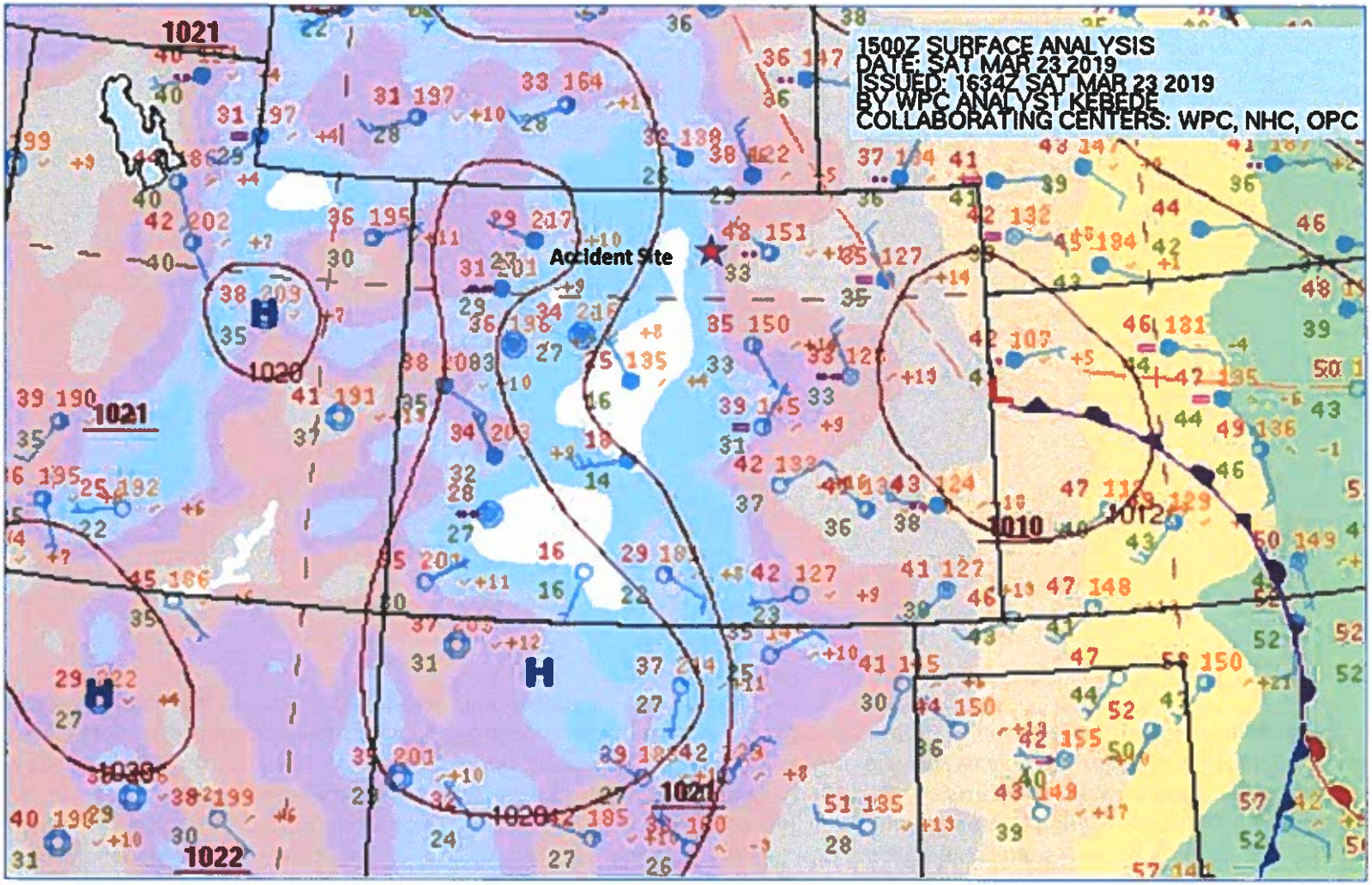
Bowling David

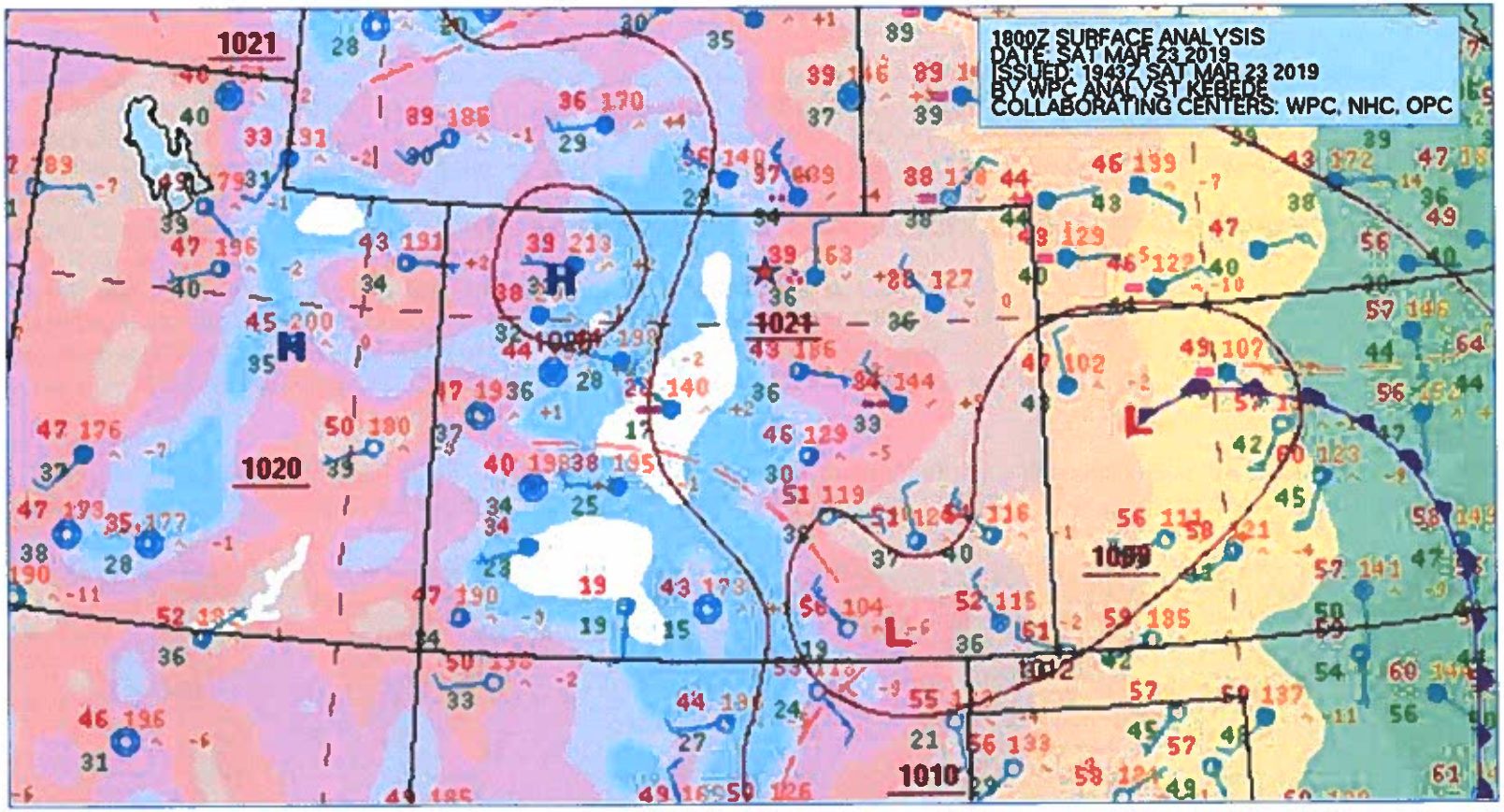
From: Eick Donald
Sent: Tuesday, June 25, 2019 7:46 AM
To: Bowling David
Cc: Helson David; Frantz Marvin
Subject: CEN19FA107 - Loveland, Colorado Weather Brief

Weather Conditions surrounding Loveland, CO, on March 23, 2019

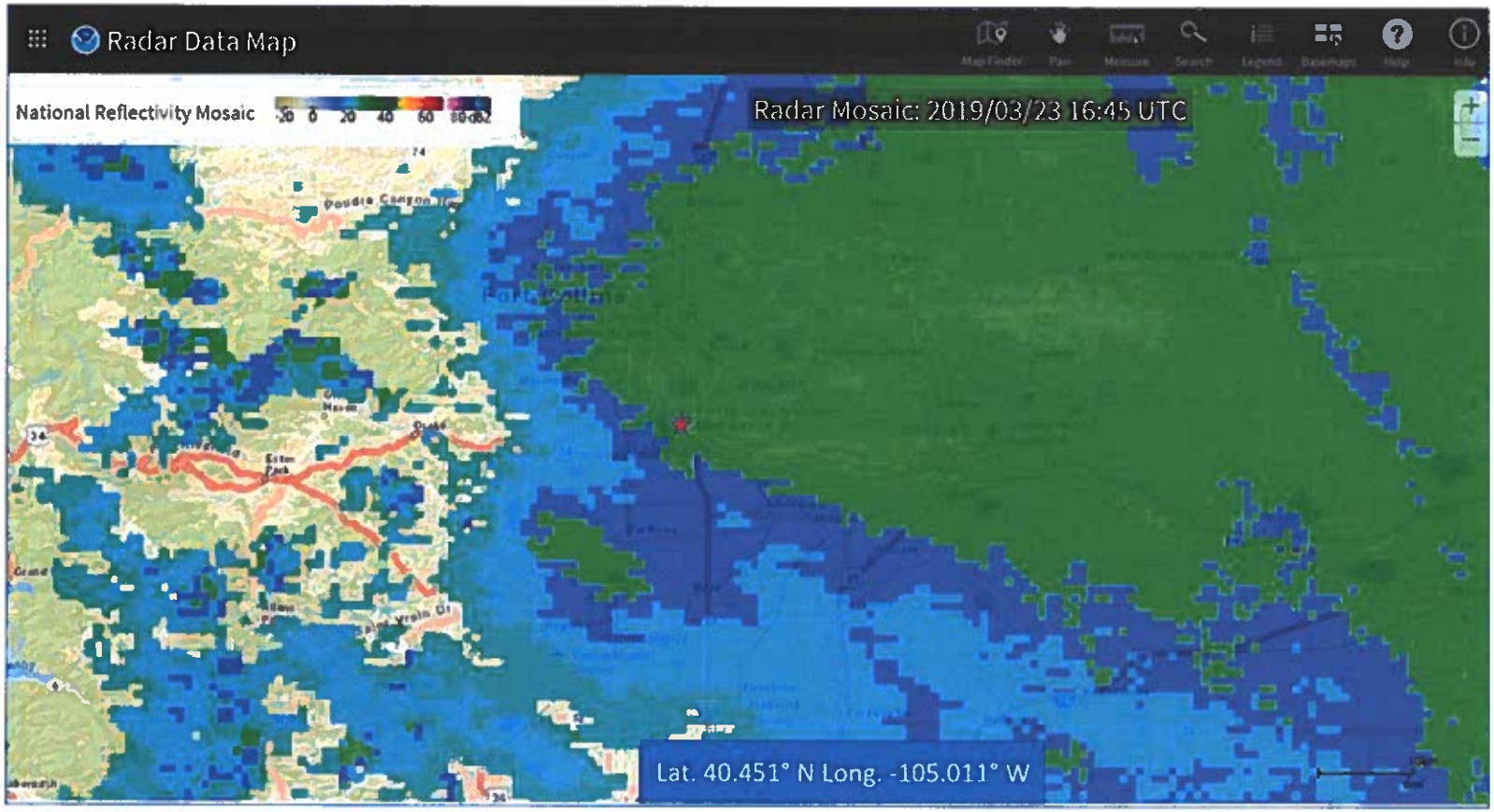
Synoptic conditions – The NWS Surface Analysis Chart for 0900 MDT (1500Z) with topography features is included below and depicted a low pressure system at 1010-hectopascals (hPa) over the Colorado and Kansas border associated with an occluded frontal system. A secondary trough of low pressure extended from the low to the northwest across northeast Colorado into eastern Wyoming. Several high pressure systems were noted at 1021-hPa over Utah and northern New Mexico. The accident site was located on the cold air side of the front in an area of relatively weak pressure gradient. The station model for Greeley, CO, immediately east of the accident site indicated northwest wind of 5 knots, light rain, broken clouds, temperature 42° Fahrenheit (F), dew point 33° F. Multiple stations surrounding the area reported fog, mist, or snow.



The next chart at 1200 MDT (1800Z) depicted the winds veering to the north at Greeley with moderate rain and to the east in the Denver area.



The NWS National Composite Radar Mosaic for 1045 MDT is included and depicted a large band of echoes near 30 dBZ associated with light rain over the area which extended eastward associated with the occluded front.



Observations – Northern Colorado Regional Airport (KFNL), Fort Collins/Loveland, CO, has an elevation of 5,016 ft, and a magnetic variation of 9° E. The airport has an Automated Weather Observation System (AWOS) which is not augmented by any human observers. The raw observations surrounding the period were as follows:

METAR KFNL 231256Z AUTO 20006KT 10SM OVC075 03/02 A2989 RMK AO2 SLP120 T00330017=
METAR KFNL 231356Z AUTO 18008KT 10SM OVC060 04/02 A2991 RMK AO2 SLP126 T00390017=
METAR KFNL 231456Z AUTO 20006KT 10SM BKN050 OVC060 04/02 A2992 RMK AO2 SLP129 T00440017 53012=
METAR KFNL 231556Z AUTO 20007KT 10SM OVC050 05/02 A2992 RMK AO2 SLP124 T00500022=
Accident 1643Z
METAR KFNL 231656Z AUTO 17011KT 10SM -RA FEW016 BKN038 OVC048 06/02 A2993 RMK AO2 RAB50 SLP127 P0000 T00560022=
Windshift from south to east
METAR KFNL 231756Z AUTO 09008G19KT 10SM -RA BKN037 OVC046 07/01 A2993 RMK AO2 SLP129 P0000 60000 T00670006 10072 20033 53004=
METAR KFNL 231856Z AUTO 08016G19KT 10SM -RA BKN039 OVC048 07/01 A2992 RMK AO2 RAE27B45 SLP124 P0000 T00670011=
SPECI KFNL 231952Z AUTO 10015KT 10SM FEW036 SCT045 OVC055 08/02 A2992 RMK AO2 WSHFT 1932 RAE41 P0000=
METAR KFNL 231956Z AUTO 10014KT 10SM FEW040 OVC055 07/02 A2992 RMK AO2 WSHFT 1932 RAE41 SLP121 P0000 T00720017=

METAR KFNL 232056Z AUTO 29004KT 10SM SCT049 OVC060 08/00 A2992 RMK AO2 SLP123 60000 T00830000 53000=

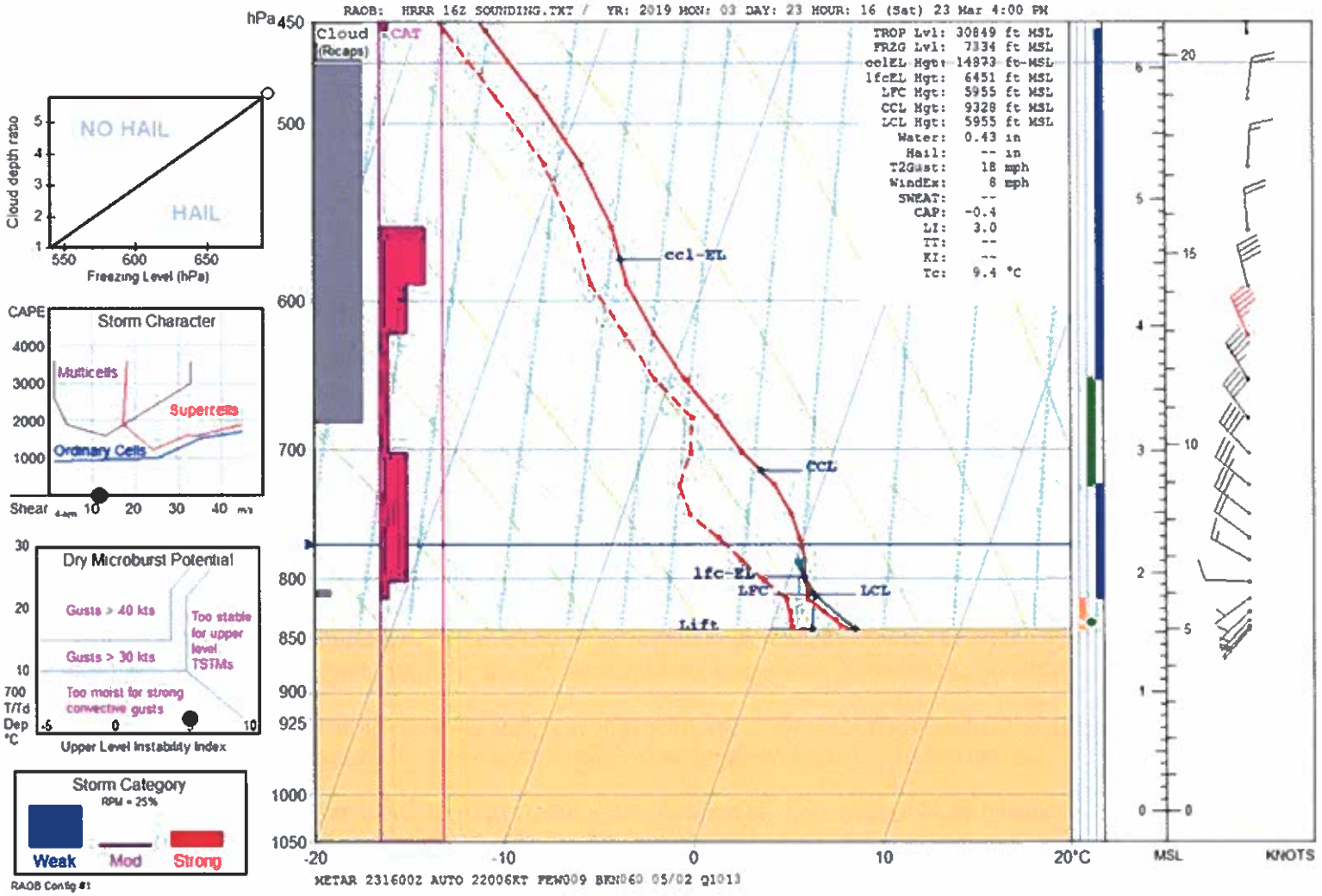
The observations indicated that VFR conditions prevailed during the period with a ceiling overcast at 5,000 ft agl was reported prior to the accident with rain showers beginning officially at 1650Z with gradually lowering ceiling to 3,800 ft agl. A wind shift was recorded immediately after the accident with winds shifting from the south to the east with wind gusts to 19 knots. No peak wind gusts were noted to mark any microburst type activity over the airport during the period, but the shift suggested some form of outflow from the area of precipitation.

The next closest weather reporting location to the accident site was from Greeley-Weld County Airport (KGXY) located approximately 18 miles east of KFNL at an elevation of 4,697 ft. The airport had an AWOS which reported the following conditions:

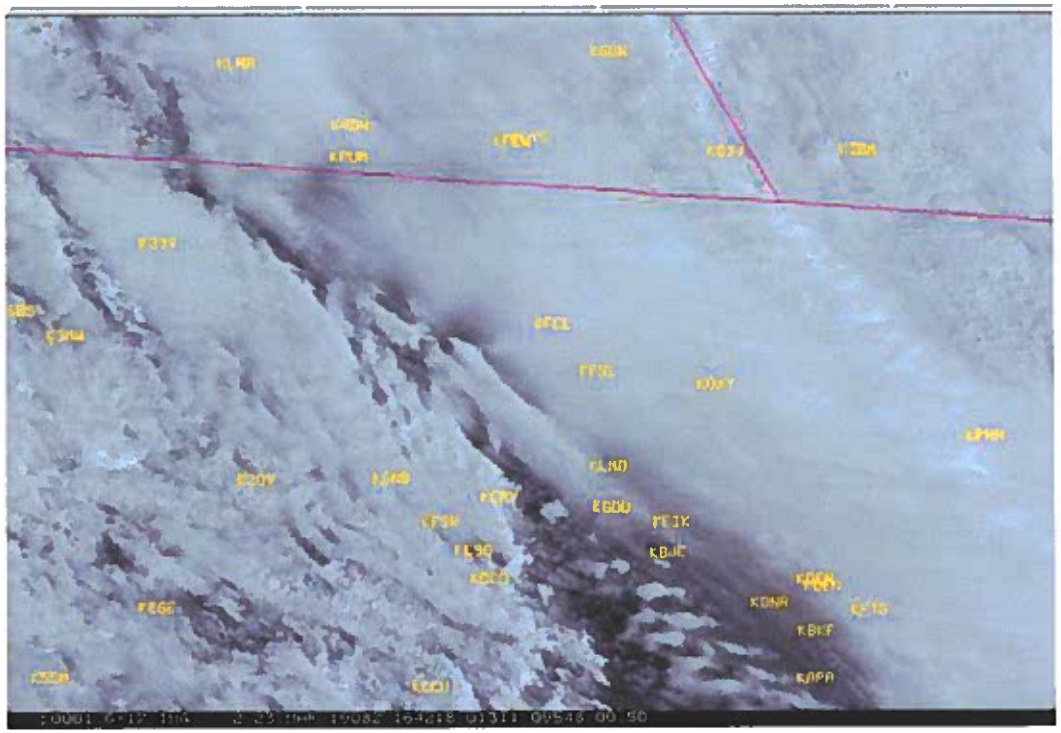
METAR KGXY 231456Z AUTO 31003KT 10SM -RA BKN022 BKN028 06/01 A2993 RMK AO2 SLP151 P0000 60000 T00560006 53015
METAR KGXY 231556Z AUTO 12004KT 10SM CLR 06/02 A2993 RMK AO2 RAE37 SLP149 P0000 T00610022
METAR KGXY 231656Z AUTO 33019KT 8SM -RA FEW015 SCT029 BKN034 06/01 A2995 RMK AO2 WSHFT 1640 RAB11 SLP153 P0000 T00560011
SPECI KGXY 231700Z AUTO 33020G27KT 8SM -RA FEW015 BKN027 OVC034 06/01 A2995 RMK AO2 PK WND 32027/1658 WSHFT 1643 P0000
METAR KGXY 231756Z AUTO 36012KT 10SM RA OVC019 04/02 A2996 RMK AO2 PK WND 32027/1658 WSHFT 1643 SLP163 P0005 60005
T00390022 10072 20039 53009
METAR KGXY 231856Z AUTO 01016G23KT 10SM -RA OVC025 04/02 A2996 RMK AO2 SLP159 P0003 T00440022
METAR KGXY 231956Z AUTO 01014G21KT 10SM -RA SCT027 BKN033 06/03 A2995 RMK AO2 SLP153 P0001 T00560028

At Greeley the light southerly wind shifted to the northwest around the time of the accident with gusts to 27 knots, and again suggested some form of outflow from the precipitation area and interacting with the upper level winds. No strong convection was noted on radar over the area during the period, with VFR to MVFR conditions during the period in light rain.

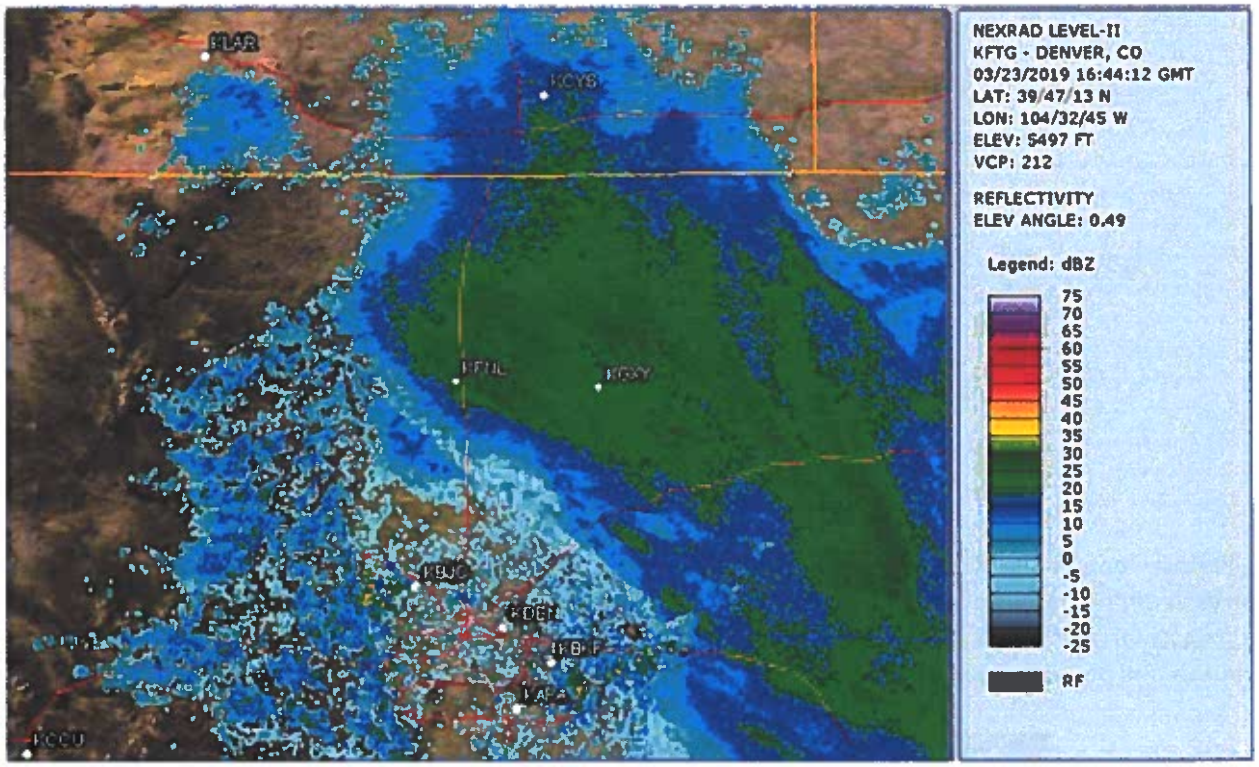
Sounding – a High Resolution Rapid Refresh (HRRR) numerical model sounding was obtained from archive data and plotted over the airport for 1000 MDT. The sounding indicated a conditional unstable atmosphere below 12,000 ft that supported weak convective activity. The sounding indicated a surface temperature of 4.5° C (40° F), a dew point of 2.2° C (36° F), with a relative humidity of 85%. The sounding did not support wet or dry microburst activity, and only weak convection. The wind profile indicated surface wind from the 220° at 6 knots with wind veering to the northwest and north through 15,000 ft with increasing wind speeds with height. The mean 0 to 6 kilometer or 18,000 ft wind was from 335° at 24 knots. The sounding did not depict any boundaries that would explain the easterly wind component reported after the accident. The sounding did support downdraft activity with the northwest to northerly flow above 8,000 ft over the mountains immediately west of the area.



Satellite Imagery – the GOES-17 visible image for 1042 MDT is attached and depicted an extensive layer of clouds over the area. The smooth and laminar clouds suggest some topographical interaction and mountain wave conditions over the area during the period.



Radar Imagery – the NWS Denver (KFTG) WSR-88D base reflectivity imagery was downloaded and examined for any signs of wind shear over the area or any other strong convection typically associated with microburst activity. The image below is the lowest 0.5 base reflectivity image for 1044 MDT (1644Z) which depicted echoes of 30 dBZ over the accident site with no significant change in winds noted on the base velocity data. No divergent couplets or high reflectivity cores were observed over the area to verify any microburst activity, just stratified precipitation. The echoes were moving east-southeast with time.



NWS Forecasts – no Terminal Aerodrome Forecasts (TAFs) are issued for KFNL or KGXY. The closest TAF was issued for Bloomfield/Jeffco Airport 32 miles south of KFNL, and was as follows:

TAF KBJC 231139Z 2312/2412 11005KT P6SM BKN080 OVC110
FM231500 32011KT P6SM SCT080 BKN120
FM232200 34011KT P6SM SCT060 SCT100
FM240500 25007KT P6SM FEW100 SCT250=

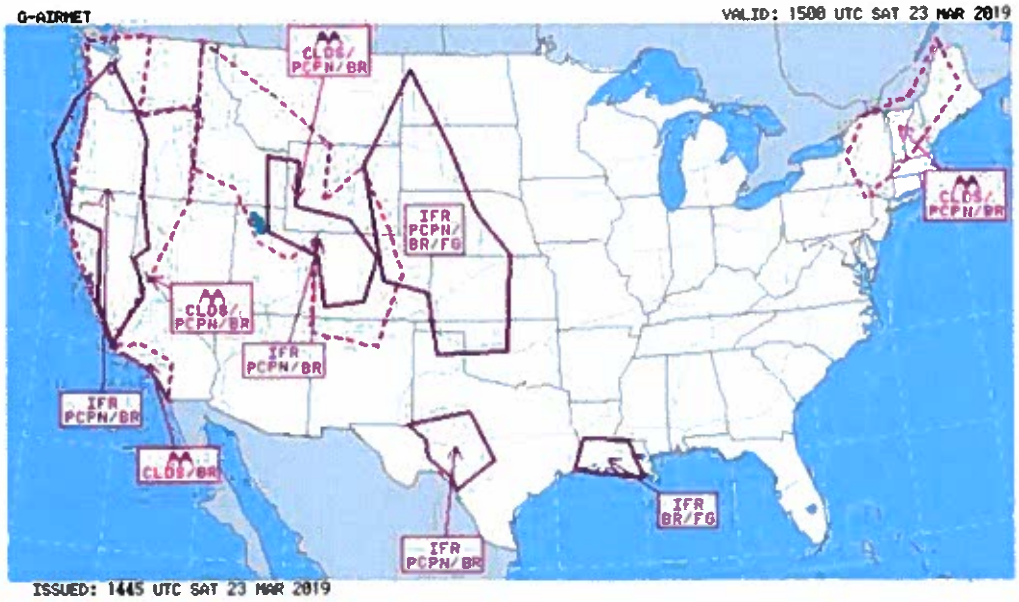
The forecast winds aloft data during the period were as follows:

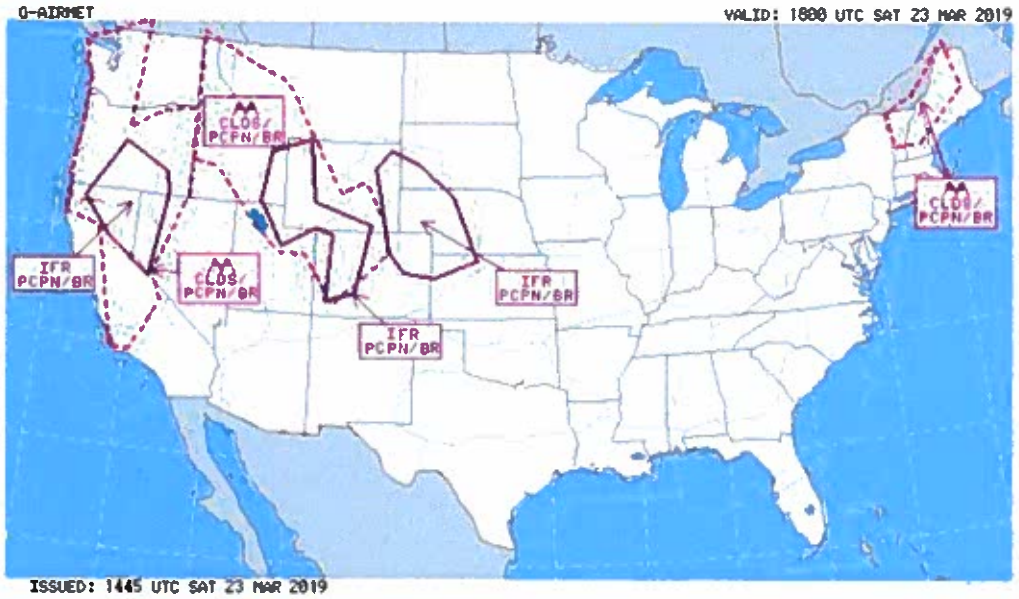
WINDS ALOFT FORECASTS
DATA BASED ON 231200Z
VALID 231800Z FOR USE 1400-2100Z. TEMPS NEG ABV 24000

FT	*3000*	*6000*	*9000*	*12000*	*18000*	*24000*	*30000*	*34000*	*39000*
PUB			*3121+00*	*3322-07*	*3026-22*	*3031-34*	*308544*	*307453*	*293952*
DEN			*3133-01*	*3338-08*	*3326-21*	*3327-34*	*313447*	*314351*	*292751*
ALS				*3124-08*	*3140-20*	*3049-31*	*296046*	*297754*	*285754*

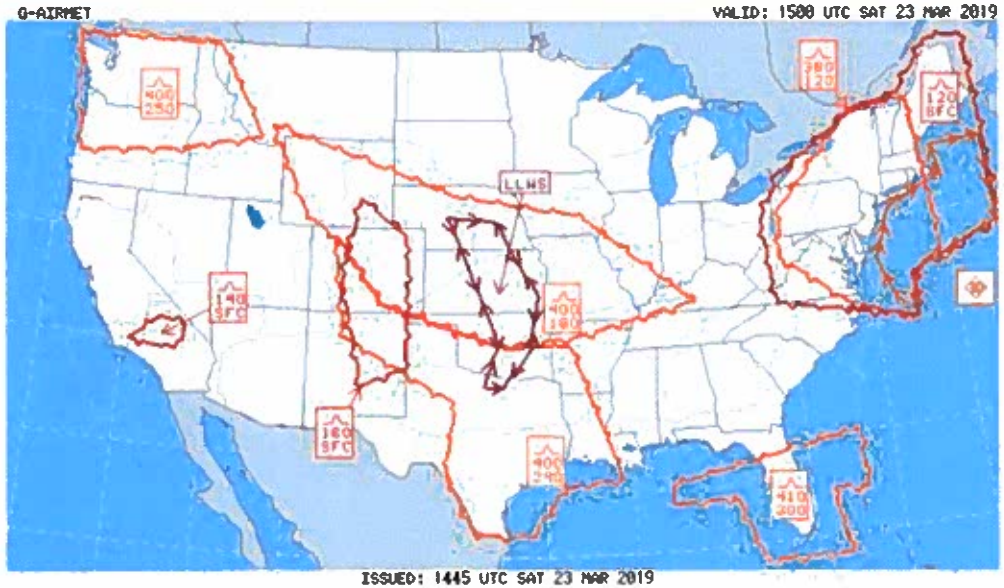
The winds aloft forecast expected northwest winds from 310 at 33 knots at 9,000 ft with little directional variation with height with slowly increasing wind speeds favorable for light to moderate mountain wave activity.

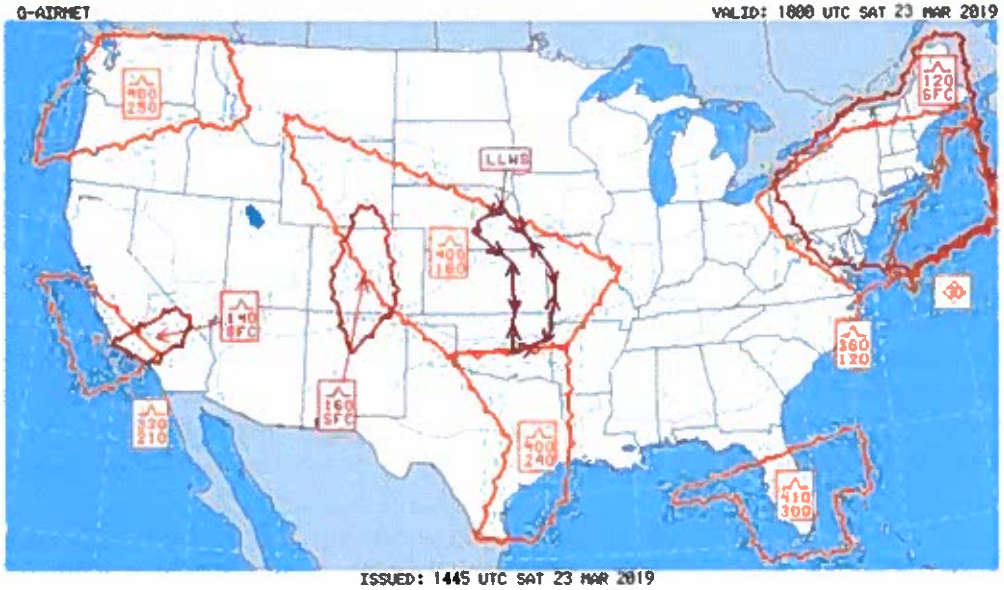
NWS Inflight Weather Advisories – The NWS had G-AIRMETs current for IFR conditions and mountain obscuration and moderate turbulence from the surface to 16,000 ft over a large portion of Colorado that extended over the accident site. Below are the graphic advisories for 0900 MDT (1500Z) and 1200 MDT (1800Z) respectively. No NWS SIGMETs, Convective SIGMETs, or Center Weather Advisories (CWA) were issued surrounding the period for Colorado.





WAUS45 KKCI 231445
WA5S
-SLCS WA 231445
AIRMET SIERRA UPDT 3 FOR IFR AND MTN OBSCN VALID UNTIL 232100
.
AIRMET IFR...MT WY CO
FROM 30SSW ISN TO 70SW RAP TO BFF TO GLD TO 50W LBL TO 20E LAA TO 40NW PUB TO CZI TO 30SSW ISN
CIG BLW 010/VIS BLW 3SM PCPN/BR/FG. CONDS ENDG BY 21Z.
.
AIRMET IFR...ID MT WY UT CO
FROM 70SW BIL TO 30NNW OCS TO LAR TO 30W DEN TO 20NW ALS TO 30NNW RSK TO 40NNW JNC TO 50WSW MTU
TO SLC TO MLD TO 40SSW DBS TO DBS TO 70SW BIL
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS ENDG 18-21Z.
.
AIRMET MTN OBSCN...ID MT WY NV UT CO AZ NM
FROM 60WSW YXC TO 20E FCA TO GTF TO CZI TO CYS TO 60SE DEN TO 50W TBE TO FTI TO 80WSW RSK TO 20WSW JNC
TO 60S MTU TO 50SW SLC TO 20SSE TWF TO 30SSE BOI TO 40WSW BOI TO 80SSE GEG TO 60WSW YXC
MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG BYD 21Z THRU 03Z.





WAUS45 KKCI 231445
WA5T
-SLCT WA 231445
AIRMET TANGO UPDT 3 FOR TURB VALID UNTIL 232100

.

AIRMET TURB...WY CO NM
FROM 40SSE DDY TO 30SSW SNY TO 40NNW LAA TO 20SW TXO TO 60WSW
CME TO 20ESE ABQ TO 40WSW HBU TO 40W LAR TO 40SSE DDY
MOD TURB BLW 160. CONDS CONTG BYD 21Z ENDG 21-00Z.

A review of the observations indicated that IFR to LIFR conditions were reported in the Denver (KDEN) area, and at Front Range Airport (KFTG) along the general route of flight.
Several pilot reports also noted moderate turbulence in the Denver area between 10,000 and 13,000 ft, and above 24,000 ft. Light mountain wave conditions were also confirmed over the area at the time by the pilot reports.

Summary – A complex wind pattern existed over the area during the period with a wind shift occurring immediately after the time of the accident. No support for convective microburst activity was noted over the area on March 23, 2019; however, a large area of light intensity precipitation was noted over the area at the time with some potential for some outflow which could have been resulted in the different winds occurring over the accident site during the period. In addition, the HRRR model sounding and satellite imagery and pilot reports noted support for mountain wave activity over the area, which supported downslope winds and downdraft activity in the area at the time of the accident. The NWS had AIRMET advisories for turbulence and IFR and mountain obscuration conditions over the area, but no advisory for low-level wind shear.

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