

# The Use of Observations in the Transition of Research **Aviation Weather Products into Operations**



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## **Offshore Precipitation and Oceanic Convection**

Supporting transition of: Offshore Precipitation Capability (OPC) and Ensemble Probabilistic Oceanic Convective Hazards (EPOCH)





#### GPM and Surface Radar

Vertically Integrated Liquid (VIL) derived from ground of temperature and radar was compared to GPM satellite-derived VIL an icing event. to better understand agreement where the products overlap and determine biases useful in

#### **METAR vs Radars**

areas offshore

OPC product was evaluating against surface reports by establishing the distribution of ground-based and satellite radar signatures with each METAR-based present weather category

## Lightning, Echo Tops, Cloud Top Height

Global lightning, GPM global precipitation and radar echo tops, geostationary cloud top heights, and CloudSat reflectivity were investigated to verify EPOCH, which gives probabilities of thunderstorms and convective clouds > 10,000 ft. (9144 m)



## **Aircraft and Satellite Data** for Icing Verification

Supporting Current and Forecast Icing Products (CIP and FIP) and Icing Product-Alaska Forecasts (IPA-F) Transition



#### **AMDAR versus PIREPs**

■ RH > 67%,

■ RH < 50%.

Aircraft (AMDAR) observations of relative S humidity were compared to icing PIREPs in order to identify the distributions moisture associated with

Fraction Relative Humidity





# **PIREP and EDRs Matching** for Turbulence Verification

Supporting Graphical Turbulence Guidance: GTG-3, GTG Nowcast (GTG-N), GTG-Global Transition



### **Eddy Dissipation Rate (EDR)**

 Aircraft-independent measure of atmospheric turbulence. EDR measurements from Delta and United Airlines are compared to PIREPs.

#### Matching PIREPs to EDRs

- PIREPs are matched to their corresponding set of EDRs from the same aircraft.
- Different time windows (around a PIREP) are used to match the maximum peak EDR value to the PIREP.
- Jan 2013 Jun 2015 period is analyzed.

## Matching Summary

PIREP-EDR Distance vs. PIREP Receipt-Observed Time PIREP location errors show sensitivity to the choice of time window for matching Location error statistics for ±7.5 minutes window agree with prior studies. Strong relationship exists between the PIREP report 9-12 12-15 15-18 18-21 21-24 24-27 27-30 lag and location errors.

#### **Global Turbulence Observation Coverage**



PIREP, AIREP (pilot reports)

EDR, TAMDAR (automatic aircraft sensor-derived)



# **METARS and AMDAR to** verify Ceiling and Visibility

In support of the transition of new AWC Ceiling and Visibility products



#### **Compare AMDAR to METAR**

AMDAR observations of relative humidity, temperature, and dewpoint were compared with METAR ceiling heights. AMDAR were matched to METARs for the first 3,000 feet during take-off and within ±5 minutes.

- METAR ceiling height and first occurrence of an AMDAR relative humidity > 98% were weakly correlated (figure above).
- Large disagreements occurred with two scenarios:
- AMDAR RH threshold height > METAR ceiling when ceiling is "broken"; aircraft flies through a gap in the clouds.
- AMDAR RH threshold may occur at lower height than the METAR ceiling when "few" or "scattered" clouds occur below the ceiling.



#### Greatest observational needs

- Observations of icing and turbulence that are unbiased (i.e., unbiased by pilot choices, etc.
- Observations from aircraft sensors that report when the sensor is iced, rather than current practice of reporting only at regular intervals, which may miss some icing events.
- Spaced-based measure of low altitude cloud bases

#### Acknowledgements

This research is in response to requirements and funding by the Federal Aviation Administration (FAA). The views expressed are those of the authors and do not necessarily represent the official policy or position of the FAA.

Cloud Top Height data were obtained from the NASA Langley Cloud and Radiation Research Group, http://www-angler.larc.nasa.gov

GPM data were provided by the NASA Goddard Space Flight Center's GPM science team and PPS, which develop and compute the GPM IMERG as a contribution to GPM. Data are archived at the NASA GES DISC.