORMATION

1.0 Synoptic Conditions

A western portion of the National Weather Service (NWS) Surface Analysis Chart for 1100 PDT is presented in figure 1. The surface analysis chart identified clear sky conditions across the accident region except for several coastal stations. The wind was calm or light from variable directions. High pressure of 1008 hectopascals (hPa) was noted in southeastern Oregon. Temperatures at interior stations in northern California were generally in the 80°s Fahrenheit (F) with temperature in 50°s observed along the coast. Dewpoint depressions at interior stations were generally between 30° and 40°F.

¹ UTC – abbreviation for Coordinated Universal Time

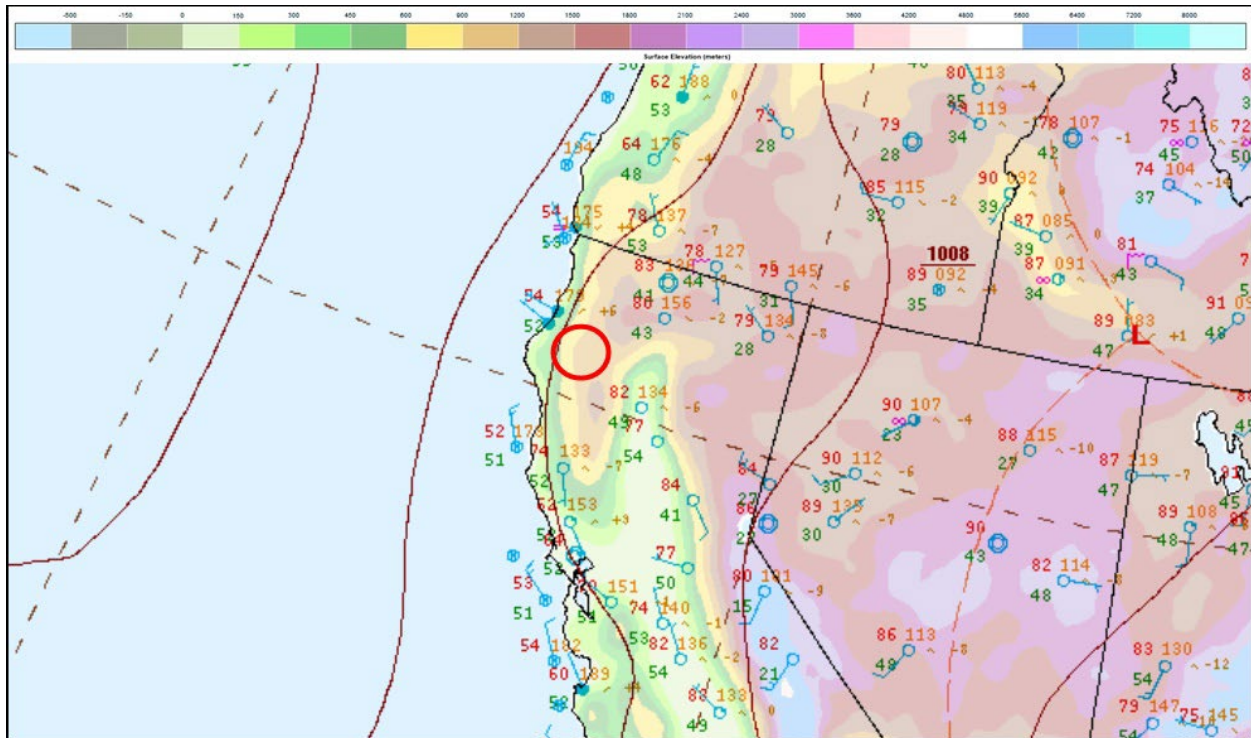


Figure 1 - NWS Surface Analysis Chart for 1100 PDT. Accident location is inside the red circle.

2.0 Surface Observations

Unofficial meteorological reporting station MDDC1 (data courtesy of MesoWest²) was located about 4 miles southeast of the accident site at an elevation of about 2,875 feet. Type, calibration, maintenance, and siting of this station, as well as the overall quality of the data, are not known. Reporting of certain parameters³ from MDDC1 (rounded to nearest whole numbers) during the times surrounding the accident time are presented here (time in PDT). At 1153 PDT, MDDC1 reported a wind from 322° at 1 knot with gusts to 6 knots.

Time	Temp	D Temp	RH	W Mag	W Dir	G Mag
0953	78	52	41	1	140°	3
1053	80	52	38	3	265°	5
1153	85	51	31	1	322°	6
1253	87	53	31	2	320°	7
1353	88	52	29	2	313°	10

² <https://mesowest.utah.edu>

³ Temp=temperature (°Fahrenheit[F]); D_Temp=dew point temperature (°F); RH=relative humidity (%); W_Mag=average wind magnitude (knots); W_Dir=average wind direction (true); G_Mag=gust wind magnitude (knots).

3.0 HRRR Model Sounding

A High-Resolution Rapid Refresh (HRRR) model⁴ sounding (figure 2) for the accident site at 1100 PDT using an elevation of about 2,390 feet was retrieved from the National Oceanic and Atmospheric Administration's Air Resources Laboratory. Below 3,000 feet the wind was from the west at between 7-9 knots. The relative humidity was below 50 percent for the entire atmosphere below 15,000 feet.

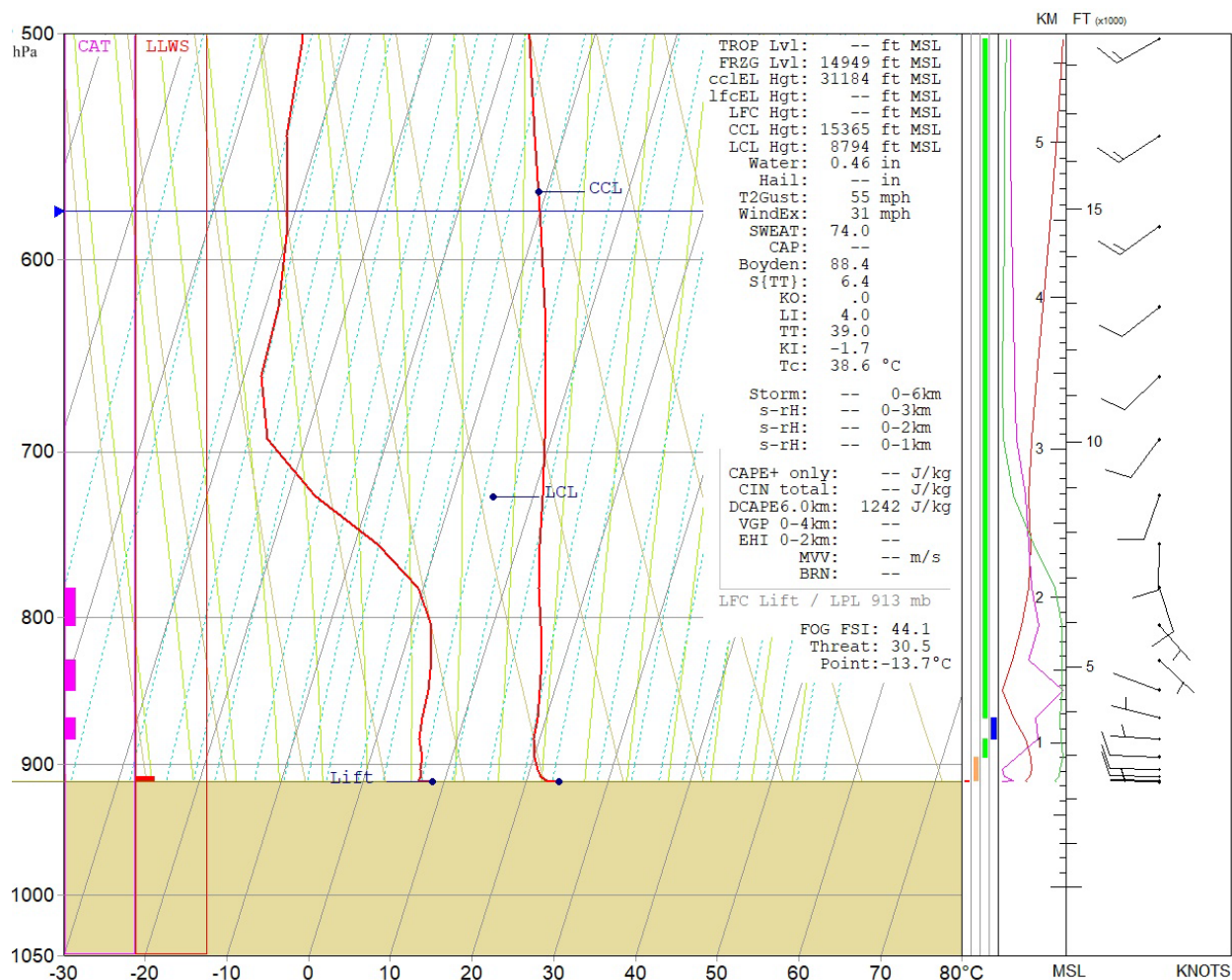


Figure 2 – HRRR model sounding data in SkewT/LogP format for 1100 PDT at the accident site, surface to 250 hPa.

⁴ The HRRR is a NOAA real-time three-kilometer resolution, hourly-updated, cloud-resolving, convection-allowing atmospheric model, initialized by three-kilometer grids with three-kilometer radar assimilation. Radar data is assimilated in the HRRR every 15 minutes over a one-hour period.

4.0 Pilot Reports

There were no publicly longline-disseminated pilot reports⁵ (PIREPs) within 50 miles of the accident location between 1000 and 1400 PDT.

5.0 Weather Radar

WSR-88D⁶ Level-II base reflectivity weather radar imagery from the Eureka, California, site (KBHX) is presented in figure 3. KBHX was located approximately 32 miles west of the accident location at an elevation of about 2,525 feet. Assuming standard refraction and considering the 0.95° beam width⁷ for the WSR-88D radar beam, the KBHX 0.527° tilt would have “seen” altitudes above the accident location of between about 3,400 and 6,600 feet above msl. Areas of light reflectivity were seen around the accident location, in patterns consistent with the high terrain. A loop of the radar imagery at this time revealed these areas of reflectivity to be “standing” and not moving in time, consistent with returns produced by the terrain.

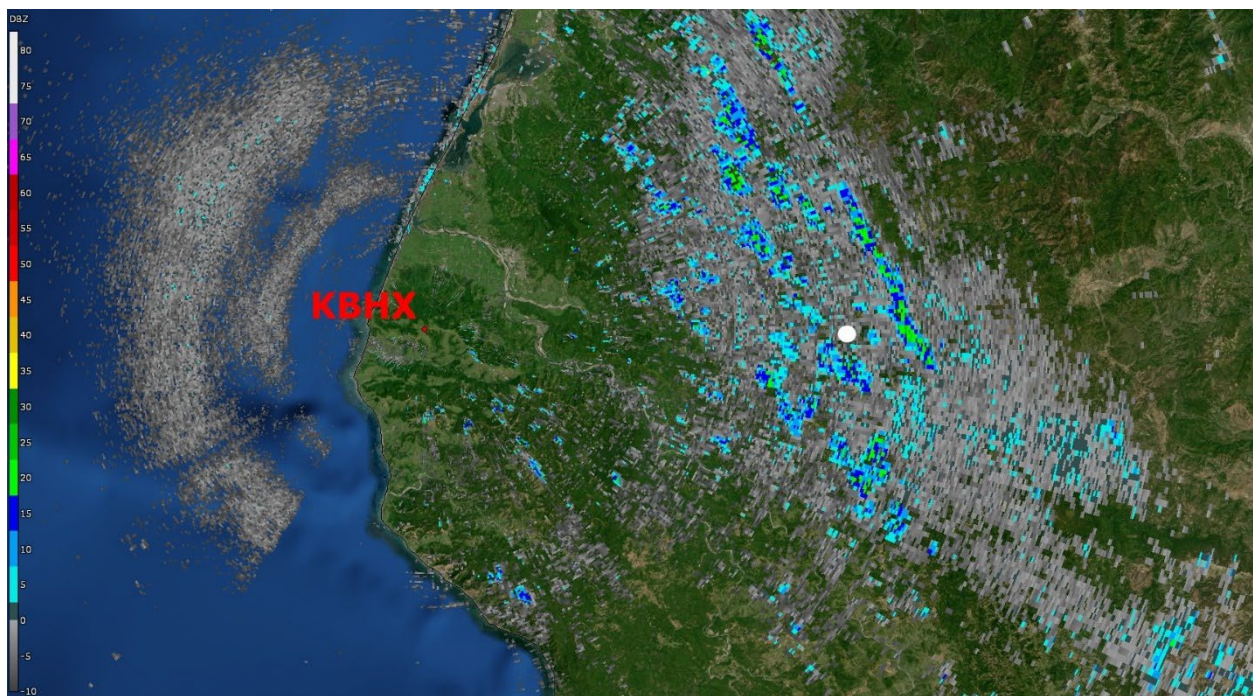


Figure 3 – KBHX 0.527° Level-II base reflectivity product from a sweep initiated at 1155 PDT. Accident location marked by the white circle.

⁵ These do not include pilot reports only broadcast via radio.

⁶ Weather Surveillance Radar 88 Doppler (WSR-88D)

⁷ Here we define the angular width of the radar beam as the region of transmitted energy that is bounded by one-half the maximum power. The maximum power lies along the beam centerline and decreases outward from the radar antenna.

6.0 Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-17 visible ($0.64\mu\text{m}$) and infrared ($10.3\mu\text{m}$) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. Images from 1151 PDT are presented in figures 4 and 5. Infrared cloud-top temperatures over the accident site were 25°C .

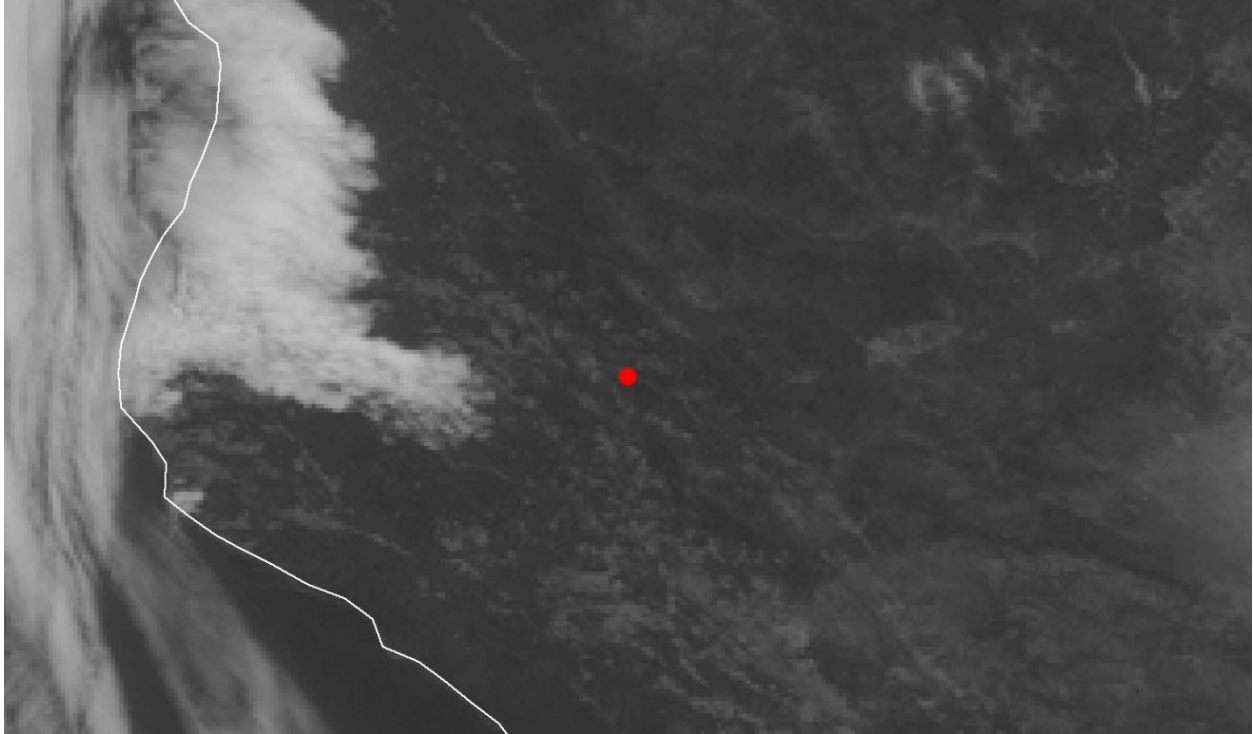


Figure 4 – GOES-17 visible imagery from 1151 PDT. Accident location denoted by red dot. Image is not corrected for parallax error.

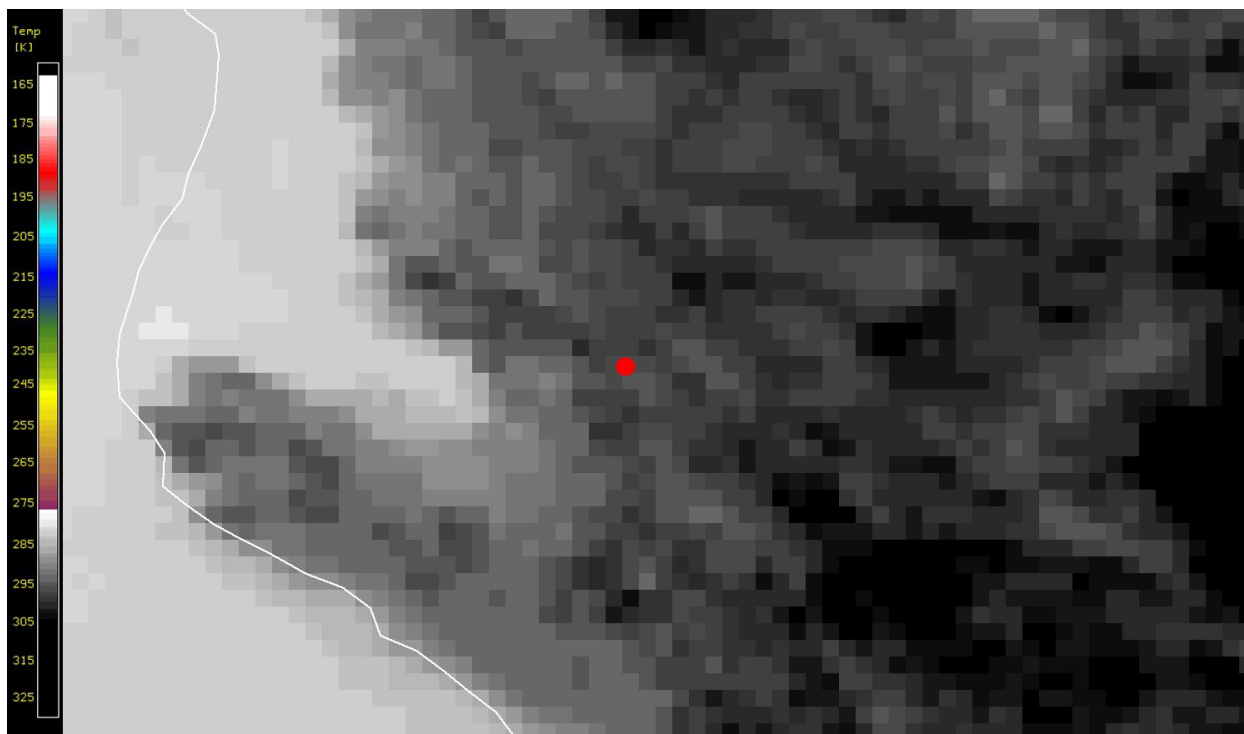


Figure 5 – GOES-17 infrared imagery from 1151 PDT. Accident location denoted by red dot. Image is not corrected for parallax error.

7.0 Area Forecast Discussion

The NWS Eureka, California, Weather Forecast Office (WFO) issued the following “Aviation” section of an Area Forecast Discussion at 0431 PDT.

*FXUS66 KEKA 151131
AFDEKA
AREA FORECAST DISCUSSION
National Weather Service Eureka CA
431 AM PDT Thu Jul 15 2021*

.Aviation...The marine layer has continue to deepen along the coast north of Cape Mendocino this morning and is now around 3000 feet. This has kept ceilings from dropping much this morning, although conditions are still IFR to LIFR. This afternoon models are showing much of the Del Norte coast clearing out, however the models have been overdoing this clearing quite a bit recently so have left the clouds in the forecast for the afternoon. The Humboldt coast is also expected to remain cloudy. The stratus is pushing north up the Russian River Valley, but the layer doesn't look deep enough to allow it to get into Ukiah this morning. Tonight the marine layer is expected to remain nearly the same or continue to deepen. This may eventually allow clouds to get into Ukiah late tonight. MKK

8.0 AIRMETs

There were no Airmen's Meteorological Information (AIRMET) advisories valid for the accident site at the accident time.

9.0 SIGMETs

There were no convective or non-convective Significant Meteorological Information (SIGMET) advisories active for the accident location at the accident time.

10.0 CWSU Products

There were no Center Weather Advisories or Meteorological Impact Statements issued by the NWS Center Weather Service Units (CWSU) at the Seattle and Oakland Air Route Traffic Control Centers that were active for the accident location at the accident time.

11.0 WRF Data

A Weather Research and Forecasting Model (WRF) simulation was run to model the weather conditions surrounding the time of the accident using initialization data from the GFS4.⁸ WRF ARW (Advanced Research WRF core) version 4.1.2 was run with 3 domains with horizontal grid spacing of 8 kilometers, 1.6 kilometers, and 320 meters over the accident site. Other WRF simulation parameters included: 60 vertical levels, the multi-scale Kain-Fritsch cumulus parameterization scheme used on the outer domain, a Lin et al. microphysics scheme, a Yonsei University boundary layer scheme, Noah land surface physics, the Dudhia scheme used for short wave radiation and the RRTM scheme for the long wave radiation. Figure 8 presents the terrain considered by the model (domain 3).

WRF output (figures 6 and 7) indicate that around the accident location at about the accident time the wind was from the west between about 14-17 knots at 910 hPa (about 100 feet agl according to the thermodynamic profile established by the HRRR model sounding).

⁸ <https://nomads.ncdc.noaa.gov/data/gfs4/>

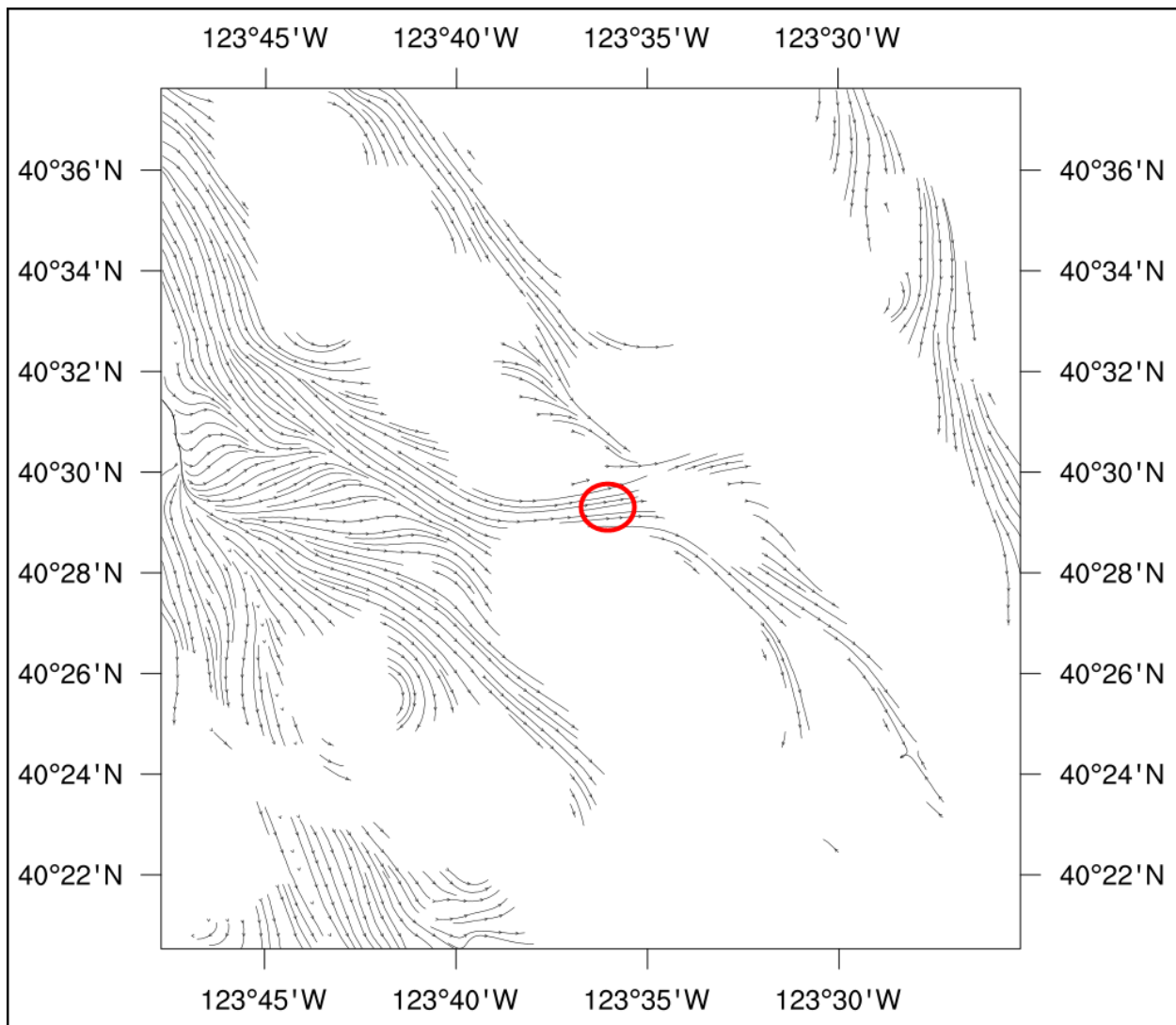


Figure 6 – WRF streamlines on the constant pressure surface of 910 hPa (about 100 feet agl according to the HRRR model sounding) at 1150 PDT. Accident location denoted by the red circle.

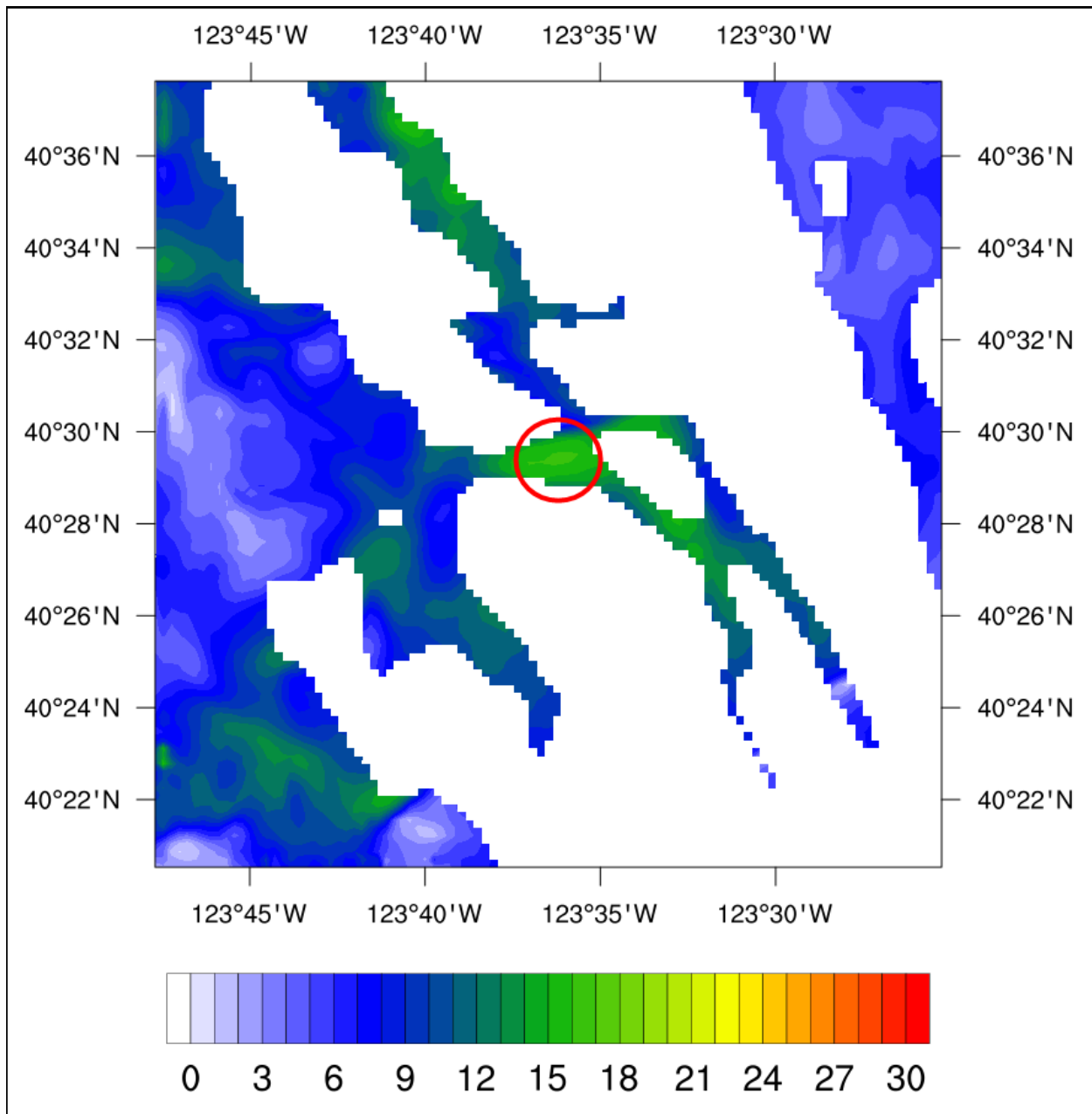


Figure 7 – WRF wind magnitudes (in knots) on the constant pressure surface of 910 hPa (about 100 feet agl according to the HRRR model sounding) at 1150 PDT. Accident location denoted by the red circle.

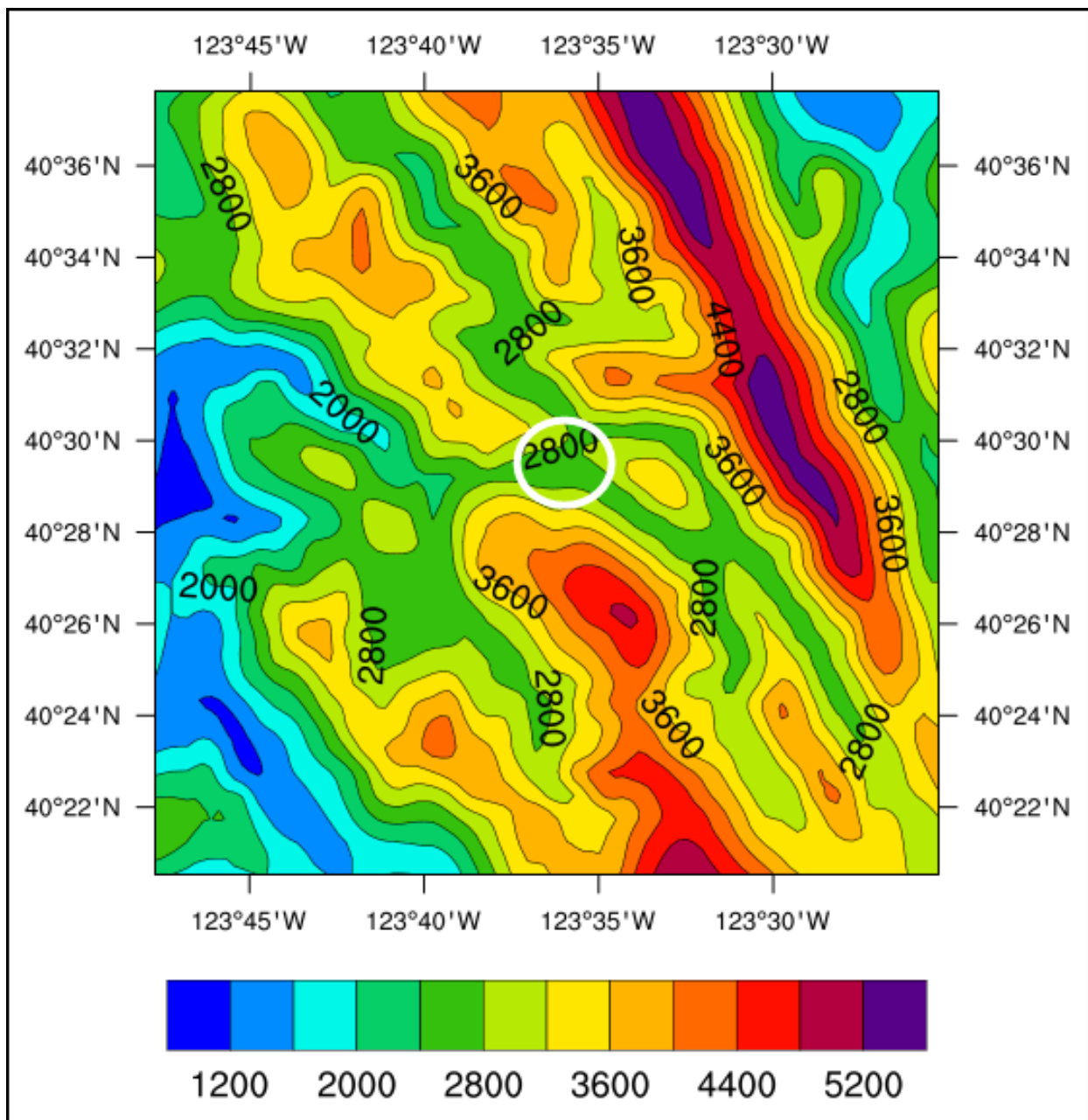


Figure 8 – WRF plan view plot of terrain considered by the model (domain 3) in creation of data plotted in figures 6 and 7. Accident location is denoted by the white circle.

Submitted by:

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