



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

September 26, 2022

Specialist's Factual Report

METEOROLOGY

WPR21FA330

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A. ACCIDENT

Location: Bernard, Idaho
Date: August 28, 2021
Time: 1316 mountain daylight time (1916 UTC¹)
Aircraft: Type – Cessna TU206F; Registration – N922MA

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 mountain daylight time on August 28, 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. The accident site was located at about: 45.009338° north latitude; 114.87202° west longitude at an elevation of about 8,300 feet.

This report provides information on the forecast turbulence, winds aloft, density altitude and surface observations.

D. WEATHER INFORMATION

1.0 Surface Observations

Unofficial meteorological reporting station THFL1 (data courtesy of MesoWest²) was located about 18 miles south-southwest of the accident site at an elevation of 4,575 feet. Type, calibration, maintenance, and siting of this station, as well as the overall quality of the data, are not known. Observations from 1251 included a temperature of 73° Fahrenheit (F), a dewpoint temperature of 37°F, wind from 050°, sustained wind magnitude of 2 miles-per-hour (mph) and a gust wind magnitude of 7 mph.

¹ UTC – abbreviation for Coordinated Universal Time

² <https://mesowest.utah.edu>

An Automated Surface Observing System (ASOS) was located at Challis Airport (LLJ³) which was in Challis, Idaho, about 41 miles southeast of the accident location at an elevation of about 5,075 feet and had a magnetic variation of about 13° east. An automated longline⁴ report from the LLJ ASOS near the accident time is presented here. It reported a temperature of 19.4° Celsius (C), a dew point temperature of 2.2°C and an altimeter setting of 30.19 inches of mercury,

[1255] METAR KLLJ 281855Z AUTO 10SM CLR 19/02 A3019 RMK AO2 SLP174
T01940022=

2.0 HRRR Model Sounding

A High-Resolution Rapid Refresh (HRRR) model⁵ sounding for near the accident site⁶ at 1200 using an elevation of 8,183 feet was retrieved from the National Oceanic and Atmospheric Administration's (NOAA) Air Resources Laboratory and analyzed by the RAwinsonde OBservation (RAOB) program. The HRRR vertical wind profile as interpolated by RAOB for altitudes below 15,000 feet is presented here

<u>Height (feet)</u>	<u>Wind Direction</u>	<u>Wind Magnitude (knots)</u>
8182	077°	2
8500	090°	2
9000	110°	1
9500	149°	1
10000	212°	1
10500	238°	2
11000	247°	3
11500	253°	4
12000	262°	5
12500	280°	8
13000	294°	10

³ This report uses the 3-digit International Air Transport Association format for airport identification, which does not use the geographic designating digit (e.g., "K" for stations in the continental U.S. and "P" for U.S. stations in Alaska and the Pacific region) as found in the 4-digit International Civil Aviation Organization (ICAO) identifier format. Weather observations from airports in this report are referenced by their reporting station's identifier (using ICAO format that includes the geographic designating digit), not by the airport at which the reporting station is located.

⁴ "Longline" refers to the dissemination of weather observations with the intent that they are available in near-real time to national databases (effectively, the whole world) and accessible to the general global public from a large number of vendors. This does not include public accessibility to observations from a reporting station's Very High Frequency (VHF; line-of-site) or telephone broadcast, where applicable. Longline-dissemination of weather observations is the primary vehicle through which the general global public has access to surface weather observations, particularly outside of the aviation community.

⁵ 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.

⁶ Coordinates used for the model were 45.01, -114.87.

13500	302°	12
14000	307°	13
14500	311°	14
15000	314°	16

Additional HRRR parameters, including density altitude processed by RAOB, are presented here:

Height (feet)	Pressure (hPA)	Temp (C)	Dew Point (C)	Density Altitude (feet)	Pressure Altitude (feet)
8182	757	13°	-3.5°	9483	7845
8218	756	11.5°	-5°	9349	7880
8254	755	10.7°	-4.7°	9303	7914
8435	750	10.2°	-5.2°	9457	8088
8690	743	9.2°	-5.3°	9644	8333
9058	733	8°	-5.6°	9939	8686
9504	721	6.5°	-5.6°	10295	9114
10030	707	4.7°	-5.9°	10712	9622
10641	691	3°	-6.5°	11240	10212
11301	674	1.2°	-7.9°	11813	10851
12014	656	-0.1°	-11.8°	12497	11542
12786	637	-0.4°	-22.4°	13352	12288
13664	616	-1.1°	-28.8°	14302	13134
14613	594	-2.2°	-34°	15290	14046
15639	571	-3.4°	-39.3°	16355	15029

3.0 GTG

The Graphical Turbulence Guidance (GTG) turbulence product is generated operationally at the National Centers for Environmental Prediction and published for public use on the Aviation Weather Center's (AWC) website.⁷ The GTG yields computer-generated four-dimensional forecasts of information related to the expected intensity of clear-air or mountain wave turbulence. It is not intended to predict turbulence associated with convection and thunderstorm clouds but may provide some guidance in areas of properly predicted thunderstorms when the convection is widespread. Figures 1-15 present the GTG mountain wave turbulence analysis imagery for 1300 for altitudes between 7,000 and 11,000 feet (inclusive). According to the National Weather Service, the images presented here came from the operational data files from the GTG that were retrieved from NOAA's Open Data Dissemination Program.⁸ It is not known if these images are identical to those that were available on the AWC website.

⁷ <https://www.aviationweather.gov/adds/>

⁸ <https://www.noaa.gov/information-technology/open-data-dissemination>

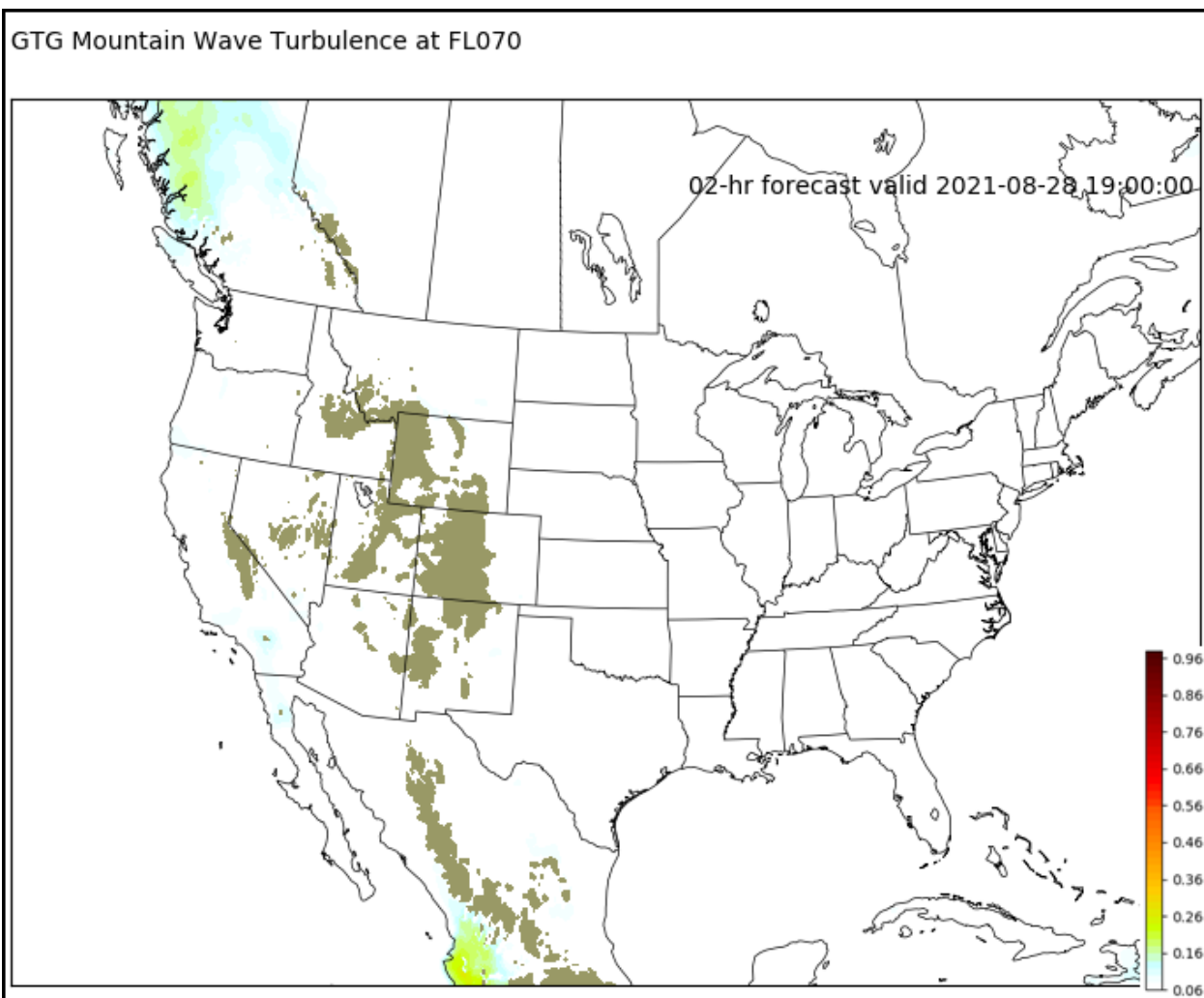


Figure 1 – GTG mountain wave turbulence 2-hour forecast imagery valid for 7,000 feet at 1300. Color scale values are eddy dissipation rate. Olive colored area indicates terrain at or above the altitude which the graphic depicts.

GTG Mountain Wave Turbulence at FL080

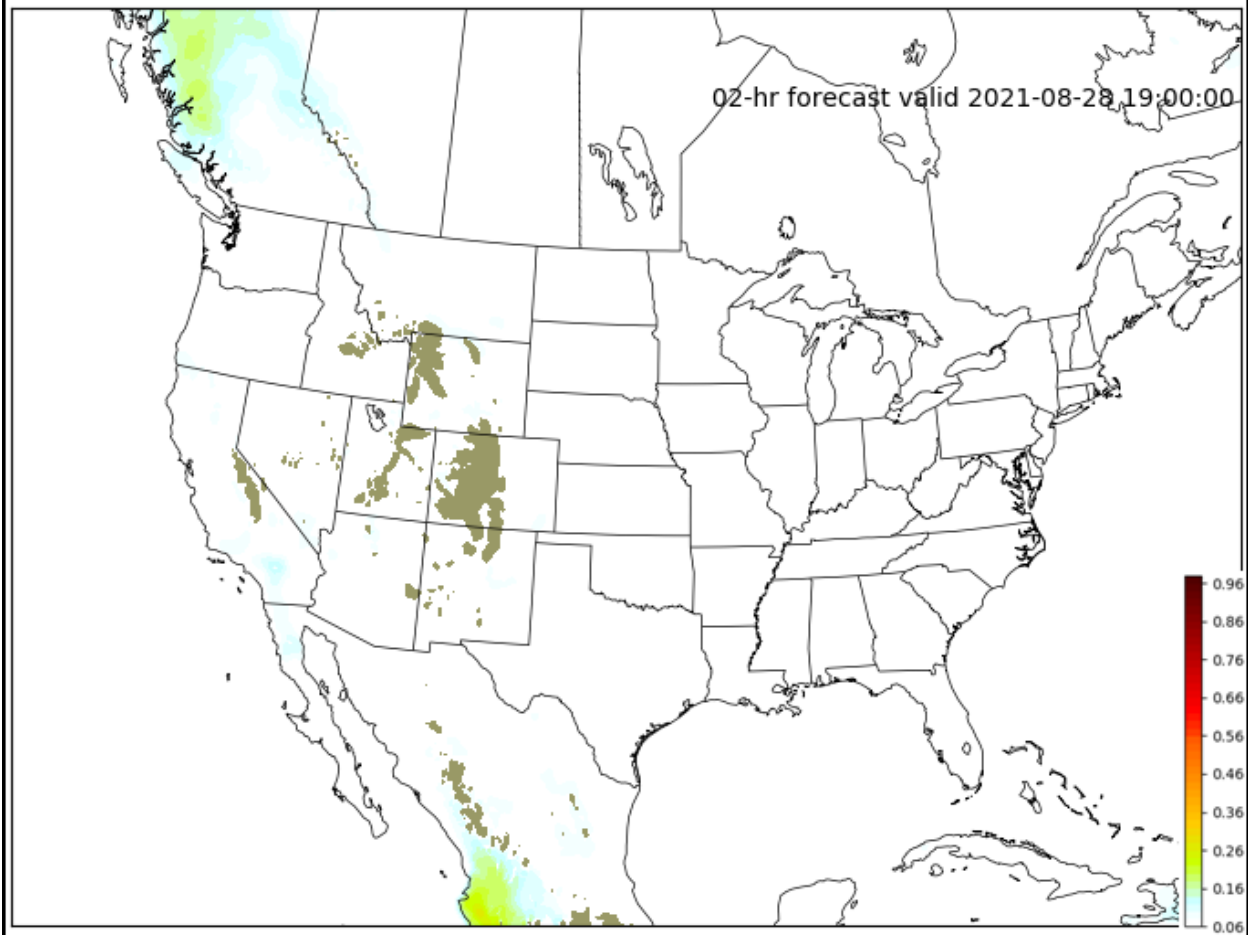


Figure 2 – GTG mountain wave turbulence 2-hour forecast imagery valid for 8,000 feet at 1300. Color scale values are eddy dissipation rate. Olive colored area indicates terrain at or above the altitude which the graphic depicts.

GTG Mountain Wave Turbulence at FL090

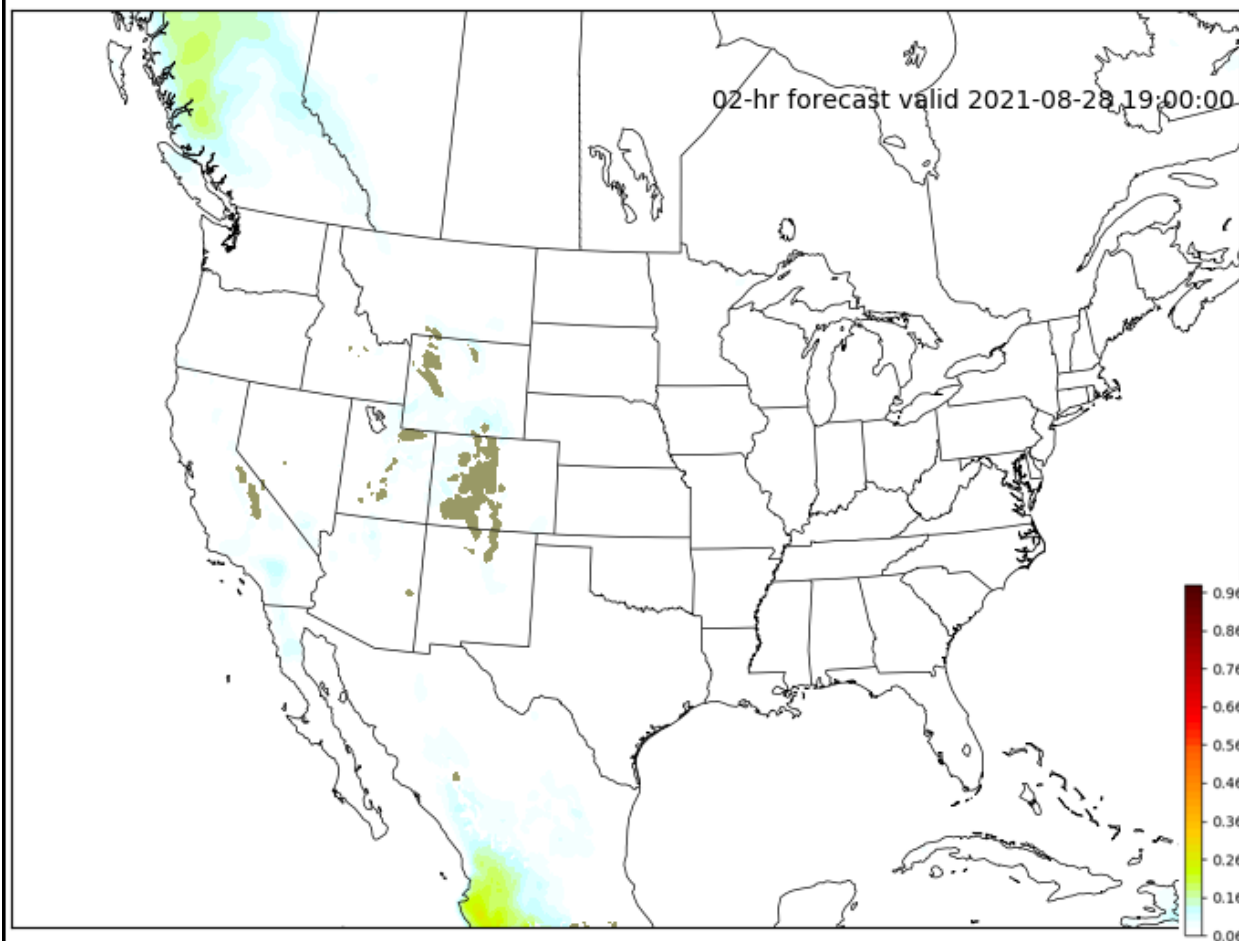


Figure 3 – GTG mountain wave turbulence 2-hour forecast imagery valid for 9,000 feet at 1300. Color scale values are eddy dissipation rate. Olive colored area indicates terrain at or above the altitude which the graphic depicts.

GTG Mountain Wave Turbulence at FL100

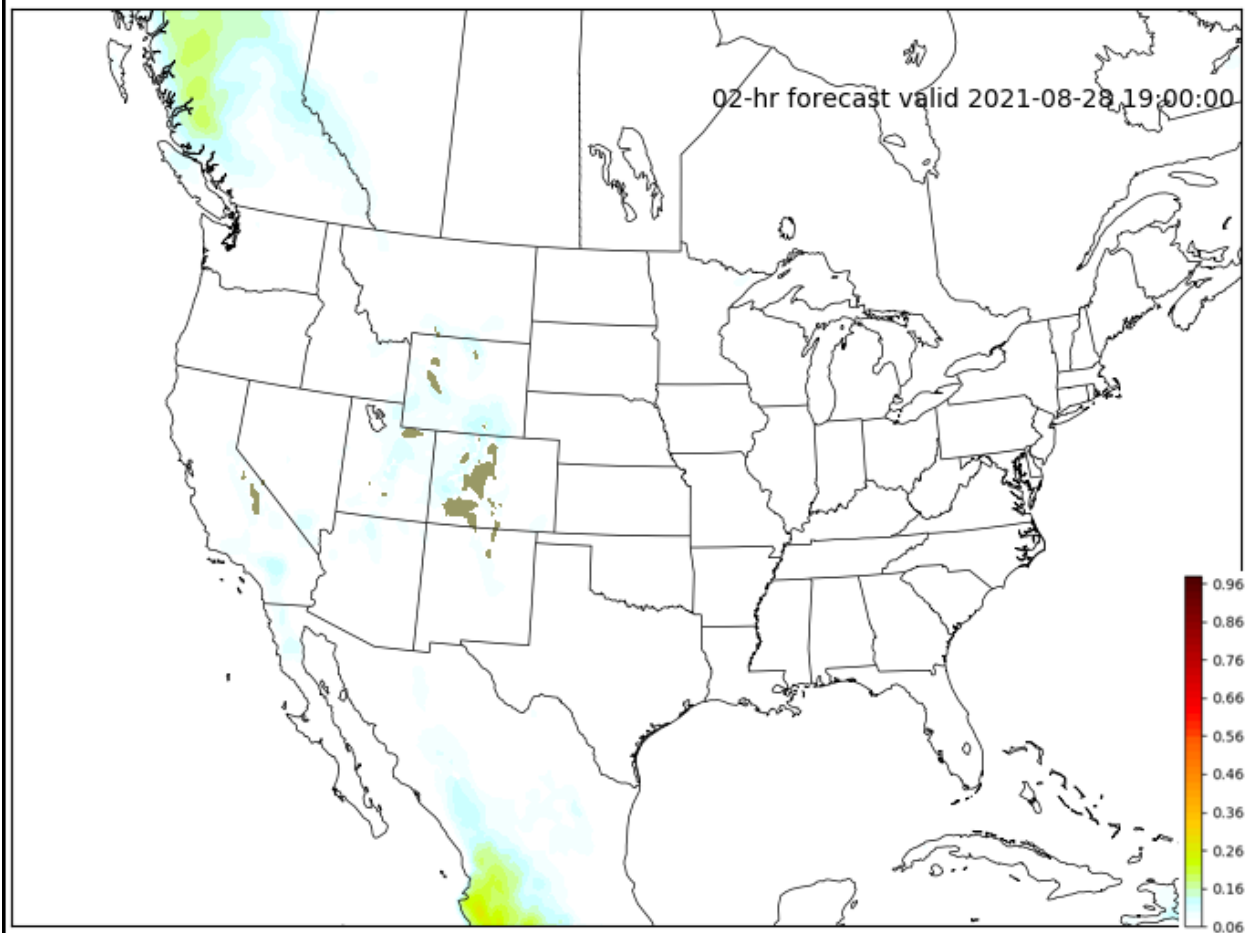


Figure 4 – GTG mountain wave turbulence 2-hour forecast imagery valid for 10,000 feet at 1300. Color scale values are eddy dissipation rate. Olive colored area indicates terrain at or above the altitude which the graphic depicts.

GTG Mountain Wave Turbulence at FL110

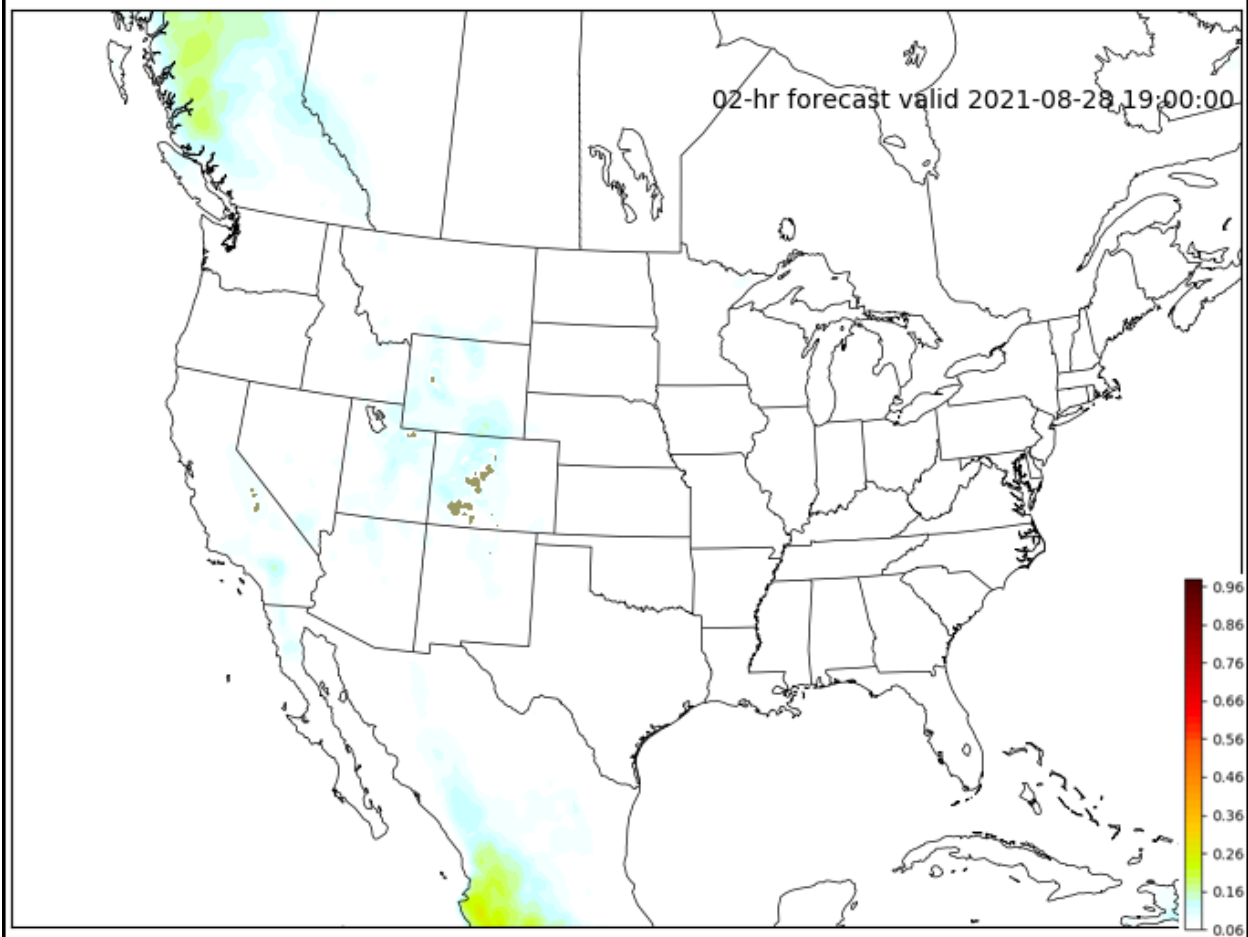


Figure 5 – GTG mountain wave turbulence 2-hour forecast imagery valid for 11,000 feet at 1300. Color scale values are eddy dissipation rate. Olive colored area indicates terrain at or above the altitude which the graphic depicts.

GTG Mountain Wave Turbulence at FL070

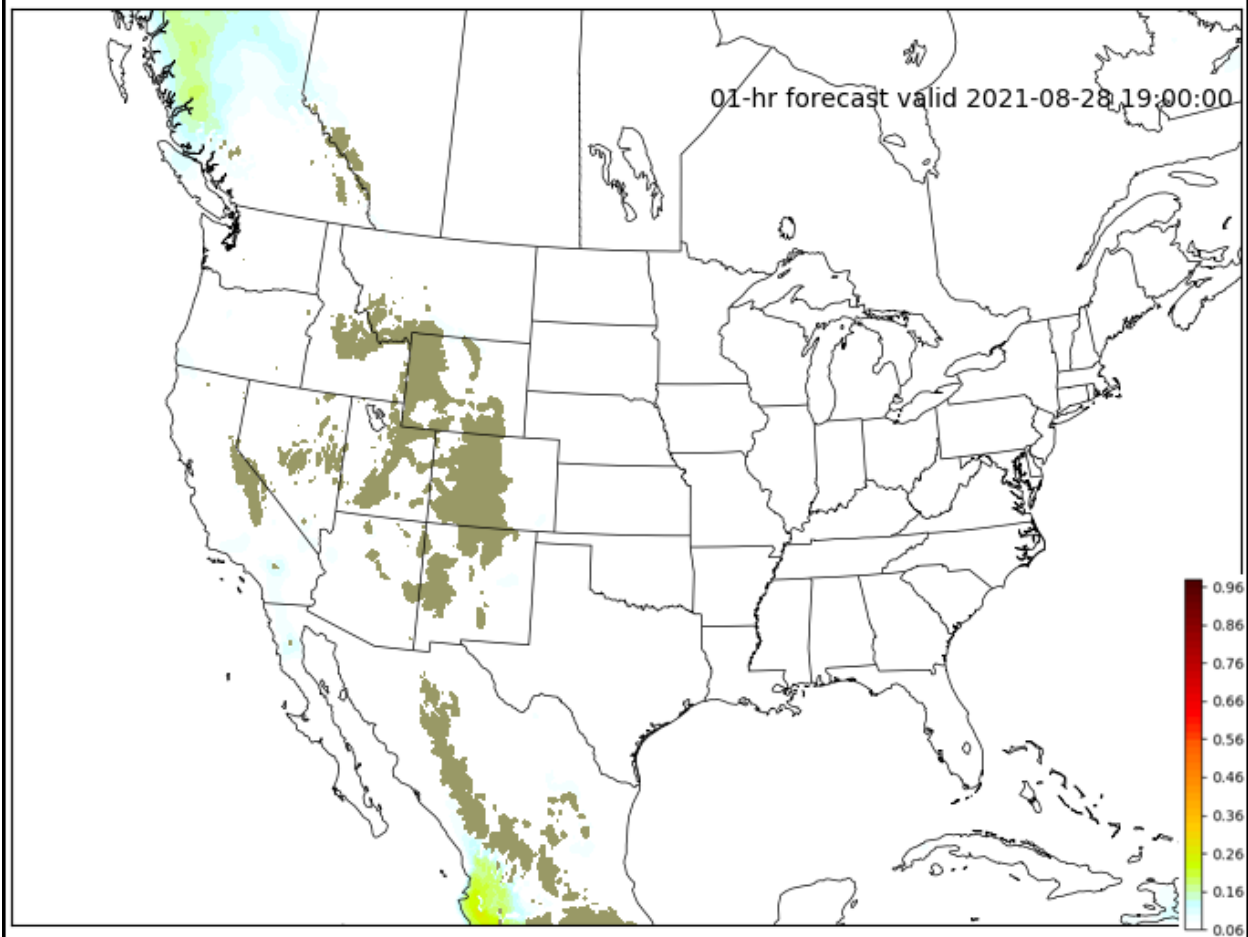


Figure 6 – GTG mountain wave turbulence 1-hour forecast imagery valid for 7,000 feet at 1300. Color scale values are eddy dissipation rate. Olive colored area indicates terrain at or above the altitude which the graphic depicts.

GTG Mountain Wave Turbulence at FL080

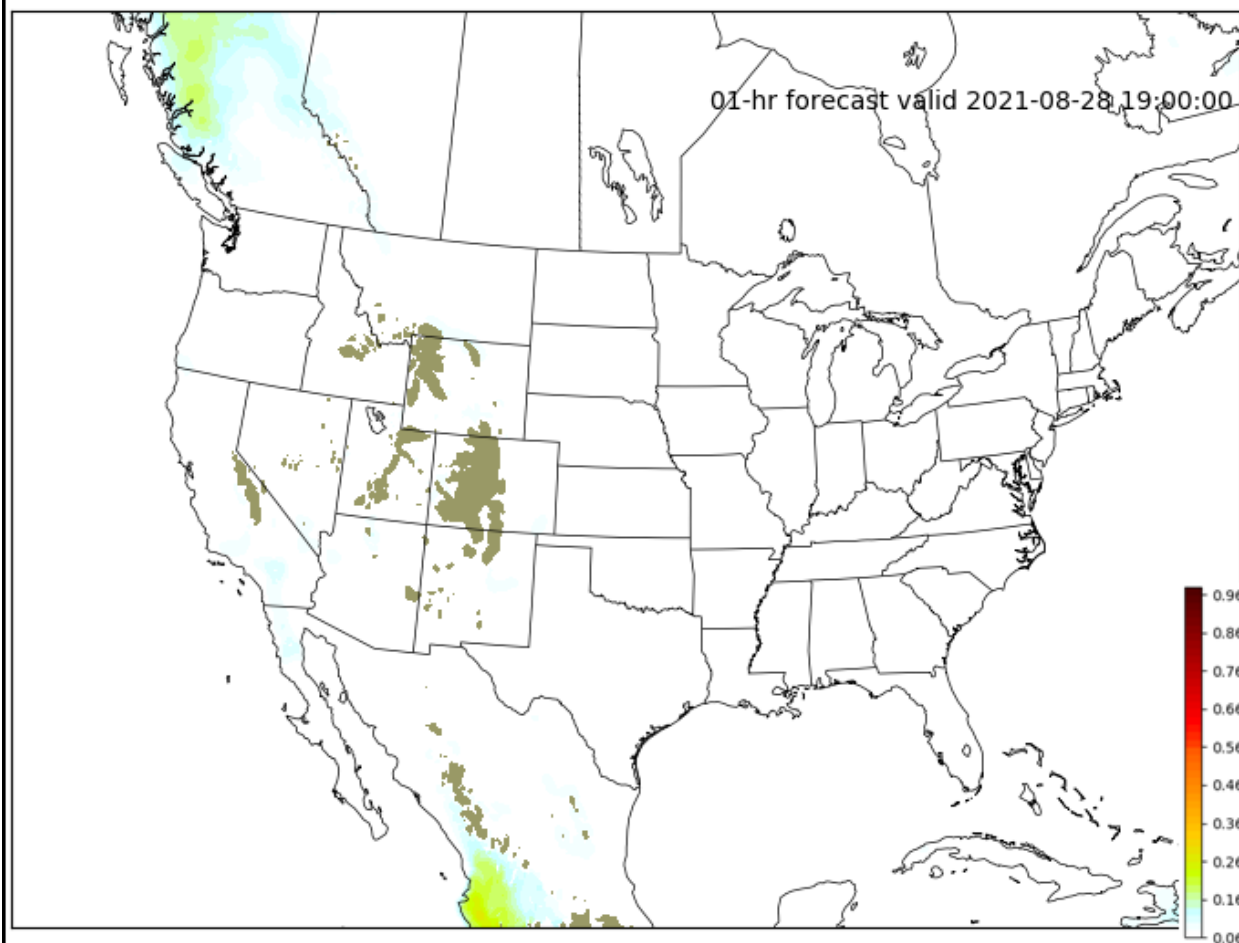


Figure 7 – GTG mountain wave turbulence 1-hour forecast imagery valid for 8,000 feet at 1300. Color scale values are eddy dissipation rate. Olive colored area indicates terrain at or above the altitude which the graphic depicts.

GTG Mountain Wave Turbulence at FL090

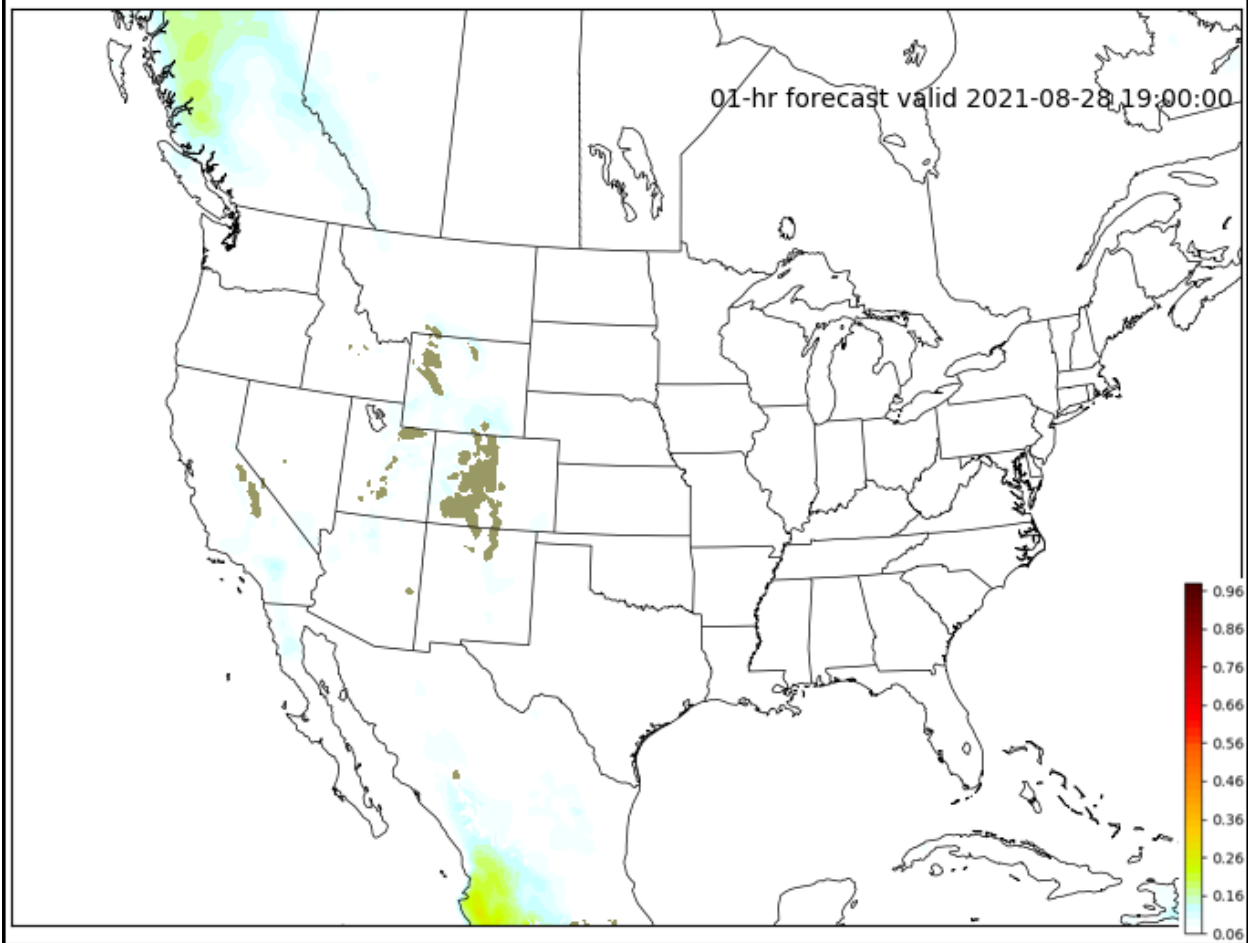


Figure 8 – GTG mountain wave turbulence 1-hour forecast imagery valid for 9,000 feet at 1300. Color scale values are eddy dissipation rate. Olive colored area indicates terrain at or above the altitude which the graphic depicts.

GTG Mountain Wave Turbulence at FL100

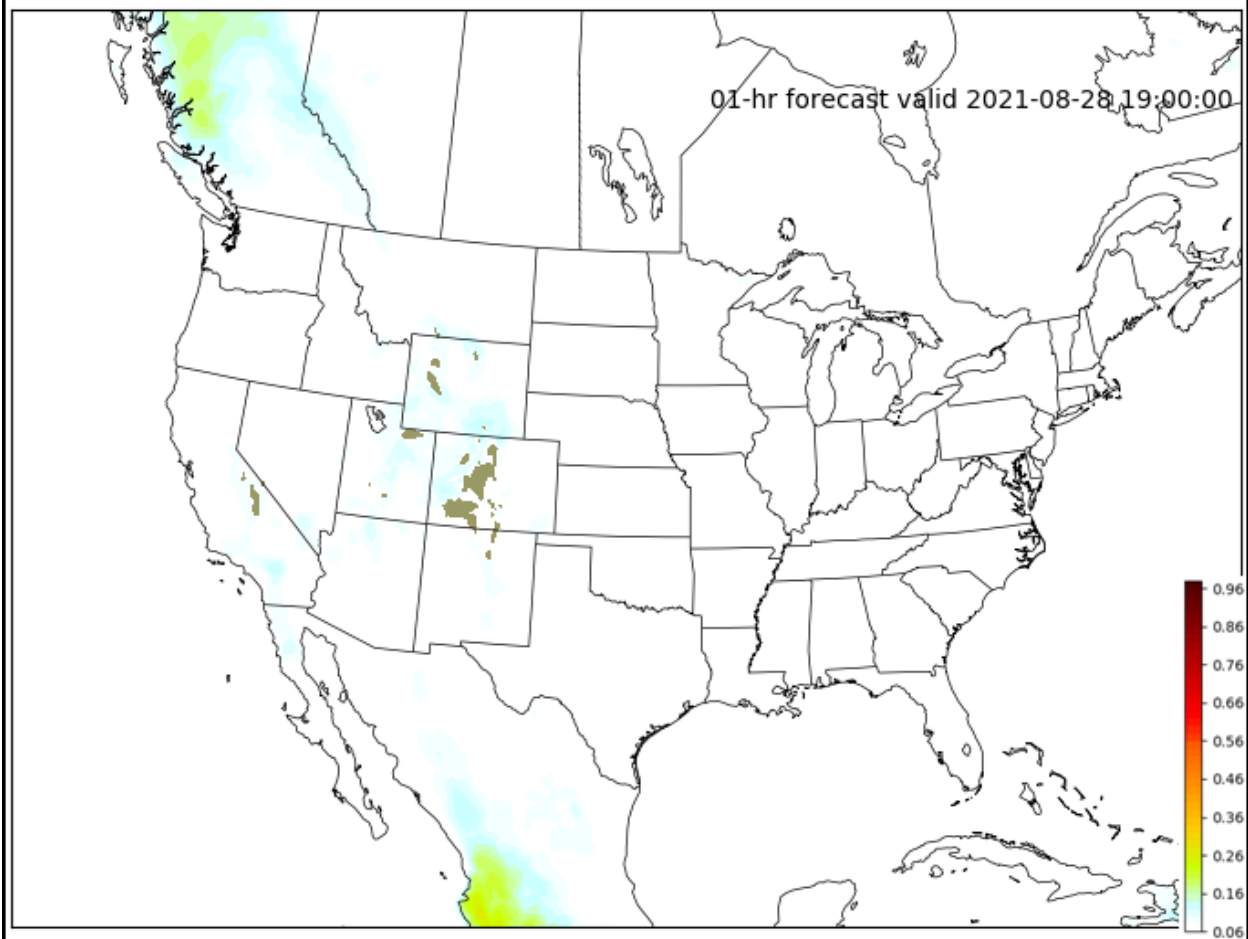


Figure 9 – GTG mountain wave turbulence 1-hour forecast imagery valid for 10,000 feet at 1300. Color scale values are eddy dissipation rate. Olive colored area indicates terrain at or above the altitude which the graphic depicts.

GTG Mountain Wave Turbulence at FL110

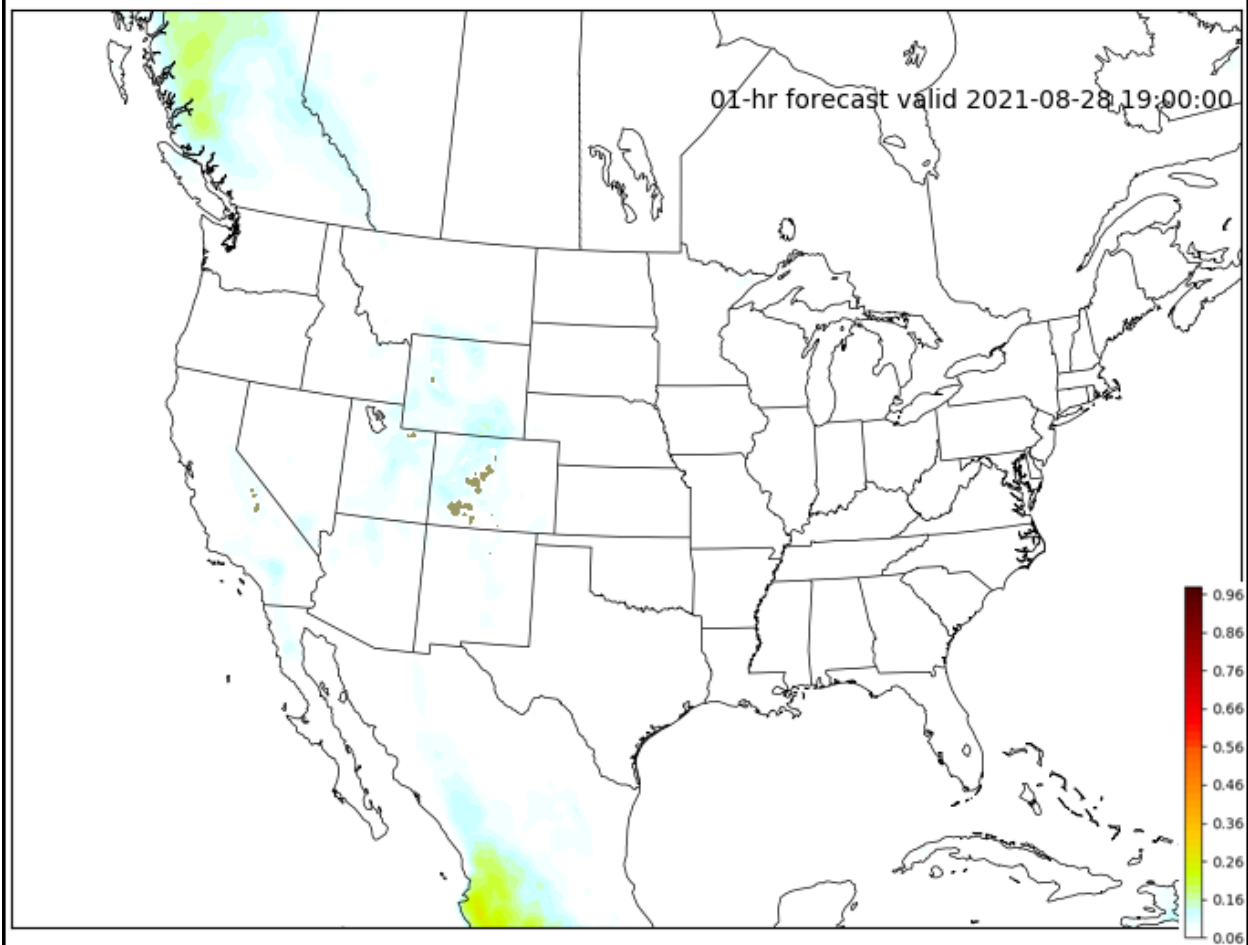


Figure 10 – GTG mountain wave turbulence 1-hour forecast imagery valid for 11,000 feet at 1300. Color scale values are eddy dissipation rate. Olive colored area indicates terrain at or above the altitude which the graphic depicts.

GTG Mountain Wave Turbulence at FL070

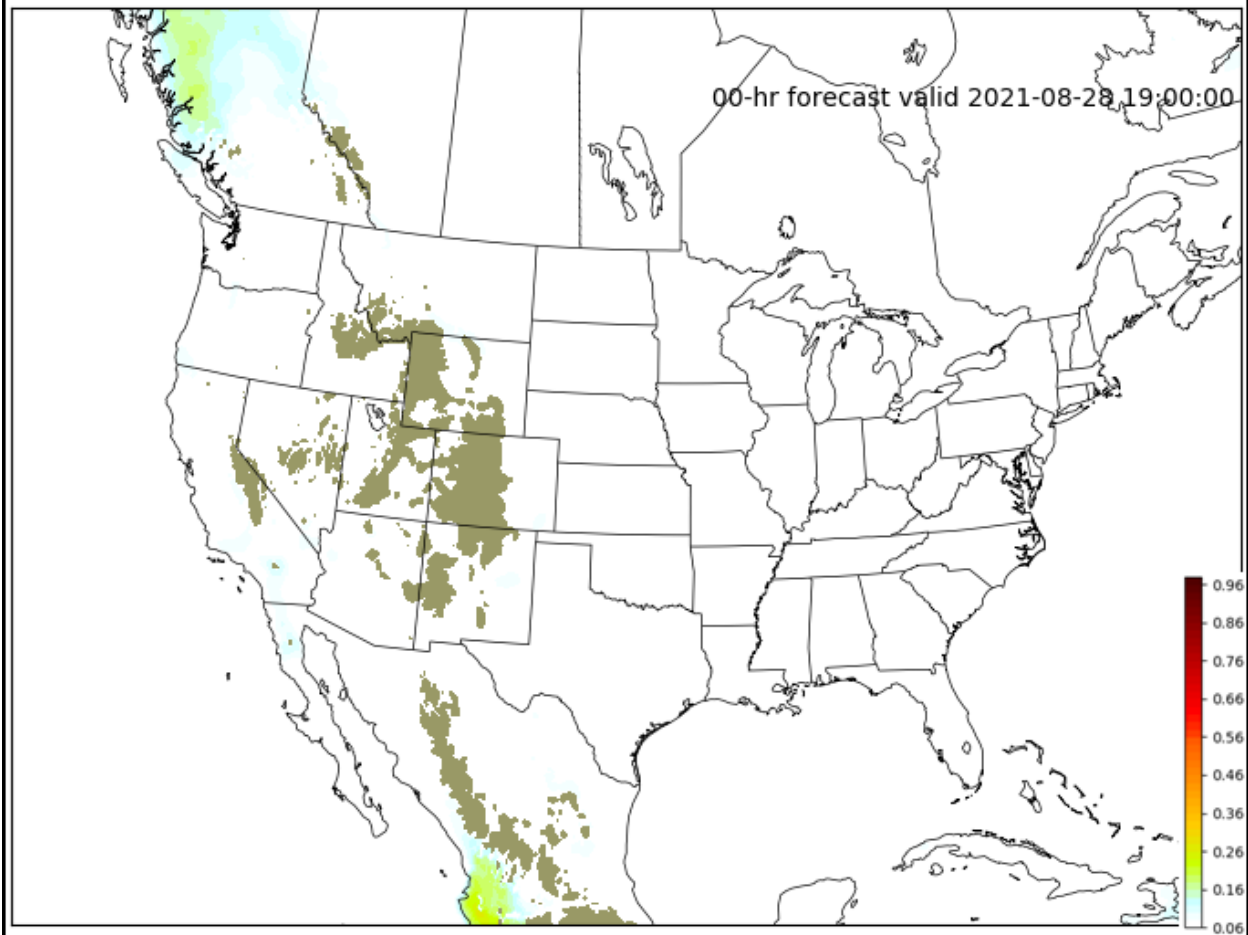


Figure 11 – GTG mountain wave turbulence analysis imagery valid for 7,000 feet at 1300. Color scale values are eddy dissipation rate. Olive colored area indicates terrain at or above the altitude which the graphic depicts.

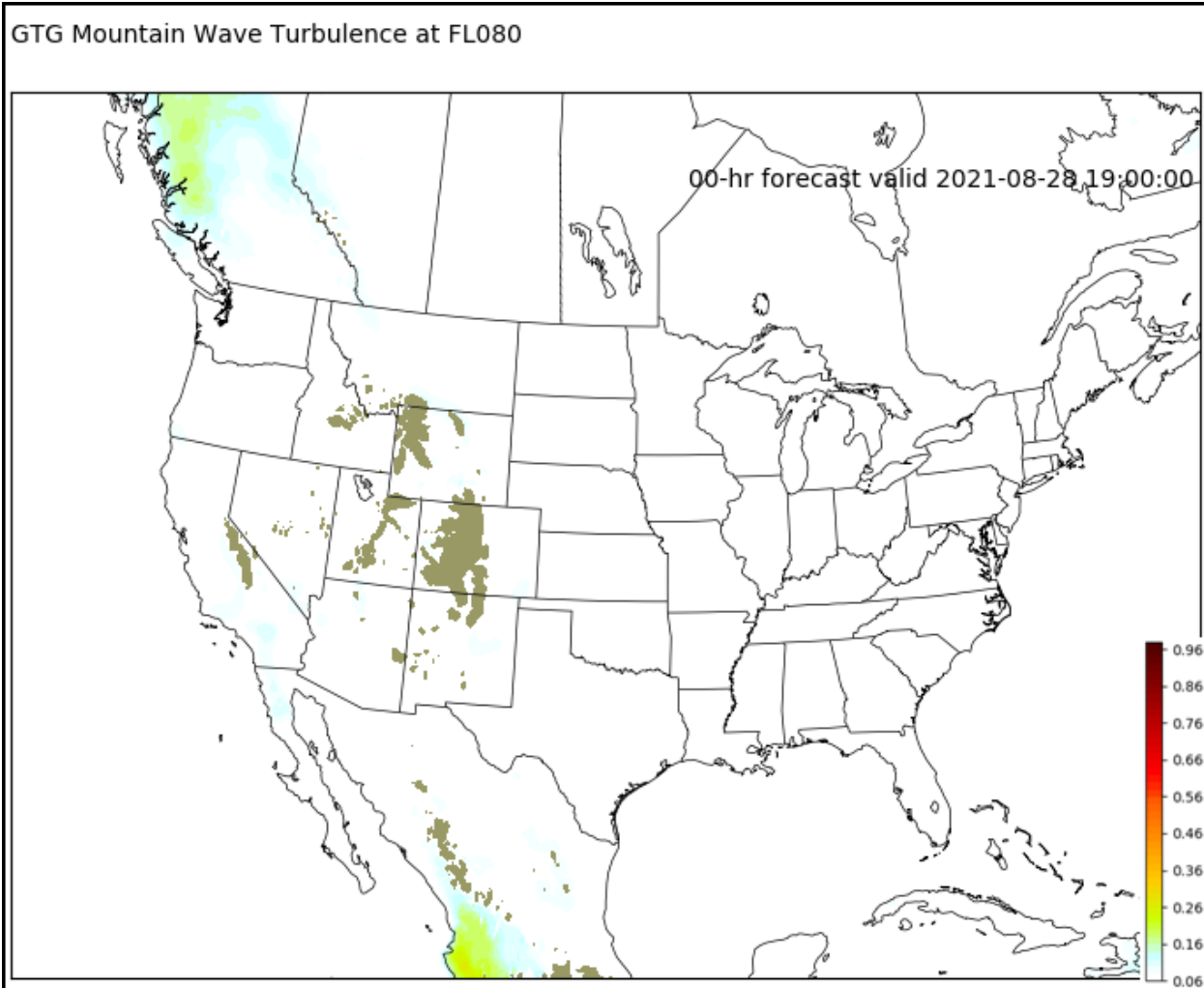


Figure 12 – GTG mountain wave turbulence analysis imagery valid for 8,000 feet at 1300. Color scale values are eddy dissipation rate. Olive colored area indicates terrain at or above the altitude which the graphic depicts.

GTG Mountain Wave Turbulence at FL090

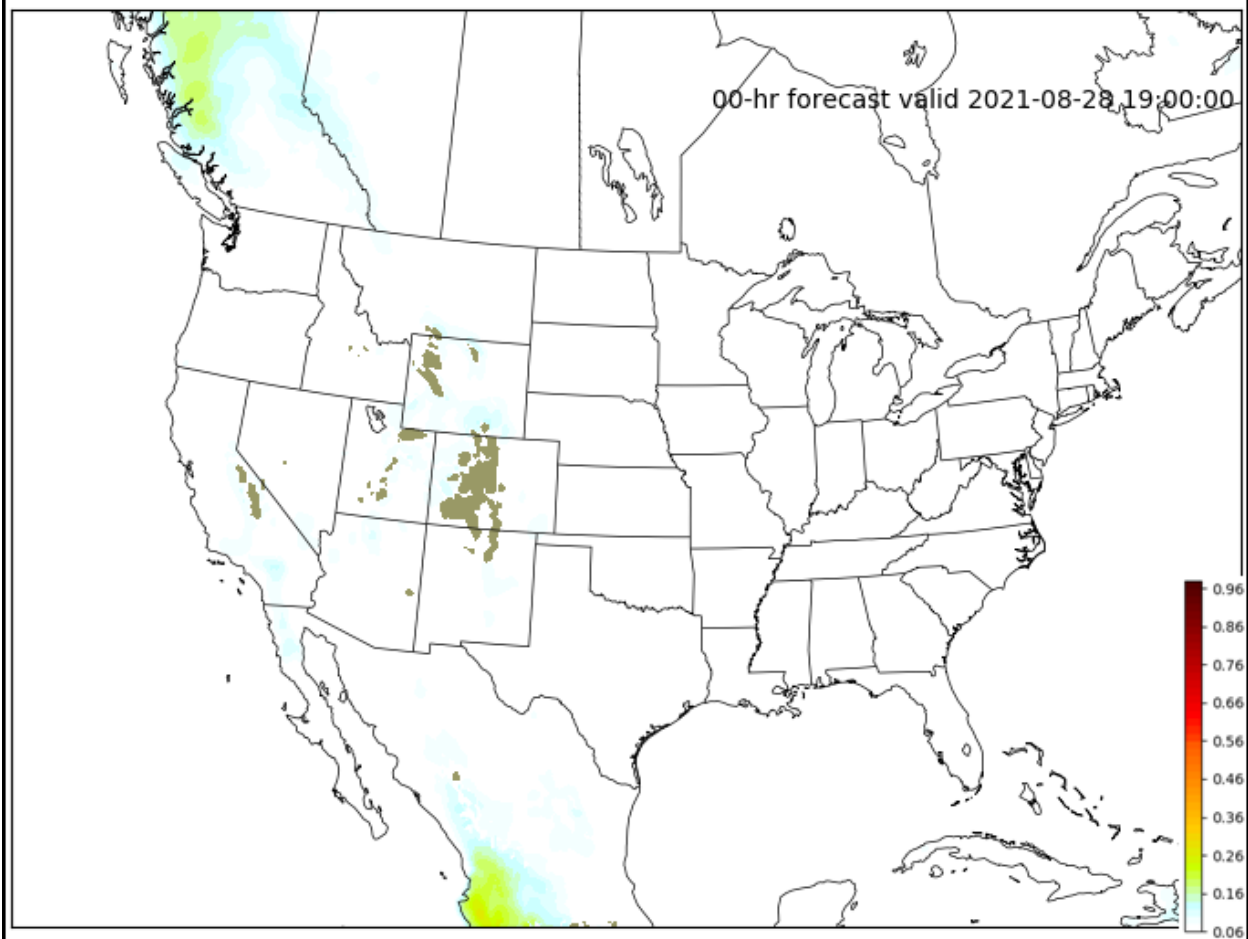


Figure 13 – GTG mountain wave turbulence analysis imagery valid for 9,000 feet at 1300. Color scale values are eddy dissipation rate. Olive colored area indicates terrain at or above the altitude which the graphic depicts.

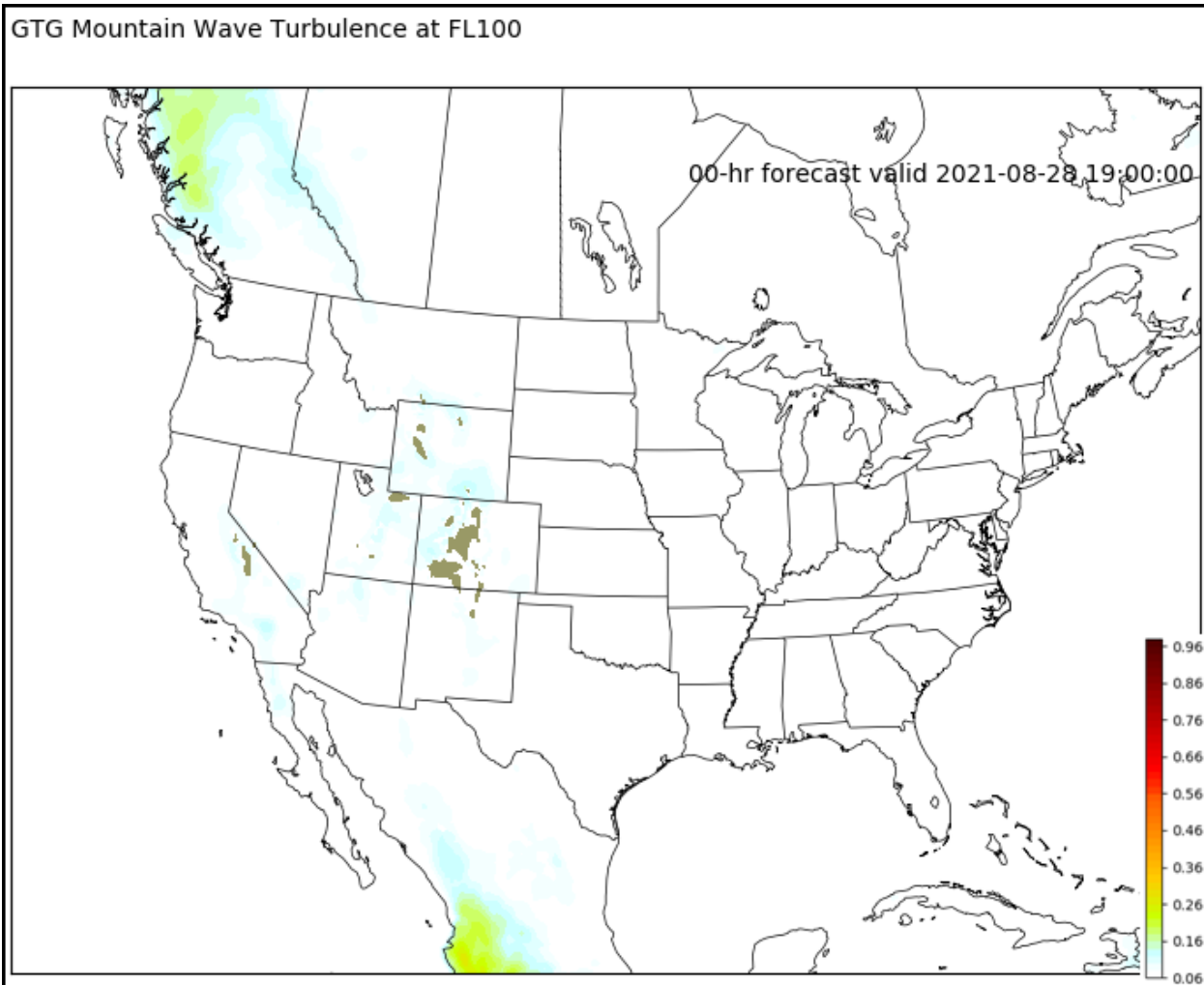


Figure 14 – GTG mountain wave turbulence analysis imagery valid for 10,000 feet at 1300. Color scale values are eddy dissipation rate. Olive colored area indicates terrain at or above the altitude which the graphic depicts.

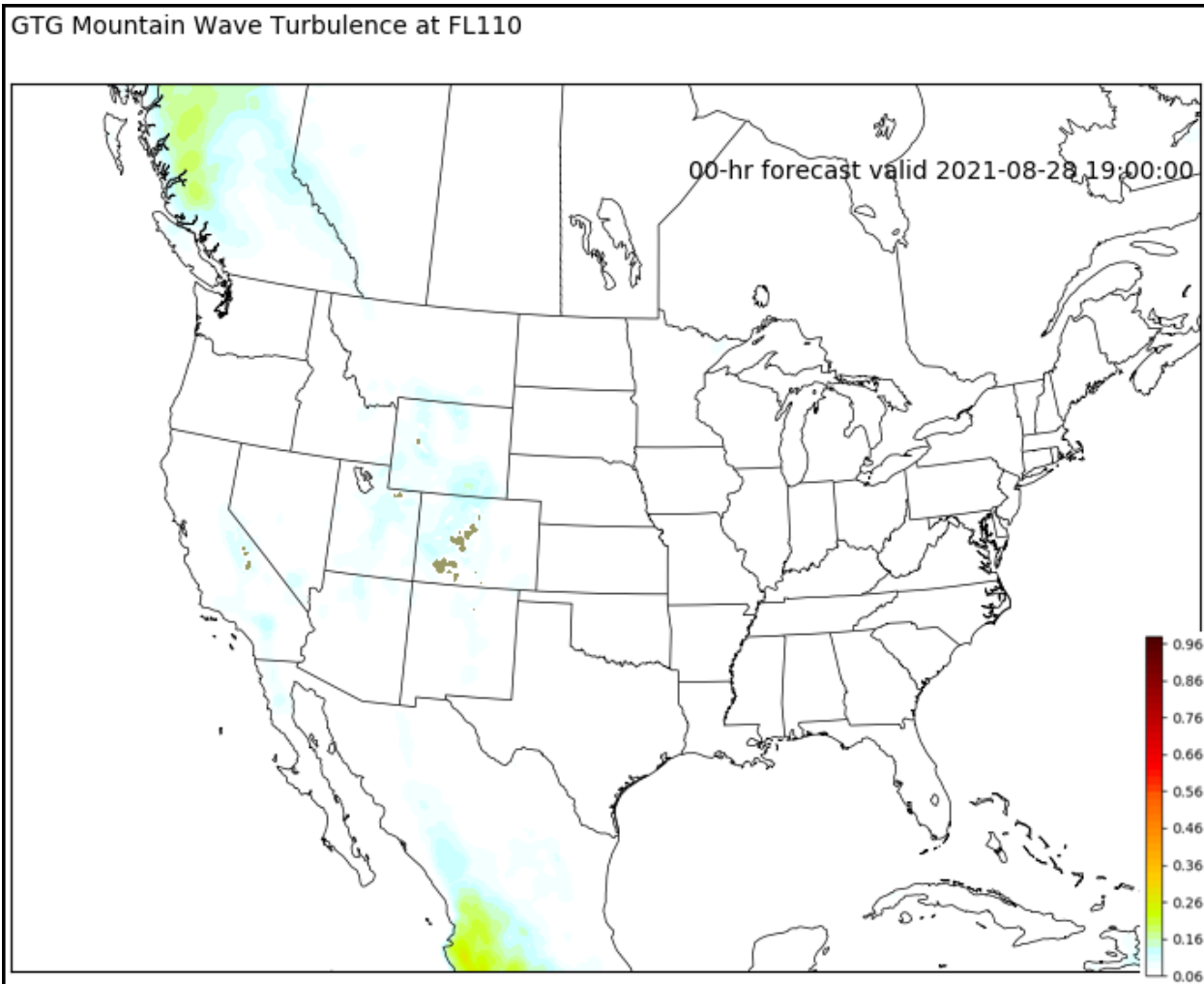


Figure 15 – GTG mountain wave turbulence analysis imagery valid for 11,000 feet at 1300. Color scale values are eddy dissipation rate. Olive colored area indicates terrain at or above the altitude which the graphic depicts.

Submitted by:

Mike Richards
Senior Meteorologist