



DCA24FA143 – Tampa, FL

Attachement 4 – NCAR Graphic Turbulence Guidance

NTSB Case 20240403

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Info from NTSB

- **Details:**
- NTSB Case: DCA24LA143
- Date: April 3, 2024
- Time: 0823 EDT (1223Z)
- Location: Gulf of Mexico
- Coordinates: 28.3257°N -86.4191°W Altitude: FL370
- Aircraft: Southwest Airlines flight 4273, B737-7CT
- DEP: New Orleans (KMSY)
- DEST: Orlando (KMCO)
- Narrative: SWA4273 was enroute from New Orleans, Louisiana (KMSY) to Orlando, Florida (KMCO) at FL370 when the aircraft encountered severe turbulence. Flight diverted to Tampa and was met by EMS. The 'B' Flight Attendant and one passenger was injured. The Flight Crew declared an emergency and diverted to Tampa (KTPA). Upon arrival both the injured Passenger and Flight Attendant were transported to the hospital via ambulance. The injured Passenger sustained a broken bone in their neck, spine, and ribs. Flight Attendant has 2 fractures of leg.

Flight WN4273: in situ EDR equipped B737

Subset of EDR reports from aircraft about the accident time/location

Note: report time/position is end of minute period over which EDR is calculated

Upon review, it was determined that the aircraft in question has the NCAR in situ EDR algorithm installed onboard and measured an EDR of **0.62** about the approximate time/location provided while flying at FL370.

NCARs research suggests an EDR of 0.62 would correspond to **severe** or greater turbulence for a medium sized B737 aircraft.

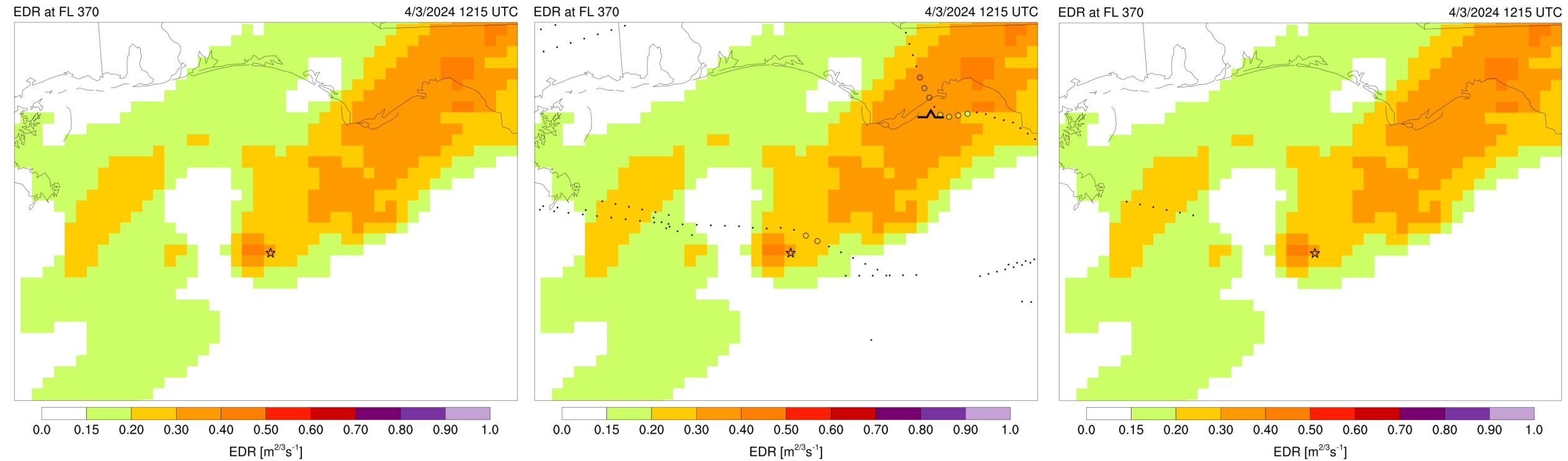
Additional elevated peak EDRs were recorded at 0.34 and 0.18 following the 0.62 EDR. A report of 0.16 EDR (light turbulence) was measured 3 minutes prior and the EDRs over the 2 minutes prior were 0.02 (null turbulence).

A severe PIREP was also found associated with the event:

PIE UUA /OV PIE280177/TM
1226/FL370/TP B737/TB SEV

Time	Lat	Lon	Alt	Mean EDR	Peak EDR
1219	28.624	-87.092	36980	0	0.02
1220	28.557	-86.945	37010	0.02	0.02
1221	28.489	-86.799	36980	0.06	0.16
1222	28.421	-86.654	36970	0.02	0.02
1223	28.367	-86.501	37010	0	0.02
1224	28.289	-86.37	36730	0.3	0.62
1225	28.219	-86.231	36970	0.26	0.34
1226	28.152	-86.09	37000	0.1	0.18
1227	28.103	-85.932	36970	0	0.02
1228	28.053	-85.776	36980	0.06	0.12
1229	28.002	-85.62	36990	0.04	0.08
1230	27.951	-85.465	36980	0.06	0.08
1231	27.906	-85.307	36980	0.06	0.08
1232	27.899	-85.138	36990	0.04	0.04

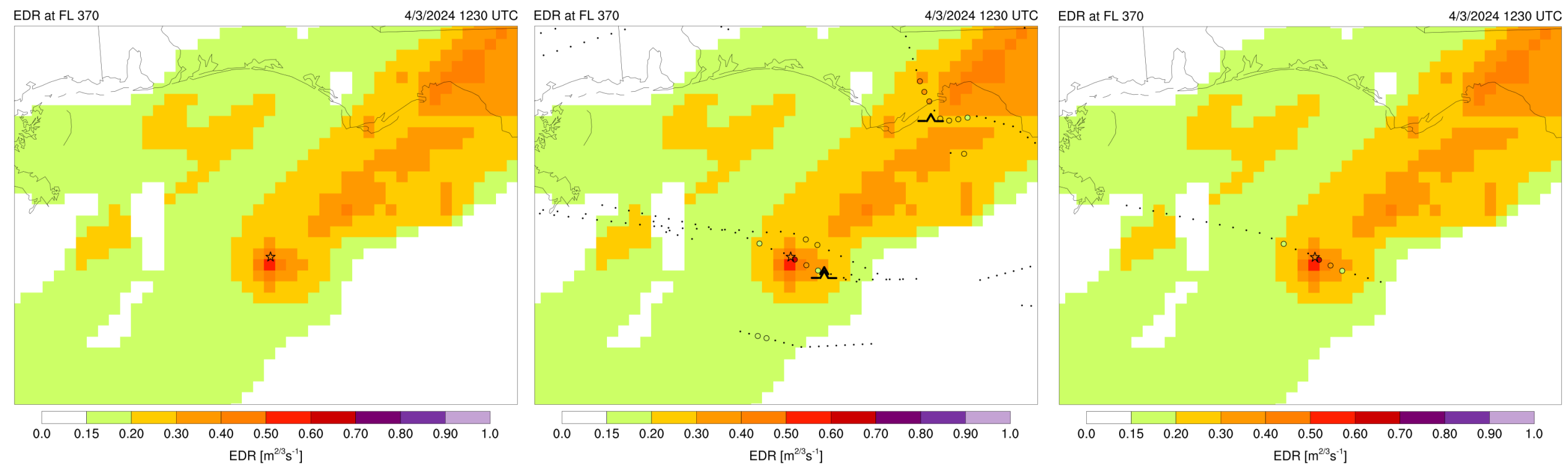
Real time semi-operational GTGN v1: Valid 1215 UTC, FL370



GTGN valid 1215 UTC, FL370 zoomed in to Gulf of Mexico region. Provided NTSB location shown as a star.

No overlay (left), all input in situ EDR and PIREPs from 1115-1215 UTC within +/- 2000 vertical feet overlaid (middle), and in situ EDR from WN4273 up to 1215 UTC within +/- 2000 vertical feet overlaid (right). (Note in situ EDR in 0-0.15 EDR range shown as black dots. EDR > 0.15 shown as open circles color coded to EDR color scale.)

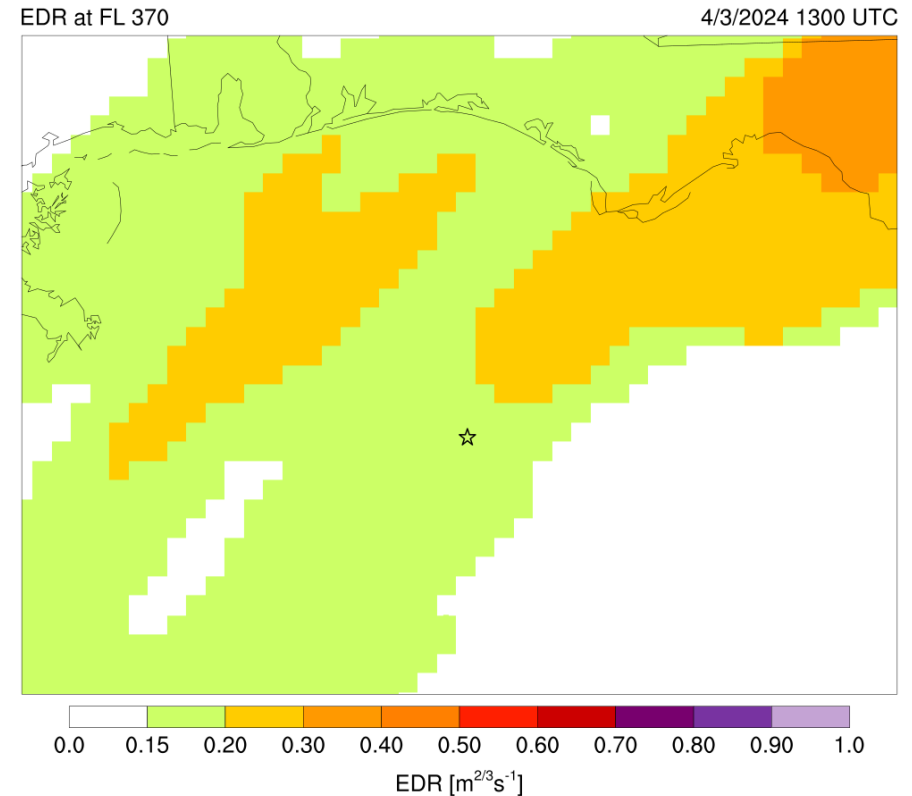
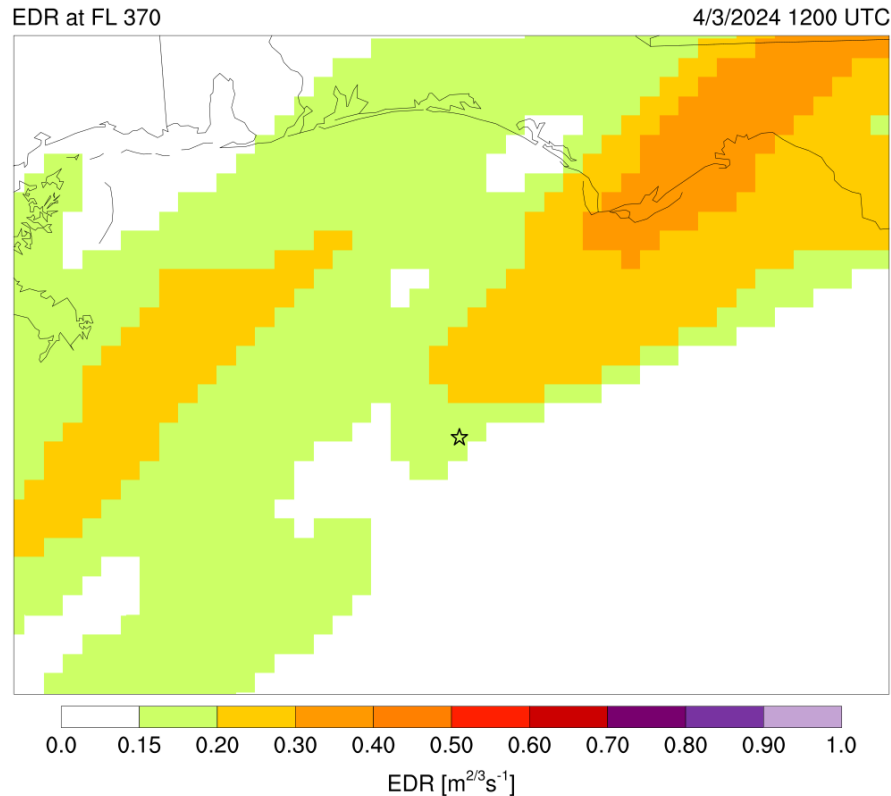
Real time semi-operational GTGN v1: Valid 1230 UTC, FL370



GTGN valid 1230 UTC, FL370 zoomed in to Gulf of Mexico region. Provided NTSB location shown as a star.

No overlay (left), all input in situ EDR and PIREPs from 1130-1230 UTC within +/- 2000 vertical feet overlaid (middle), and in situ EDR from WN4273 up to 1230 UTC within +/- 2000 vertical feet overlaid (right). (Note in situ EDR in 0-0.15 EDR range shown as black dots. EDR > 0.15 shown as open circles color coded to EDR color scale.)

GTG3 Forecast FL370, 1- and 2- hour forecast from 11 UTC valid at 12 (left) and 13 (right) on 20240403

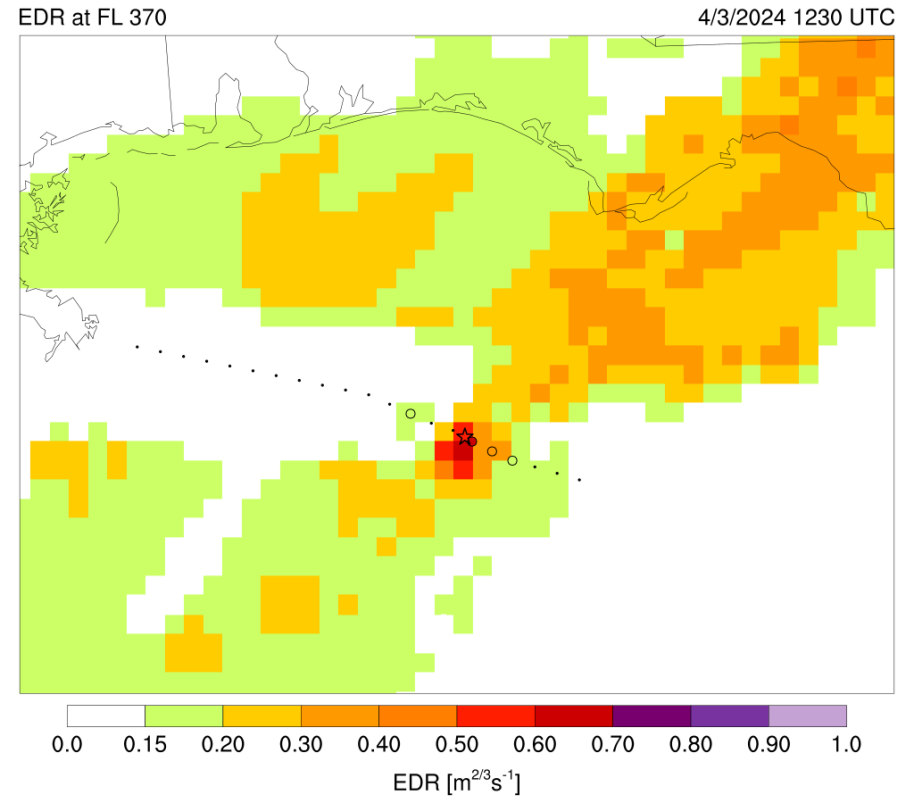
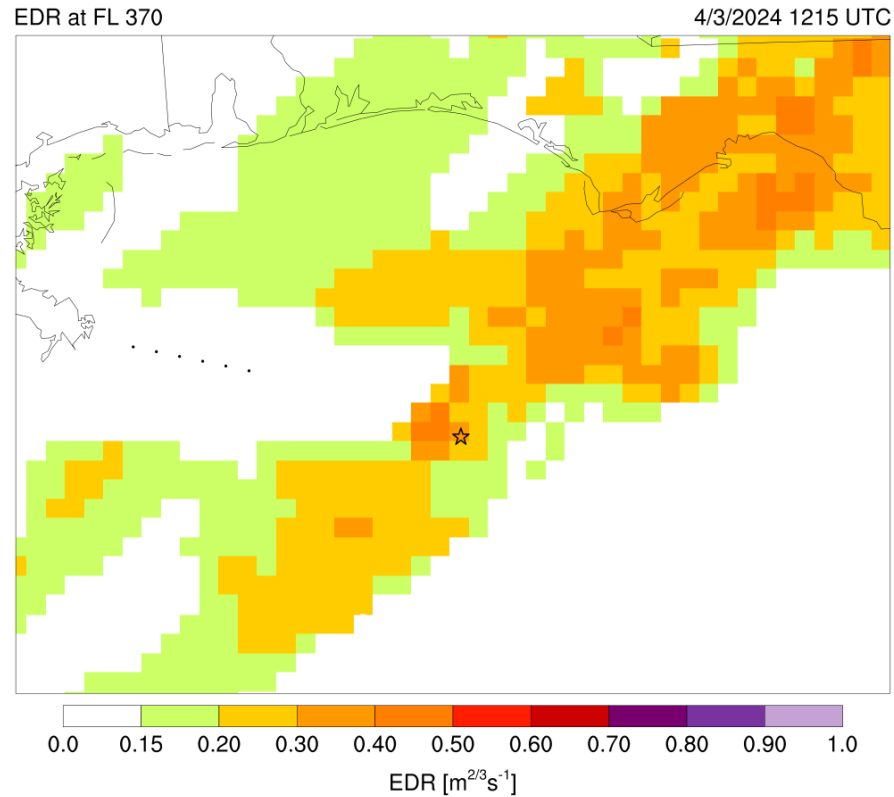


Provided NTSB location shown as a star

Discussion

- Real time semi-operational GTGN v1 output valid at 1215 UTC, prior to the 1224 UTC encounter of 0.62 EDR as measured by the in situ EDR algorithm deployed on the aircraft, shows EDR nowcast in the 0.3-0.5 range at and in the vicinity of the event location.
- GTG3 forecast EDR between 0.15 and 0.2 at the event location. The nowcast elevated EDRs in GTGN were identified by the RADAR based NTDA algorithm (not shown) that is an input to GTGN and identifies convectively induced turbulence. Note that the event location is near the southern boundary of the NTDA algorithm domain.
- Real time semi-operational GTGN v1 output valid at 1230 UTC used the reported 0.62 EDR from this aircraft and the resulting nowcast shows a value up to 0.6 about the event location.
- The GTGN v1 updates at 1215 and 1230 UTC show a band of elevated turbulence that extends from northeast of the event location, southwest, ending in the vicinity of the event location. The nowcast shows a possible route avoiding MOG turbulence just southwest of the event. However, as noted above, the southern boundary of the RADAR based NTDA domain is near the event location which means the nowcast south and southwest of the event is based solely on the GTG3 forecast. (Aircraft observations were not observed in that region at that time). A review of lightning data in the region shows the convective band extends southwest a significant way past the location of the incident.
- GTGN v2 will include ground and spaced-based (GLM) lightning data, as well as a higher resolution domain and other improvements. A slide showing GTGN v2 valid at 1215 and 1230 UTC with the inclusion of lightning data for this case on the 13 km domain is included for reference.

GTGN v2 valid 1215 and 1230 UTC, FL370



GTGN v2 valid 1215 UTC (left) and 1230 UTC (right), FL370, zoomed in to the Gulf of Mexico region. Provided NTSB location shown as a star. In situ EDR from WN4273 up to GTGN valid time within +/- 2000 vertical feet overlaid. Addition of lightning data in GTGN v2 identifies elevated turbulence over the Gulf outside the RADAR domain and shows elevated turbulence band extends south west from event location which was not seen by the real time semi-operational GTGN v1.