



NCAR

# Progress in Icing Forecast Product Development

**Marcia K. Politovich**

**FAA Aviation Weather Research Program  
InFlight Icing Product Development Team Lead**



# Quick Outline

- **Update/schedule on CIP/FIP**
  - Changes to CIP – severity, probability
  - Testing by users
- **Schedule**
  - Un-restricted operational use?
  - Alaska?
- **Are TAMDAR PIREPS useful for CIP?**



# CIP Upgrades

- **Upgrades are a response to YOUR concerns**
  - Probability instead of potential
  - Severity!
  - Display concepts: color, altitude resolution, etc.

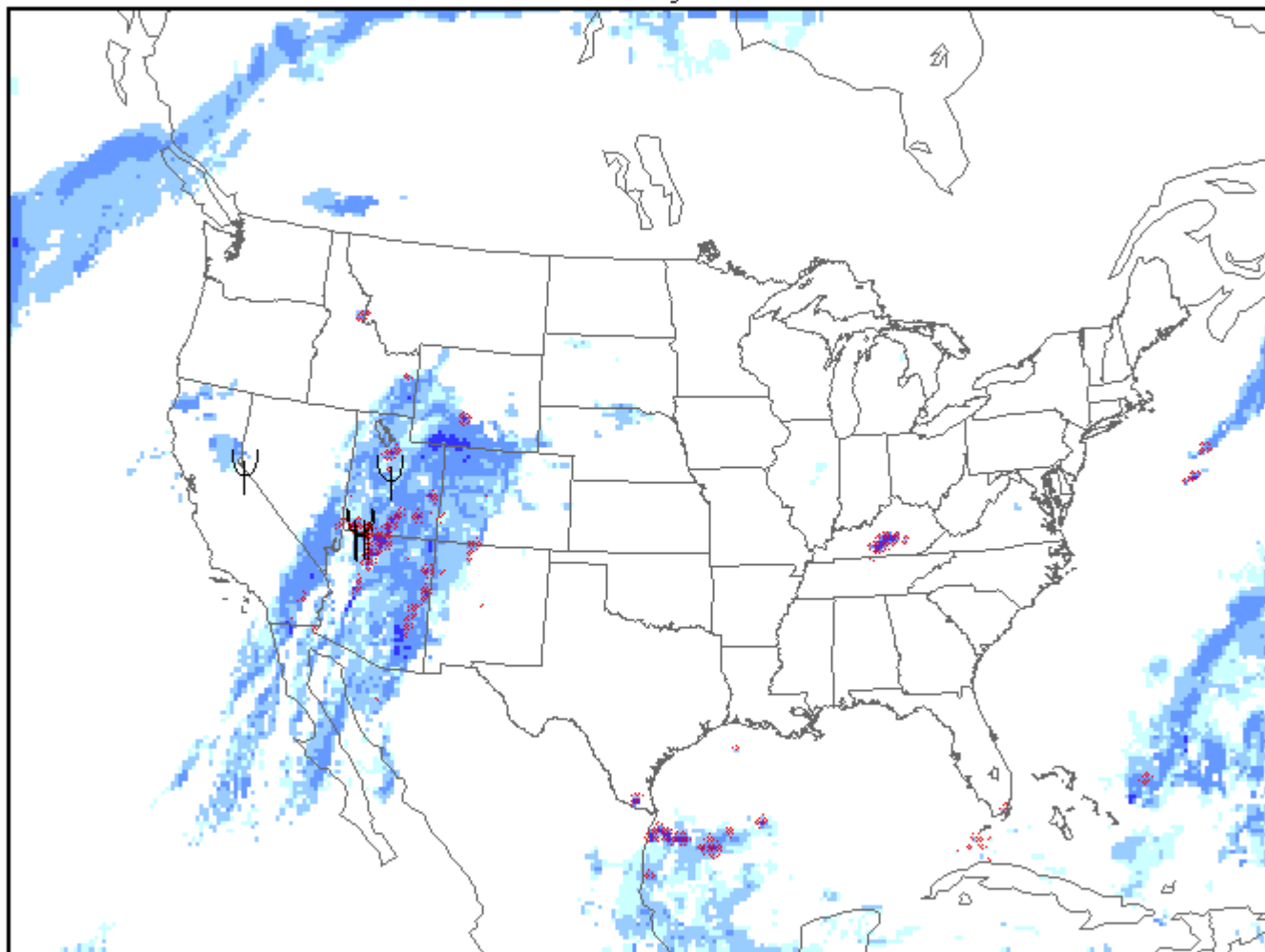
By FAA policy CIP is a Supplementary Weather Product for enhanced situational awareness only and must be used with one or more primary products (safety decision) such as an AIRMET or SIGMET (see AIM 7-1-3).



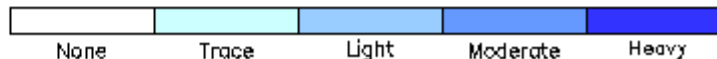
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## Icing severity at FL190

Analysis valid 1600 UTC Thu 05 Oct 2006



SLD threat



⊘ Negative

∩ Trace-Light

∩ Light-Moderate

∩ Moderate-Severe

Icing PIREP Symbols

∩ Trace

∩ Light

∩ Moderate

∩ Severe

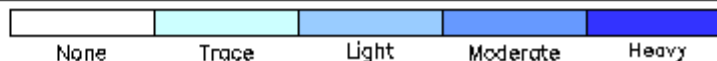
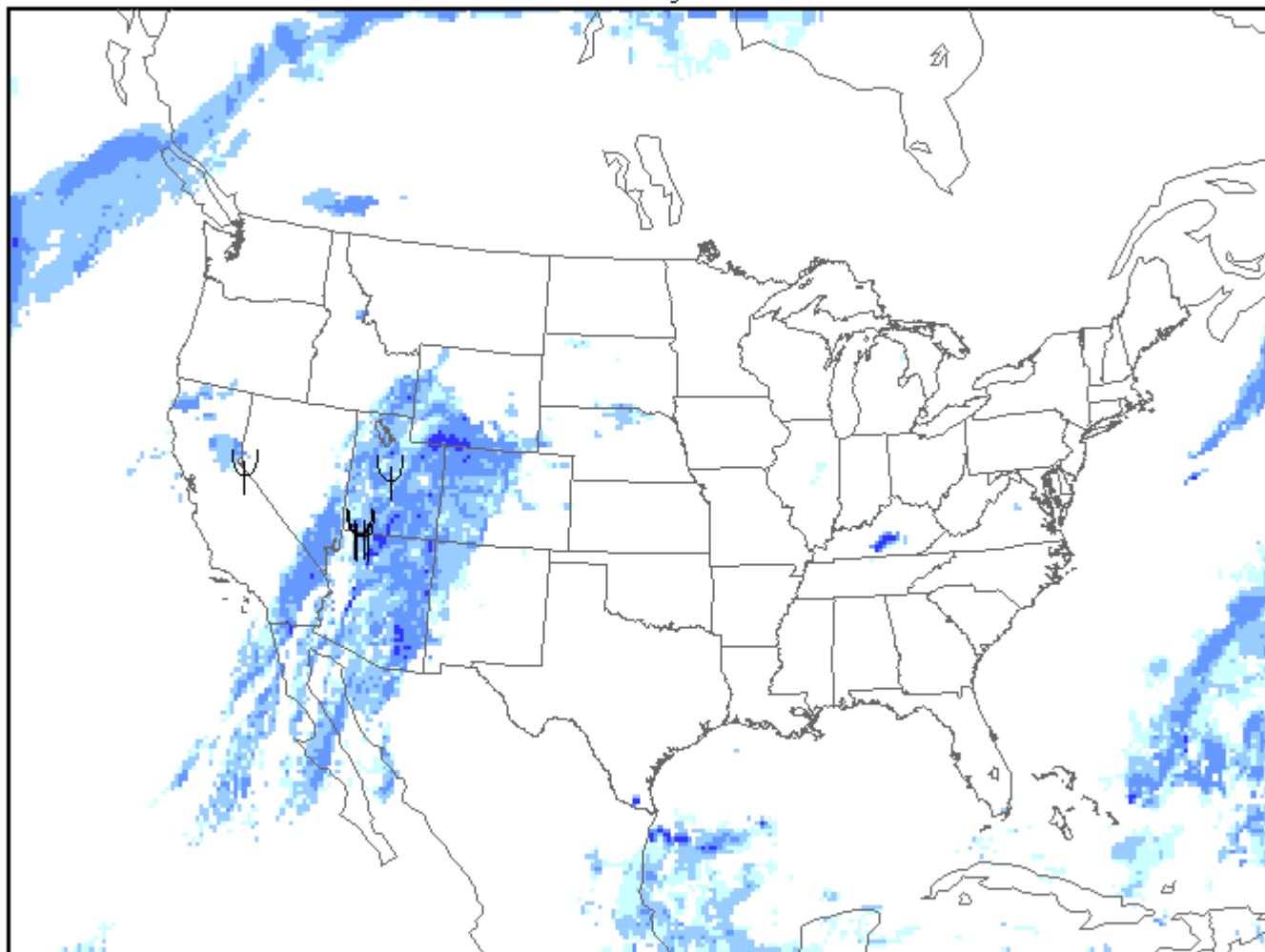
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## Icing severity at FL190

Analysis valid 1600 UTC Thu 05 Oct 2006



Icing PIREP Symbols

- |            |               |                   |                     |
|------------|---------------|-------------------|---------------------|
| ⊖ Negative | ∩ Trace-Light | ∩∩ Light-Moderate | ∩∩∩ Moderate-Severe |
| ∩ Trace    | ∩ Light       | ∩∩ Moderate       | ∩∩∩ Severe          |

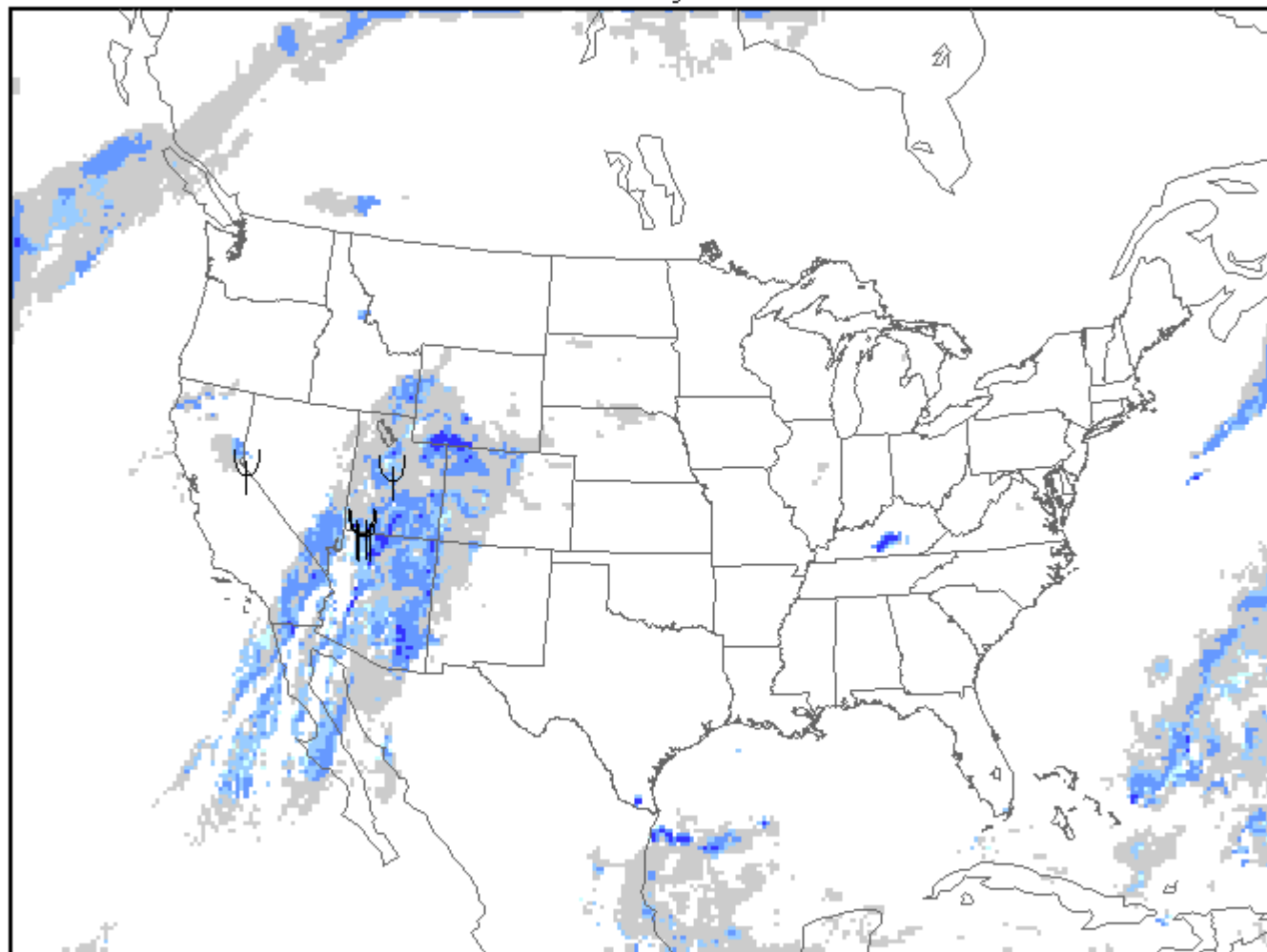
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## Icing severity (prob>25%) at FL190

Analysis valid 1600 UTC Thu 05 Oct 2006



Icing PIREP Symbols

- |            |               |                   |                     |
|------------|---------------|-------------------|---------------------|
| ∅ Negative | ∩ Trace-Light | ∩∩ Light-Moderate | ∩∩∩ Moderate-Severe |
| ∩ Trace    | ∩∩ Light      | ∩∩∩ Moderate      | ∩∩∩∩ Severe         |

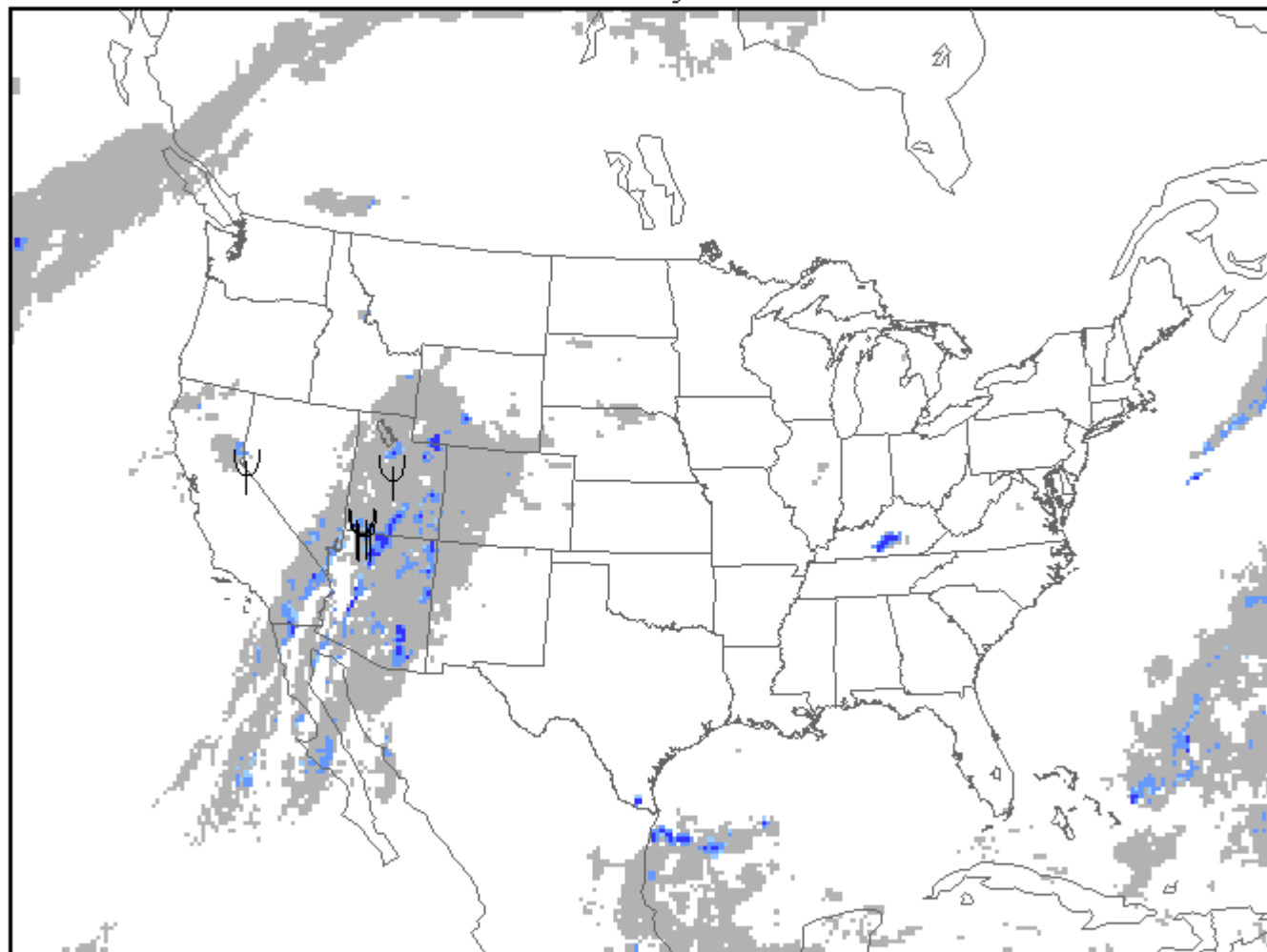
By FAA policy CIP is a Supplementary Weather Product for enhanced situational awareness only and must be used with one or more primary products (safety decision) such as an AIRMET or SIGMET (see AIM 7-1-3).



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## Icing severity (prob>50%) at FL190

Analysis valid 1600 UTC Thu 05 Oct 2006



Icing PIREP Symbols

- |            |               |                   |                     |
|------------|---------------|-------------------|---------------------|
| ∅ Negative | ∩ Trace-Light | ∩∩ Light-Moderate | ∩∩∩ Moderate-Severe |
| ∩ Trace    | ∩∩ Light      | ∩∩∩ Moderate      | ∩∩∩∩ Severe         |

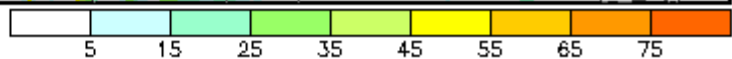
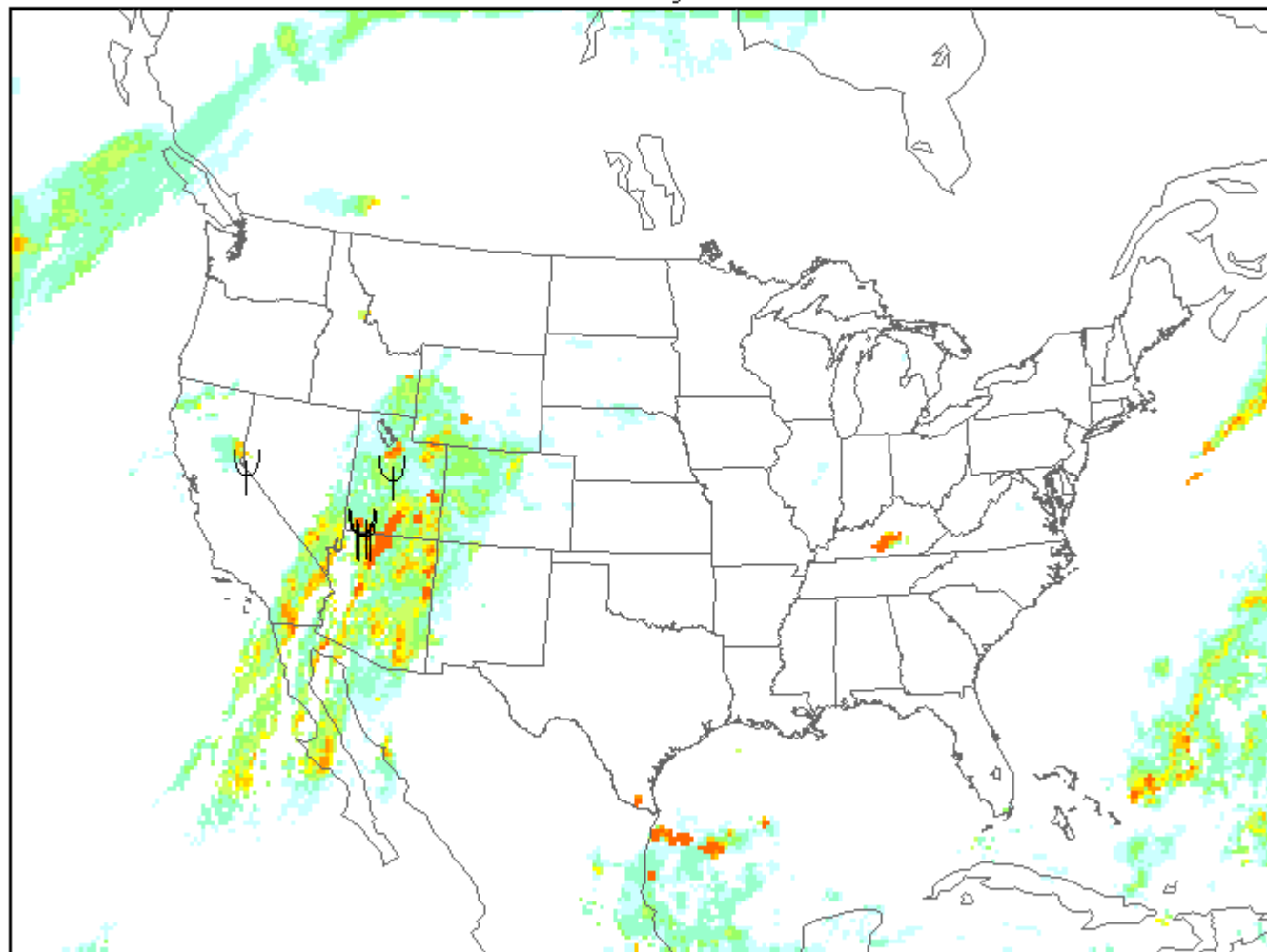
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## Probability of icing at FL190

Analysis valid 1600 UTC Thu 05 Oct 2006



Icing PIREP Symbols

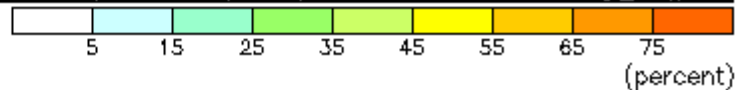
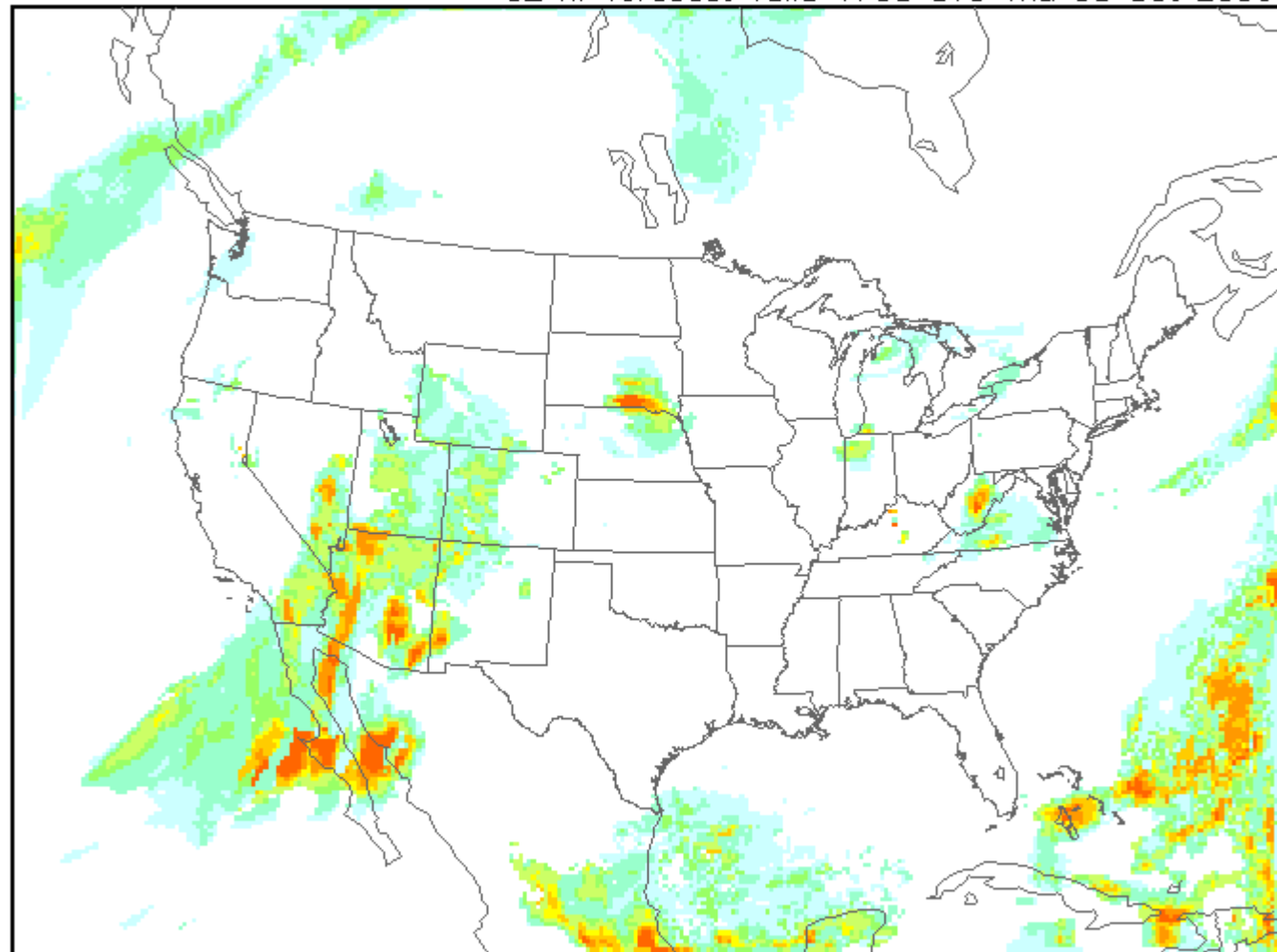
- |            |               |                  |                   |
|------------|---------------|------------------|-------------------|
| ∅ Negative | Ψ Trace-Light | Ψ Light-Moderate | Ψ Moderate-Severe |
| U Trace    | Ψ Light       | Ψ Moderate       | Ψ Severe          |



The FIP is an automatically-generated product that supplements AIRMETs and SIGMETs by identifying areas of forecast icing potential, but it does NOT substitute for the intensity and forecast information contained in AIRMETs and SIGMETs.

## Potential for icing at FL190

02 hr forecast valid 1700 UTC Thu 05 Oct 2006

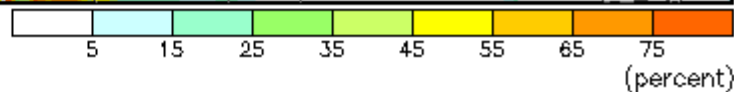
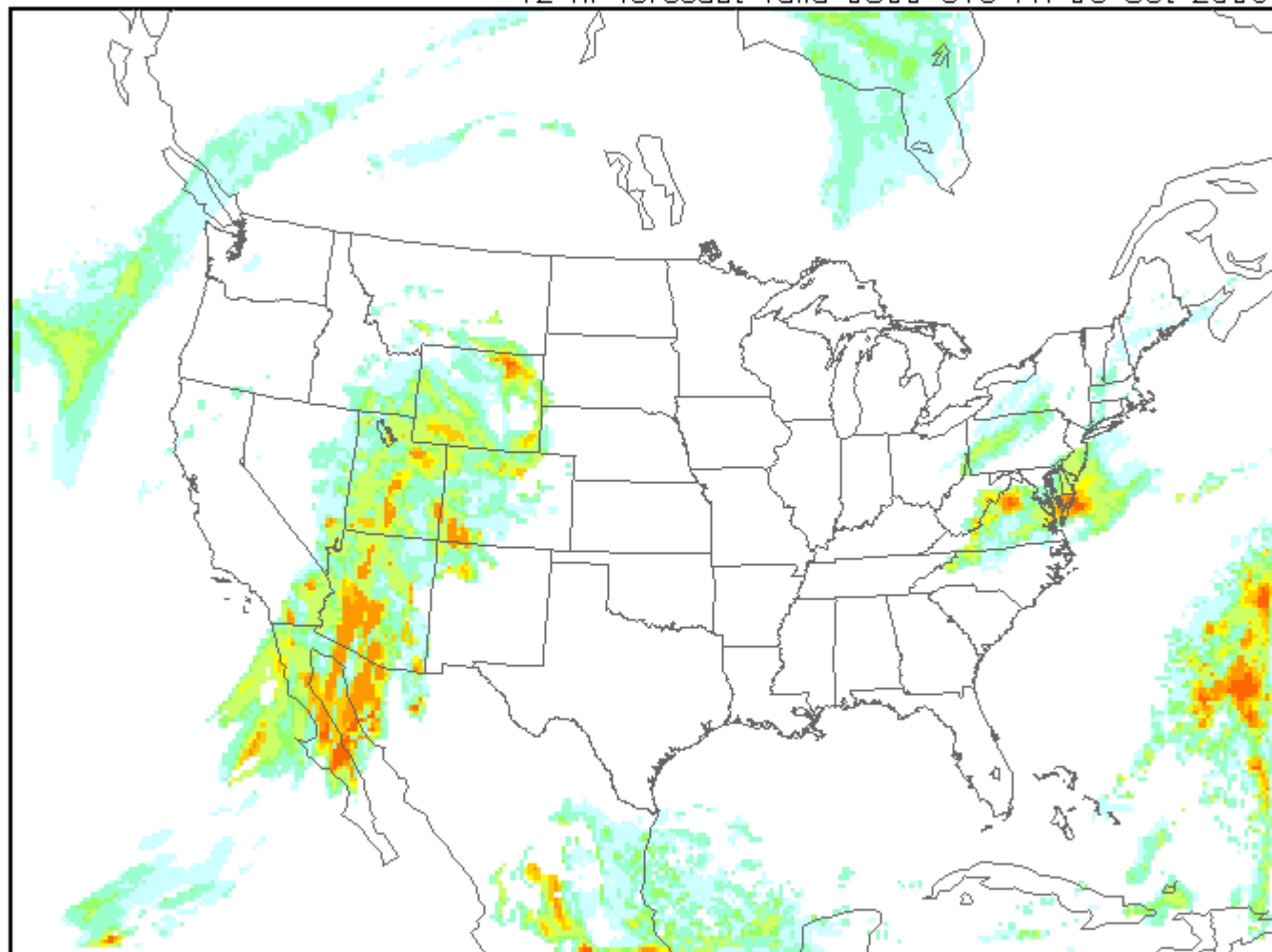


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The FIP is an automatically-generated product that supplements AIRMETs and SIGMETs by identifying areas of forecast icing potential, but it does NOT substitute for the intensity and forecast information contained in AIRMETs and SIGMETs.

## Potential for icing at FL190

12 hr forecast valid 0300 UTC Fri 06 Oct 2006

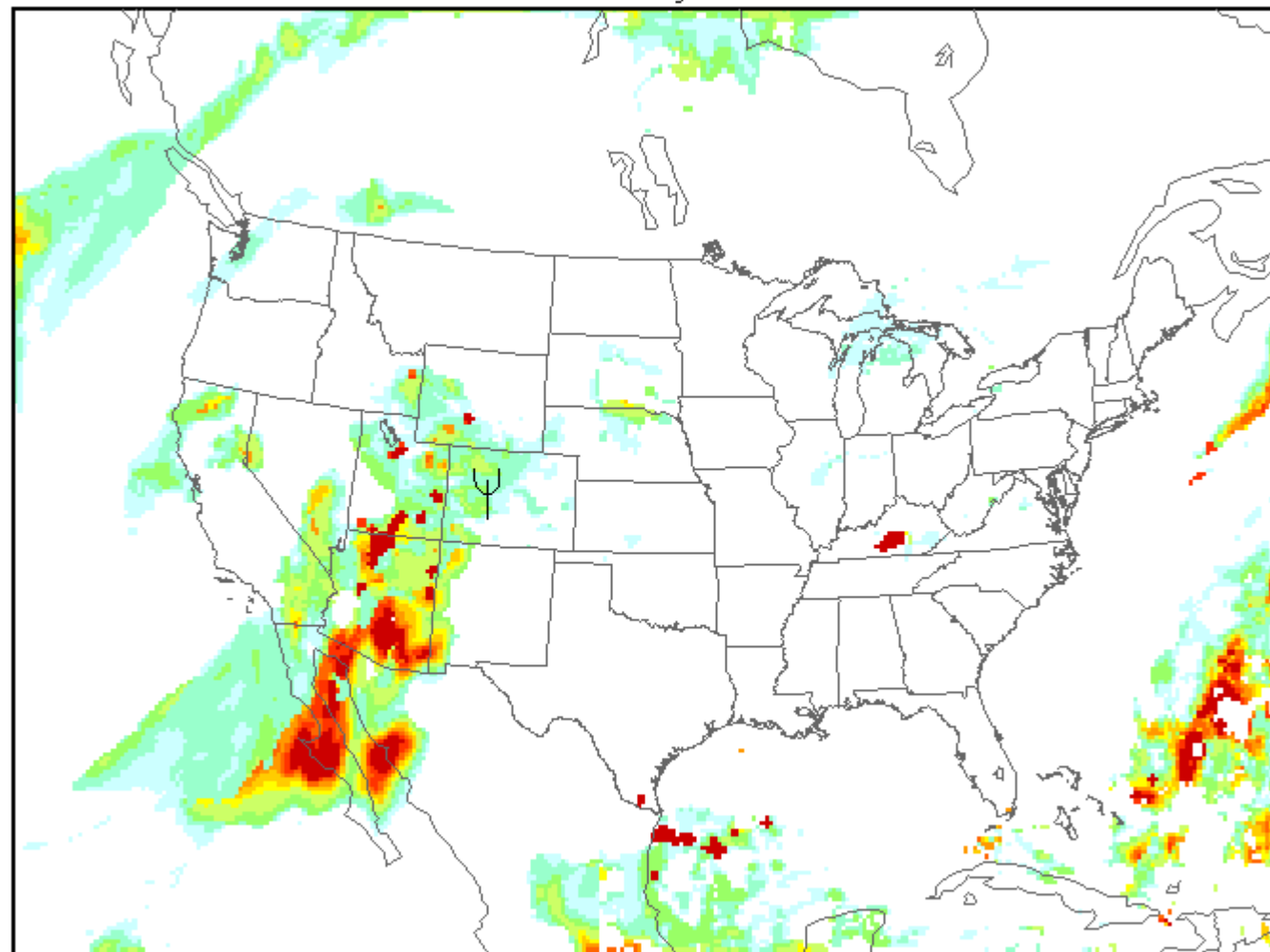


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The CIP is an automatically-generated product that supplements AIRMETs and SIGMETs by identifying areas of current icing potential, but it does NOT substitute for the intensity and forecast information contained in AIRMETs and SIGMETs. It is authorized for operational use by meteorologists and dispatchers.

## Icing potential at FL180

Analysis valid 1600 UTC Thu 05 Oct 2006



5 15 25 35 45 55 65 75 85 95

Icing PIREP Symbols

∅ Negative

∩ Trace-Light

∪ Light-Moderate

∩ Moderate-Severe

∩ Trace

∩ Light

∩ Moderate

∩ Severe

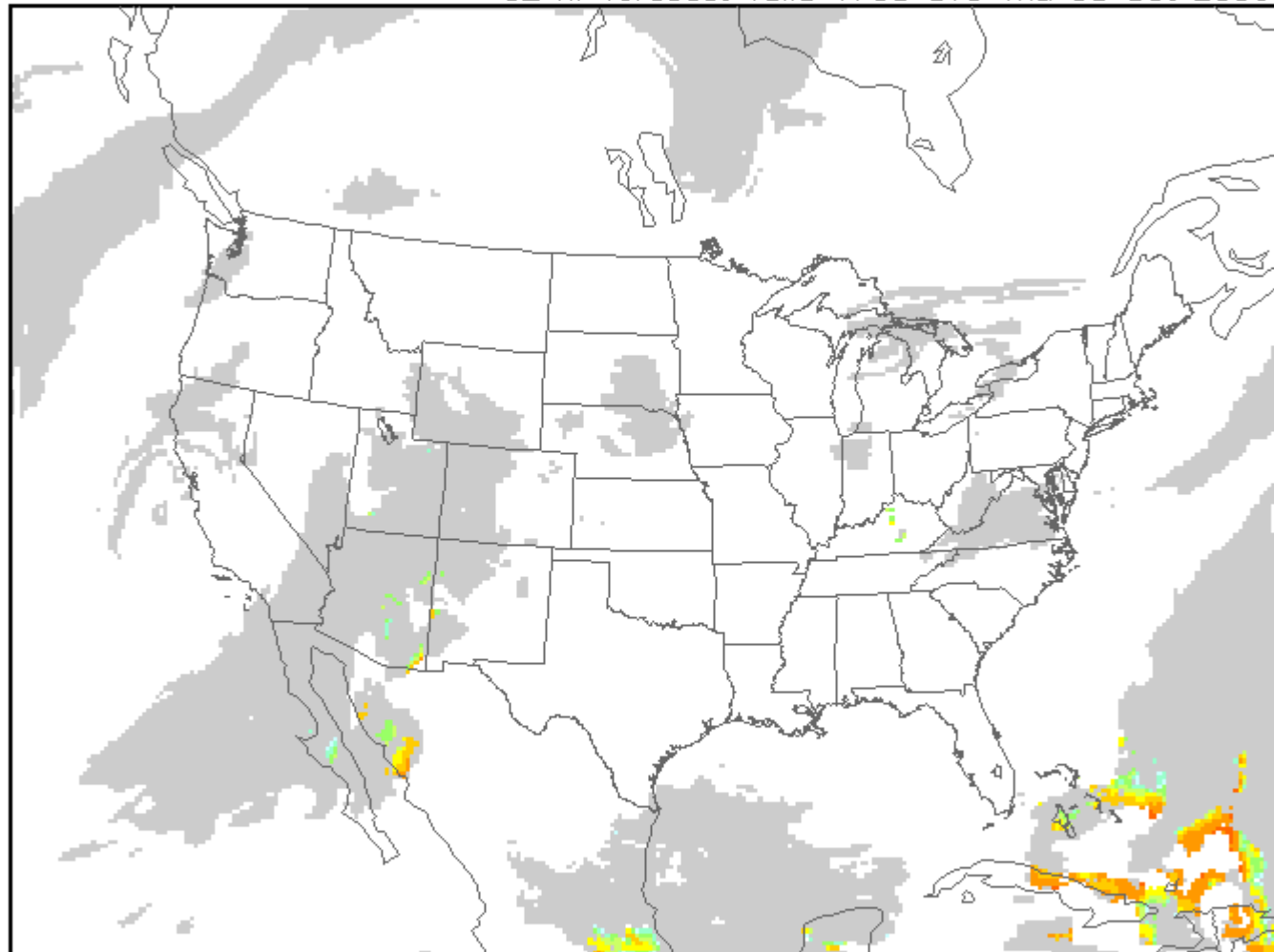


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The FIP is an automatically-generated product that supplements AIRMETs and SIGMETs by identifying areas of forecast icing potential, but it does NOT substitute for the intensity and forecast information contained in AIRMETs and SIGMETs.

## SLD Icing Potential at FL190

02 hr forecast valid 1700 UTC Thu 05 Oct 2006



Unknown 5 15 25 35 45 55 65 75



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### Icing AIRMETs (blue) and SIGMETs (red)

chart created at 1606 UTC Thu 05 Oct 2006

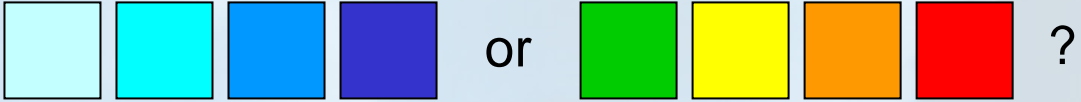

AIRMETs valid until 2000z/5<sup>th</sup>, SIGMETs expire at or before 1755z/5<sup>th</sup>





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# Future Plans for CIP/FIP

- **Color scheme**  or  ?
- **More vertical levels**
- **Technical upgrades**
  - TAMDAR
  - NSSL 3D radar mosaic
  - NASA LaRC advanced satellite products
  - Ensemble forecasts
- **Human-Over-The-Loop**
- **Tie-in to GFA – G-AIRMET**
  - G-AIRMET experimental Feb'07, operational Oct'07



# On Deck: FIP

- **D3 (experimental) decision for new FIP is March 2007**
  - Code has been frozen
  - Verification data sets have been produced
  - Severity and probability
  - Product on ExADDS immediately after decision
  
- **D4 follows a year later**
  - Some tweaks
  - Need to work on FIP/AIRMET issues



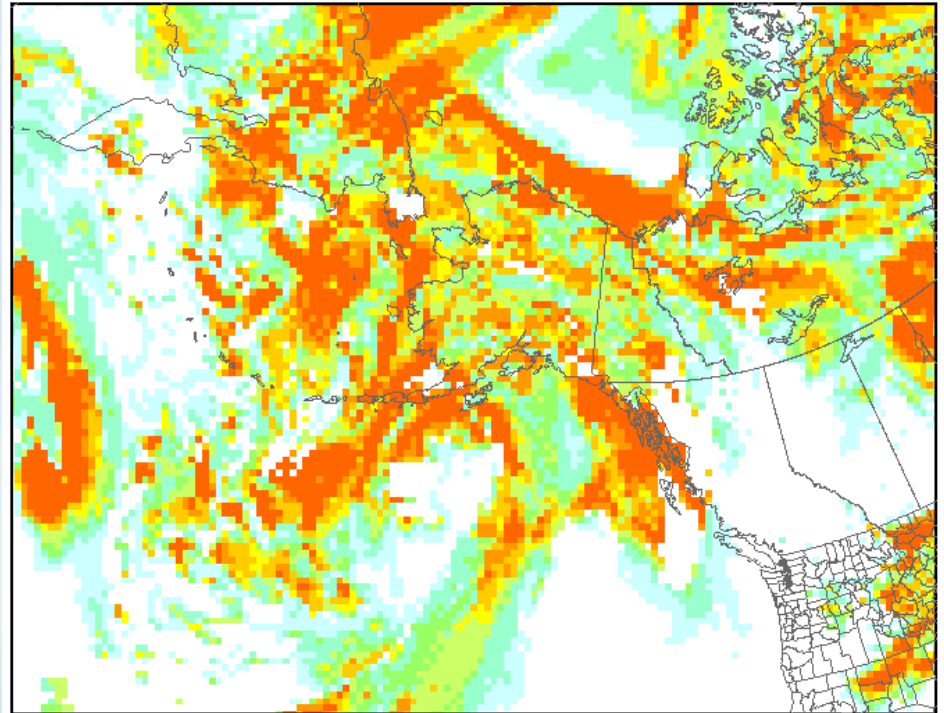
# Alaska

- Product development depends on model development schedule
- Current and forecast products are now experimental and on ExADDS

By FAA policy CIP is a Supplementary Weather Product for enhanced situational awareness only and must be used with one or more primary products (safety decision) such as an AIRMET or SIGMET (see AIM 7-1-3).

## Maximum icing potential (1000 ft. MSL to FL300)

Analysis valid 1300 UTC Mon 09 Oct 2006



5 15 25 35 45 55 65 75 (percent)

Icing PIREP Symbols

Trace	Trace-Light	Light-Moderate	Moderate-Severe
⊂	⊂	⊂	⊂
Trace	Light	Moderate	Severe
⊂	⊂	⊂	⊂





Product	D2	D3	D4	Effective Operational Date
CIP	na	na	12/11/01	3/27/02
FIP	na	12/11/01	7/9/03	3/1/04
CIP-AK	10/1/02	11/13/03	FY10	FY11
FIP-AK	10/1/02	11/17/04	FY09	FY10
CIP Severity	na	8/26/04	10/4/06	12/6/06
FIP Severity	na	3/31/07	5/15/08	FY08
Global CIP	FY08	FY10	FY11	FY12
Global FIP	8/31/07	FY09	FY10	FY11



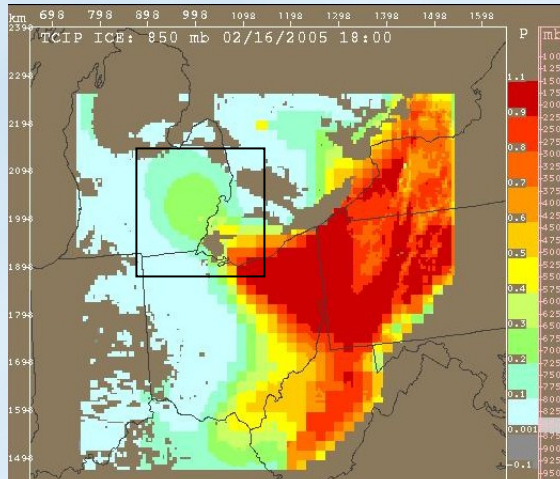
Product	D2	D3	D4	Effective Operational Date
CIP	na	na	12/11/01	3/27/02
FIP	na	12/11/01	7/9/03	3/1/04
<del>CIP-AK</del>	10/1/02	??	<del>FY10</del>	<del>FY11</del>
<del>FIP-AK</del>	10/1/02	??	<del>FY09</del>	<del>FY10</del>
CIP Severity	na	8/26/04	10/4/06	12/6/06
FIP Severity	na	3/31/07	5/15/08	FY08
<del>Global CIP</del>	<del>FY08</del>	<del>FY10</del>	<del>FY11</del>	<del>FY12</del>
<del>Global FIP</del>	8/31/07	<del>FY09</del>	<del>FY10</del>	<del>FY11</del>



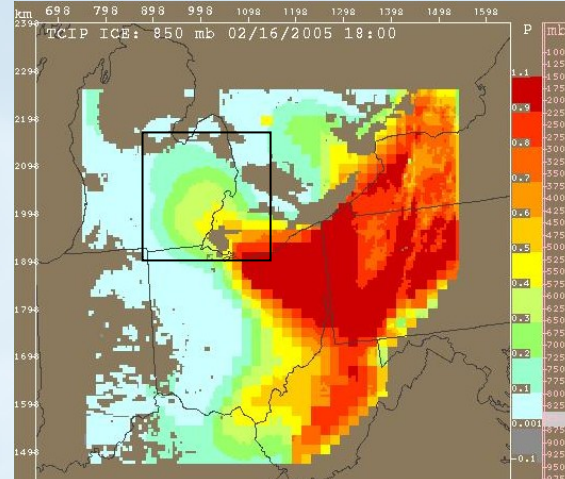
# Are TAMDAR icing reports useful?

- **They make a visible difference in the product**
- **Statistically, the improvement seems low**
  - Verification methods are relatively clumsy
  - Hard to obtain good “truth” data sets
- **May be possible to make a map of current/recent icing from TAMDAR reports**

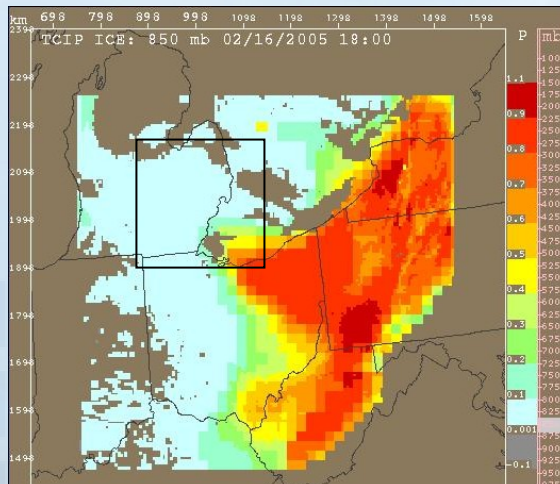
# Impacts (5K ft)- HRCIP



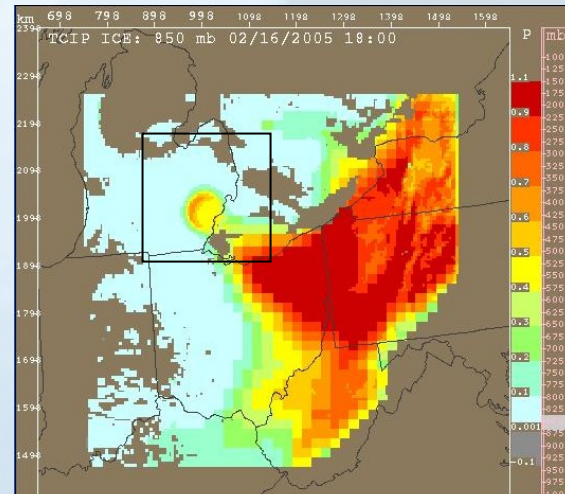
Voice Only



Voice + Pos TAMDAR

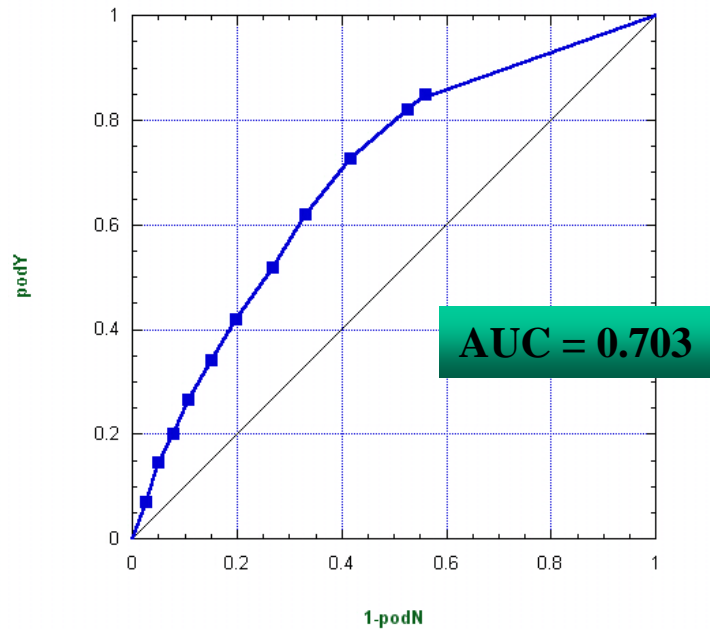
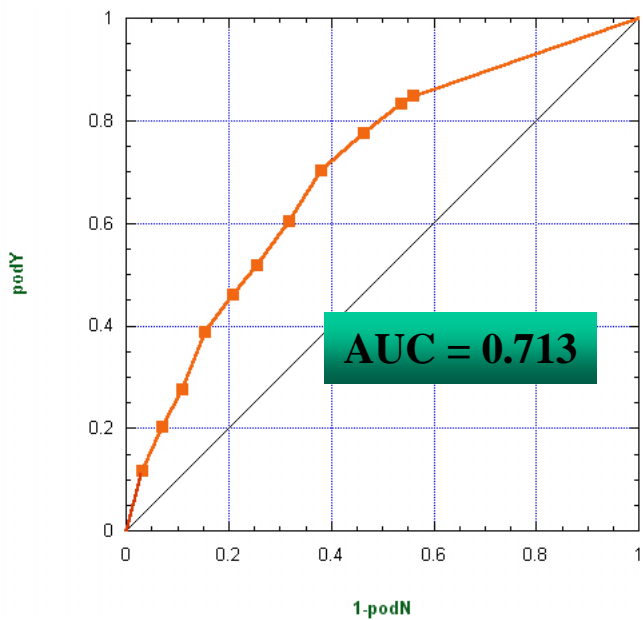
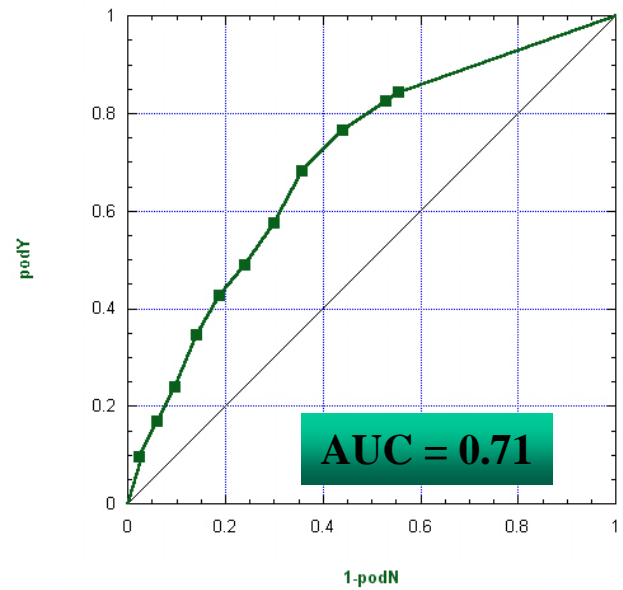
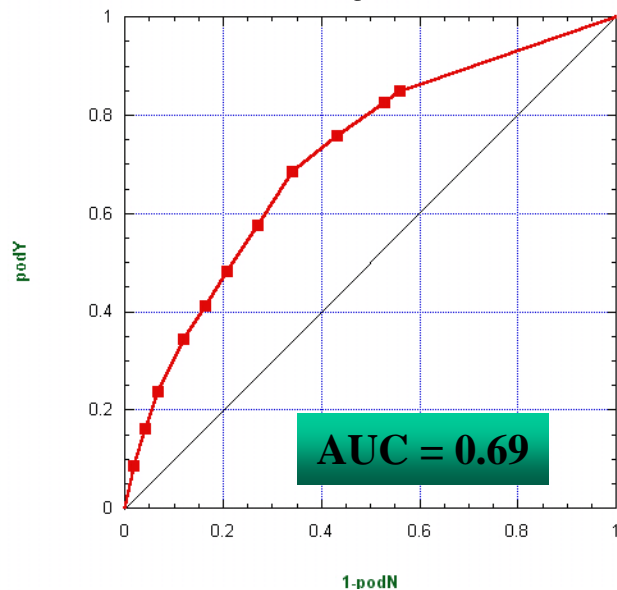


Large Disk - Pos & Neg



Small Disk - Pos & Neg

# ROC Curves





# R&D Summary

- **Progress!! Success!!**
- **Coordinate with**
  - MDL and AWC for HOTL and GFA
  - DOD for ensemble forecasts, database
  - JPDO for planning
- **Incorporate new data sources as we learn to extract relevant information**
  - NSSL 3D radar mosaic
  - NASA LaRC satellite products
  - TAMDAR