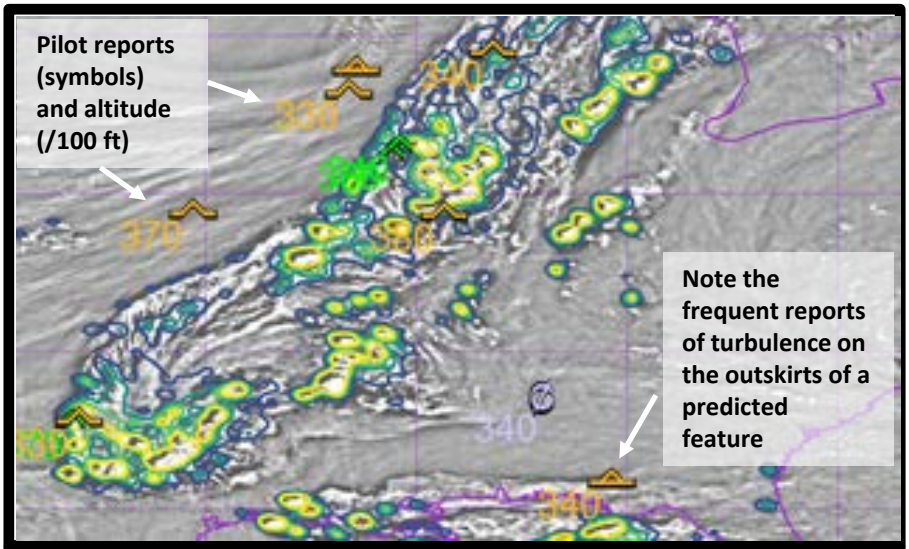
# Turbulence Probability

# Quick Guide

## Why is the Turbulence Probability Important?

**Turbulence Detection remains a challenge for aviation. Unexpected turbulence damages aircraft and can injure passengers and crew. This machine learning algorithm has been trained using observations of in-flight turbulence and satellite observations. It detects turbulence just less than half the time. The product is Moderate or Greater (MOG) turbulence probability.**




Probability of MOG from 10% (dark blue contours) to 40% (yellow) *over the eastern U.S. from GOES-16 ABI at 1640 UTC, 23 Oct 2020*

**This is a product created using machine learning. Thousands of turbulent (and non-turbulent) cases are used to relate satellite structures (Clean Window Infrared (10.3 μm) and Water Vapor Imagery (6.19 μm)) to observed turbulence between 30,000 and 40,000 ft.**

**Best results occur with Water Vapor imagery; however, if using GOES-17 data during times of the Loop Heat Pipe issue, Clean Window detection works but predictions are 1/3 less precise, and turbulent regions are smoothed out.**

## Impact on Operations

**Primary Application:** Best performance is with strong gravity waves that perturb clouds, and with developing convection

**Application:** Probabilistic model is tuned to have very low bias ("high reliability"). However, the probabilities typically do not exceed 40%.

**Short description:** Probability is of MOG for a large aircraft between 30K and 40K feet over a ten-minute flight segment.

## Limitations

**Does not detect all features**: Challenged by subtle gravity waves that emerge near convection or from jet-stream shearing

**Turbulence Location:** Turbulence often occurs on the edge of predicted features, not in the center. Thus, skirting a feature does not necessarily mean avoiding turbulence.

**Limitation :** Probability typically does not exceed 40%

**Website with data**: https://cimss.ssec.wisc.edu/turbulence

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