Evaluation of Convective Weather Avoidance Models for the Terminal Area

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Objective
Verify the performance of the Terminal Convective Weather Avoidance Model (CWAM) and investigate its sensitivity to TRACON complexity, spatial filter size, and forecast time horizon.

CWAM Modeling
Modify en route CWAM for terminal applications:
- Identify impacts that are specific to terminal operations (manually):
  - "Classic" Deviation
  - Holding
  - Remotes
  - Avoidance planning
  - Diversions
  - Slowdowns
  - Pathfinding
- Identify nonimpacted flights (automated)
- Create Terminal Weather Avoidance Field (TWAF) from probability of weather impact decisions

Creating the Model
Statistical Pattern Classifier

Dependence on Terminal Area
Corner Post Structure (Chicago) vs. Complex Structure (New York)

Performance of Terminal CWAM
- Flight paths are closer to storms in terminal airspace compared to en route airspace
- Pilot behavior is more predictable in Complex TRACONs compared to Corner Post TRACONs
- A higher Weather Avoidance Field threshold for maximum CSI indicates pilots penetrate stronger storms in Complex TRACONs

Methodology

Sensitivity to Spatial Filter Size and Forecast Time Horizon
Spatial Filter vs. Weather Forecast
- The model shows slight dependence on spatial filter size (4 km filter generates the best tradeoff)
- Weather forecast uncertainty reduces model performance

Conclusions
- The Terminal Convective Weather Avoidance Model is validated by an independent dataset
- There is less weather avoidance flexibility in a Complex TRACON
- Pilot behavior deviates less frequently in a Complex TRACON
- Model can be calibrated for different TRACON types by adjusting Weather Avoidance Field threshold
- Weather forecast uncertainty reduces model performance