

Winter Weather Challenges for Aviation



**NATIONAL
WEATHER
SERVICE**

November 25, 2024

NWS Baltimore/Washington Weather Forecast Office

Presenter: Brian LaSorsa, Science Operations Officer

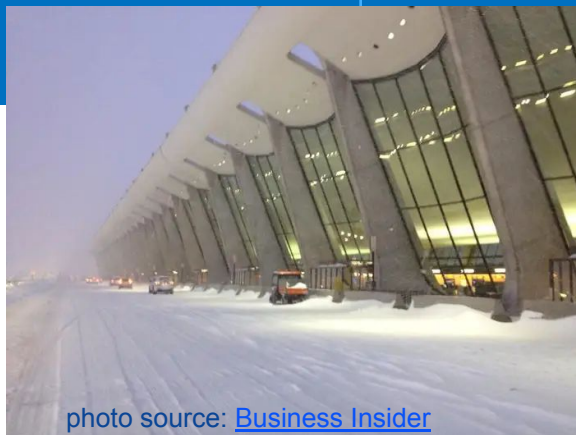


photo source: [Business Insider](#)



photo source: [Dulles Airport](#)



photo source: [gazetteleader](#)



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Problem Statement

- **Communication of probabilistic forecasts is very important to assess the combination of confidence and potential impact on aviation.**
- **Terminal Aerodrome Forecast is mostly a deterministic forecast.**

Agenda

- Challenges of Aviation Winter Weather Forecasting
- Potential Solutions
- Summary



Challenges of Aviation Winter Weather Forecasts

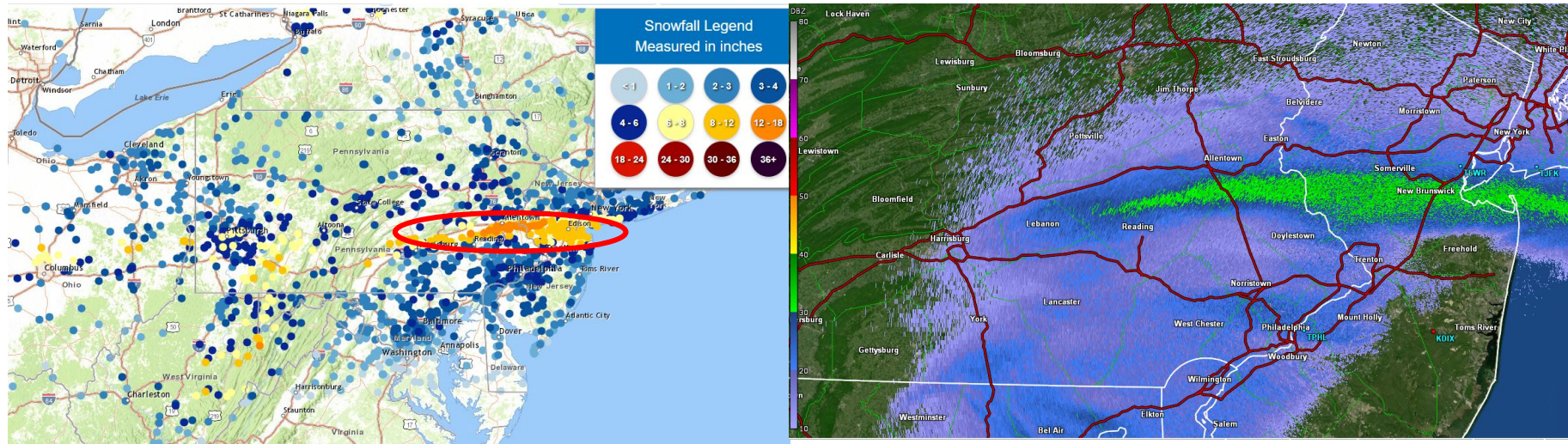
- Most storms have tight gradients (large differences in snow accumulation via short distances)
- Precipitation type has a significant effect on impacts
 - EX: FAA deicing planning is different for ice vs. snow
 - Do they need to plow or just treat the runways?
- Wintry precipitation rates (snow and/or ice)
 - Feedback from DCA tower visit: Wintry precipitation is important, but whether or not it will stick is very important.
 - “Flurries with very cold air that do not stick is much different than wet snow sticking onto the wings”

Challenges of Aviation Winter Weather Forecasts (Continued)

- **Snow to liquid ratio (same amounts of precipitation cause different snowfall accumulations based on temperature)**
 - **How much do they need to plow? Will it be blowing and drifting? How heavy will the snow be?**
- **Start and end time of wintry precipitation**
 - **DCA tower visit: For winter weather, timing of frozen precipitation is the most important factor.**



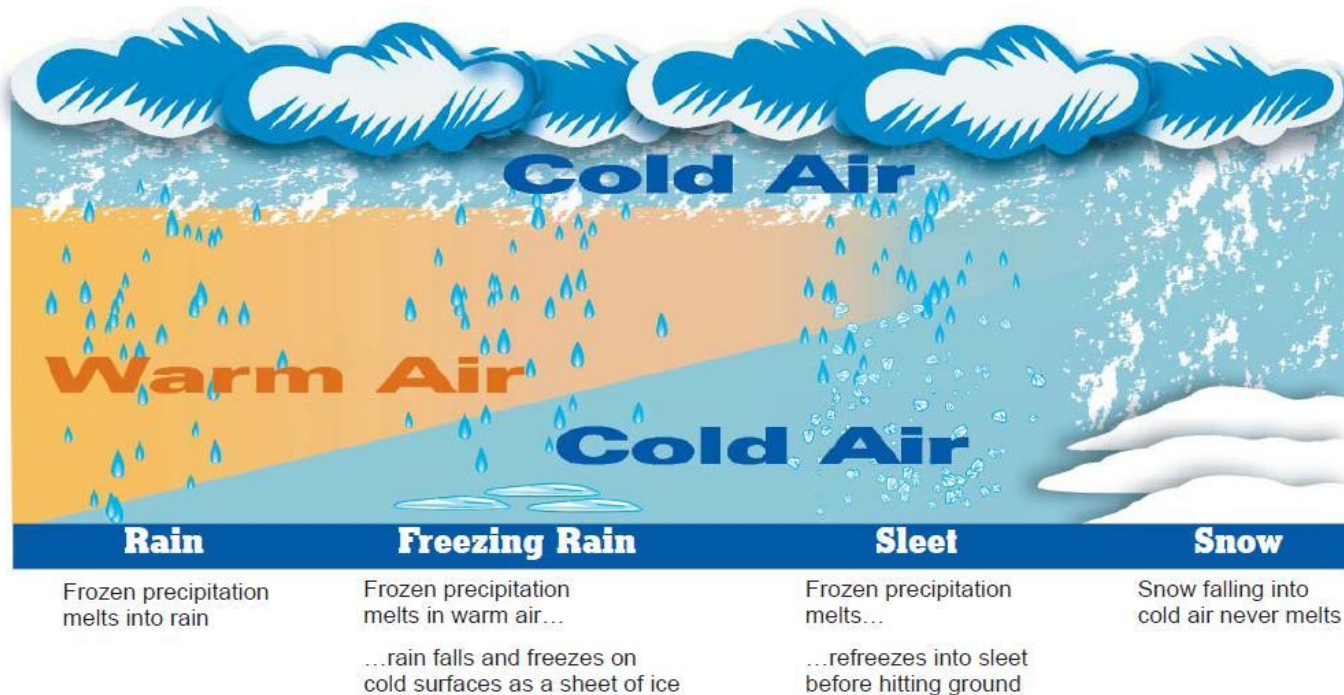
Challenges of Aviation Winter Weather; Gradient



February 16th-17th, 2024

- Banding snowfall is very common in certain setups.
- Snowfall accumulations went from a few inches to over a foot in just a few miles!

Challenges of Aviation Winter Weather; P-Type



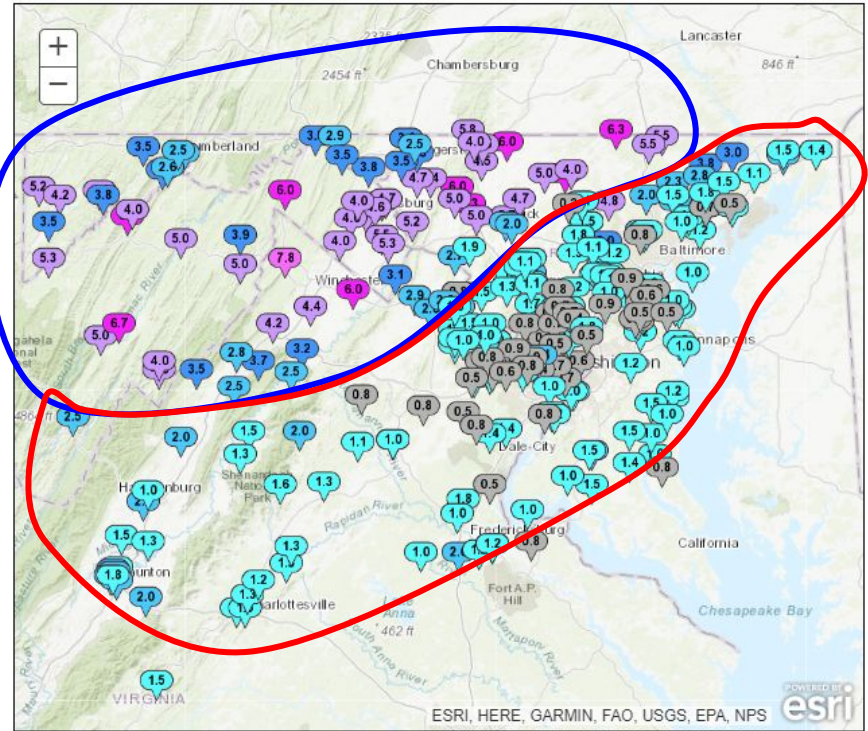
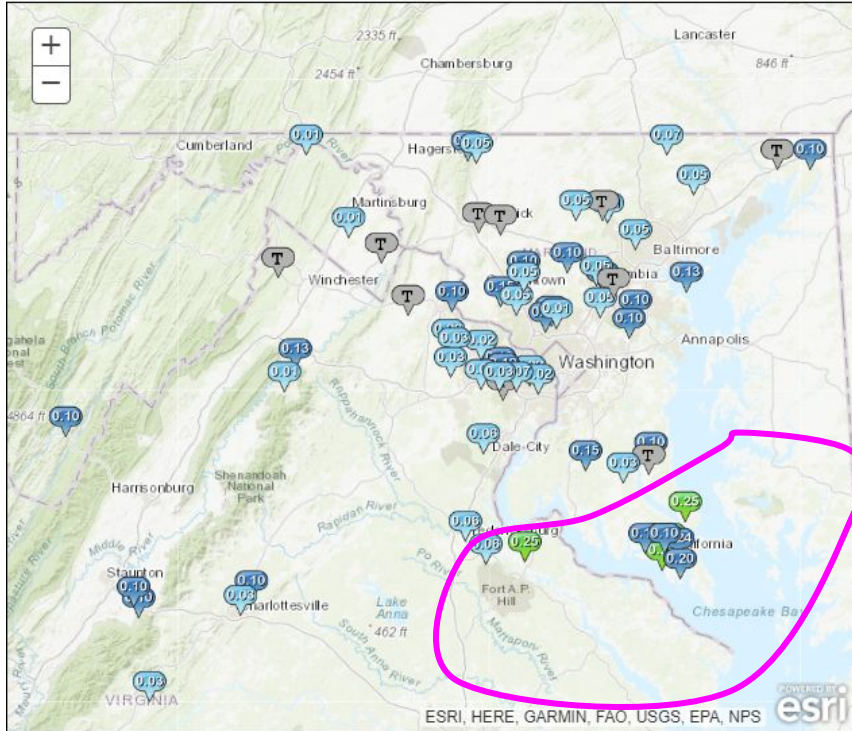
- Warmer air overran cold air near the surface
- Snow, sleet, and freezing rain occurred at the same time in our area.
- Accumulations and impacts were driven by p-type and rates (see next slide).

February 18th, 2021

Challenges of Aviation Winter Weather; P-Type

[Link here](#)

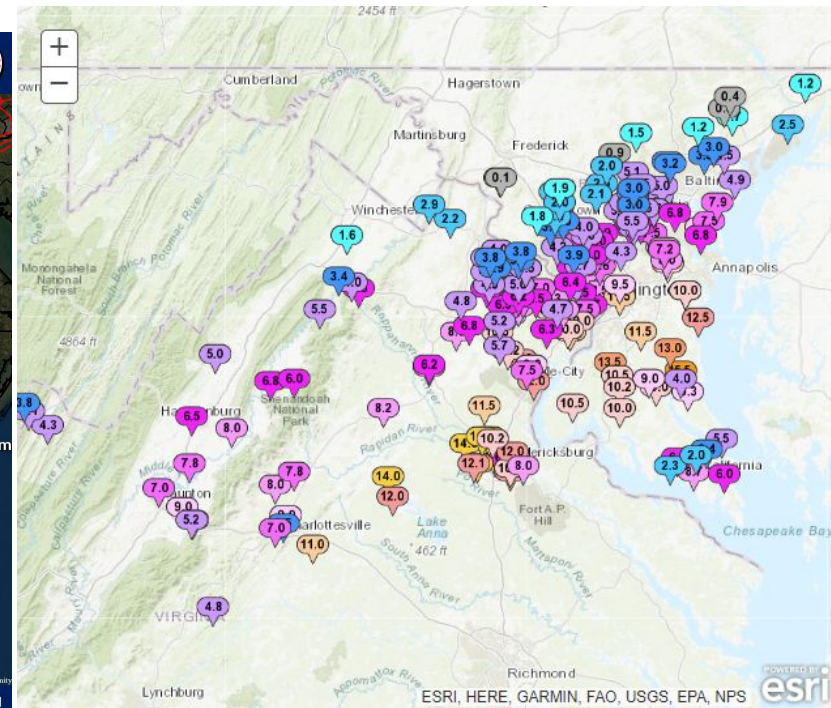
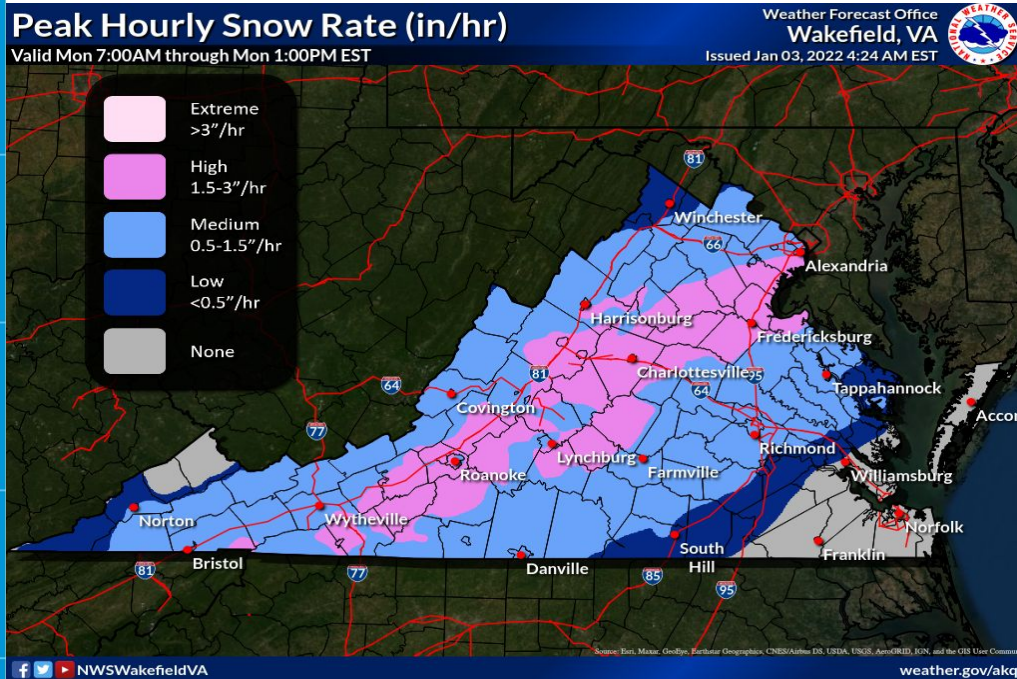
[Link here](#)



February 18th, 2021 (storm total snowfall on right, storm total ice on left)



Challenges of Aviation Winter Weather; Precipitation Rates



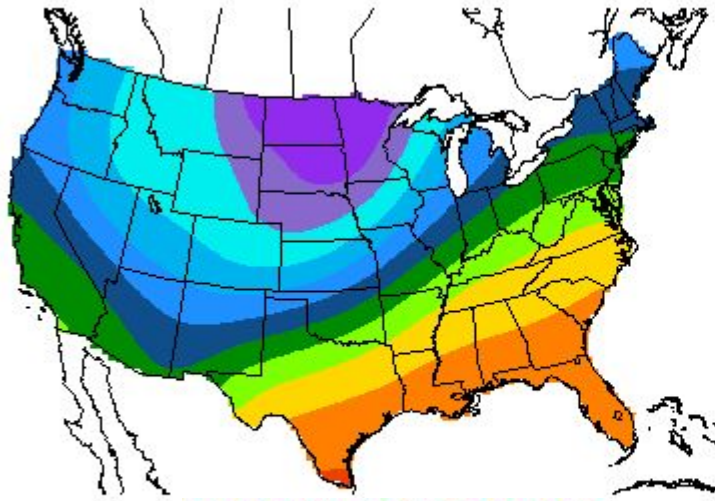
[Link here](#)

January 3, 2022

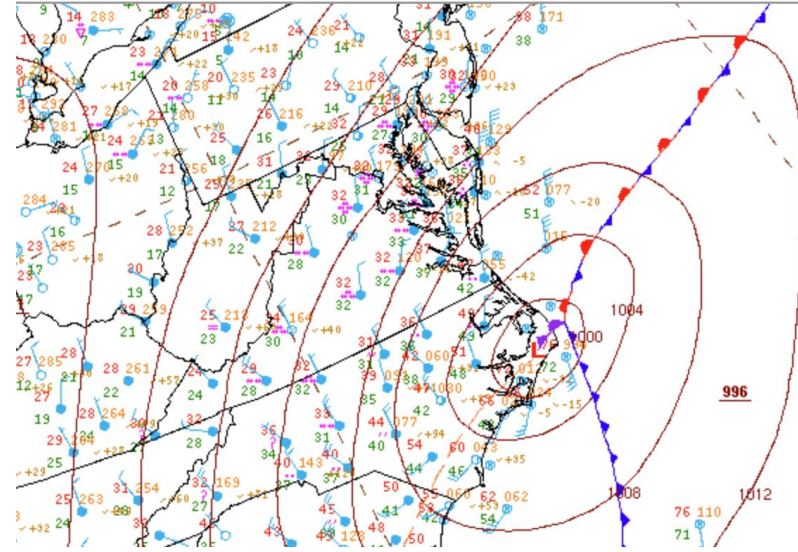
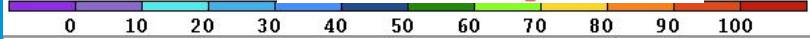


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Challenges of Aviation Winter Weather; Precipitation Rates



Maximum Temperature January 2nd, 2022



January 3rd at 10 AM

January 3, 2022



3:23 p.m. EST, January 3, 2022

FAA lifts weather ground stop at DC's Reagan National Airport

From CNN's Pete Muntean

The Federal Aviation Administration's data shows the ground stop for flights bound to Reagan National Airport serving Washington, DC, has now been lifted.

The earlier ground stop at Baltimore/Washington International Airport has also ended.

In Washington, DC, 8.5 inches of snow was measured on Monday, making it the heaviest one-day snow total since January 2016 and eclipsing the one-day total from January 2019, CNN meteorologist Brandon Miller said.

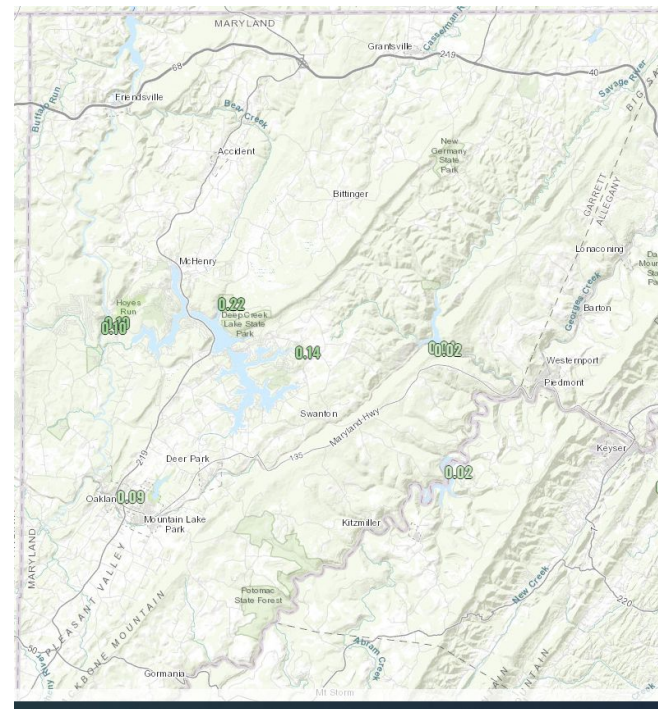
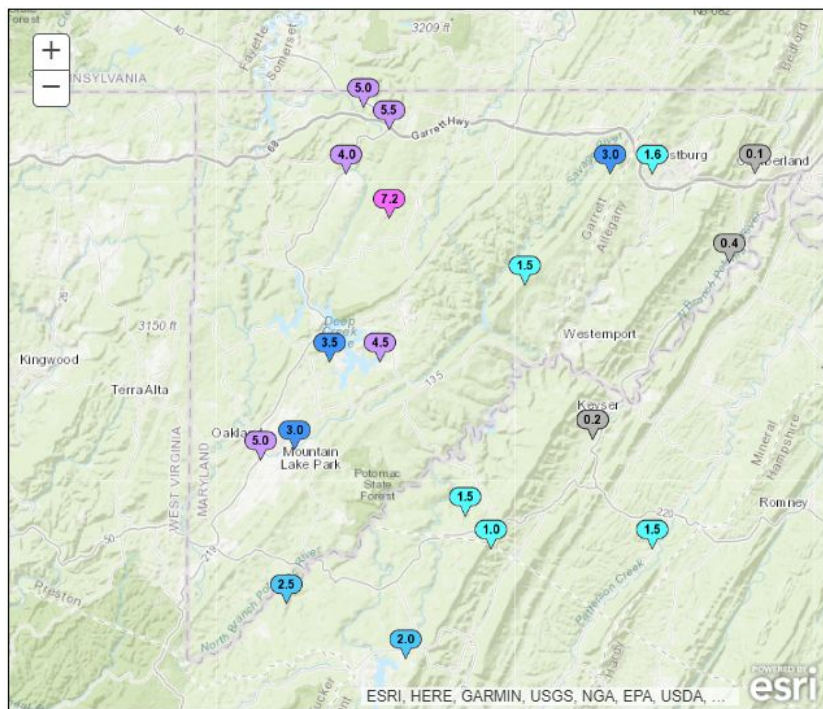
Washington is under a winter storm warning until mid-afternoon.

Washington, D.C.
January 3rd, 2022

Fredericksburg, VA
January 3rd, 2022

Challenges of Aviation Winter Weather; Snow-Liquid Ratios

[Link here](#)



Liquid amounts
~ 0.25"

Snow amounts
~ 5-7"

SLR
~ 20-25:1

November 28, 2023



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Challenges of Aviation Winter Weather; **Snow-Liquid Ratios**



Keyser's Ridge Webcam 7:01 AM



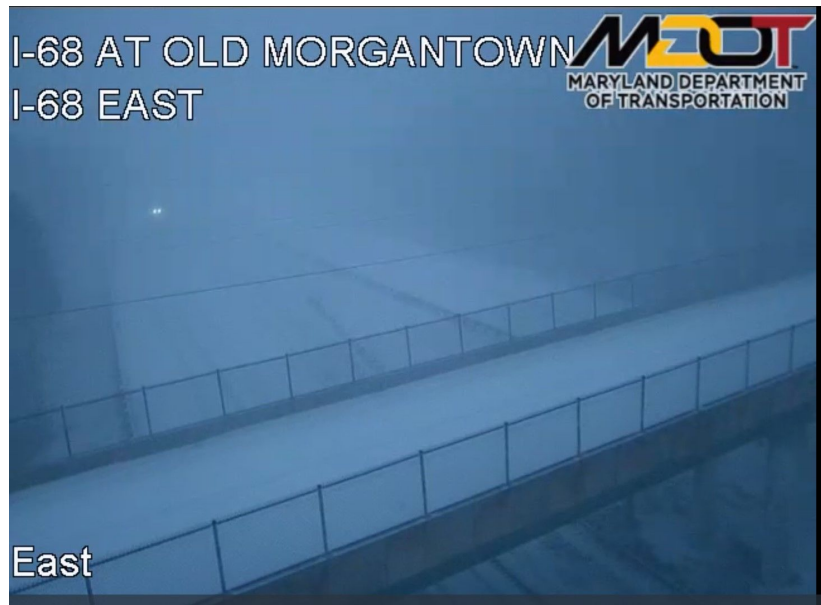
Keyser's Ridge Webcam 7:07 AM

Snowfall with high SLR (dry snow) combined with gusty winds can drastically reduce visibility in addition to producing much higher snowfall totals.

November 28, 2023



Challenges of Aviation Winter Weather; Snow-Liquid Ratios



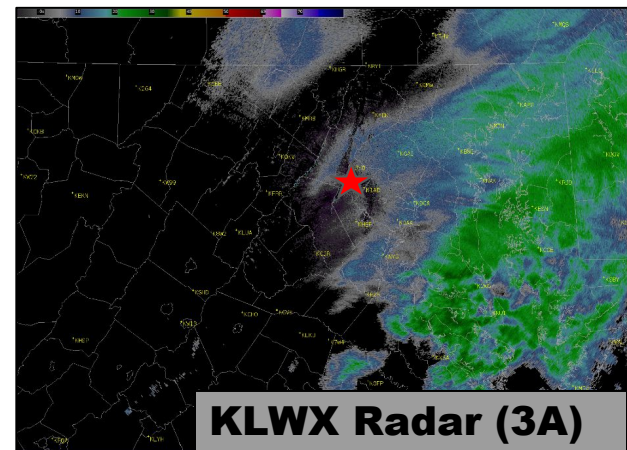
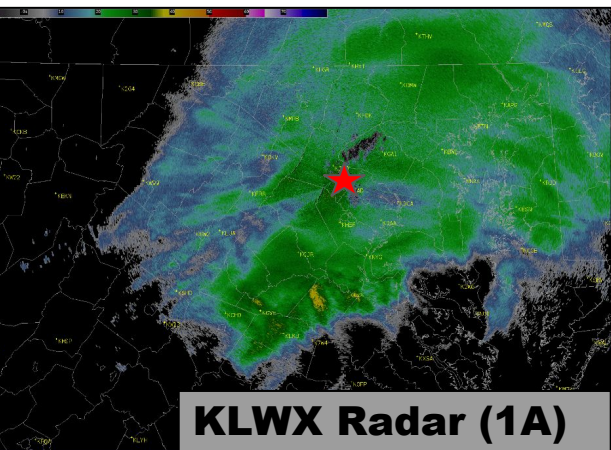
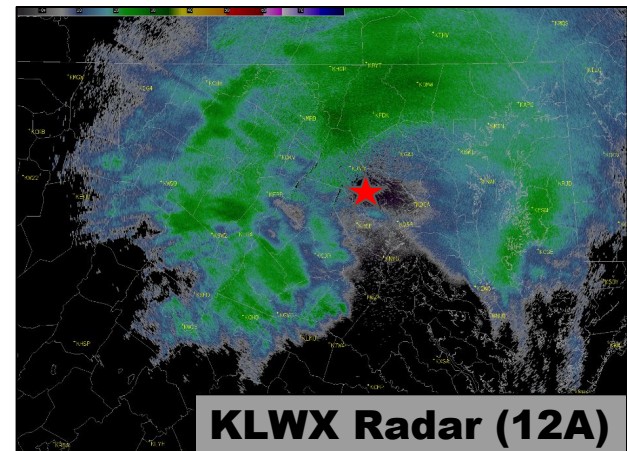
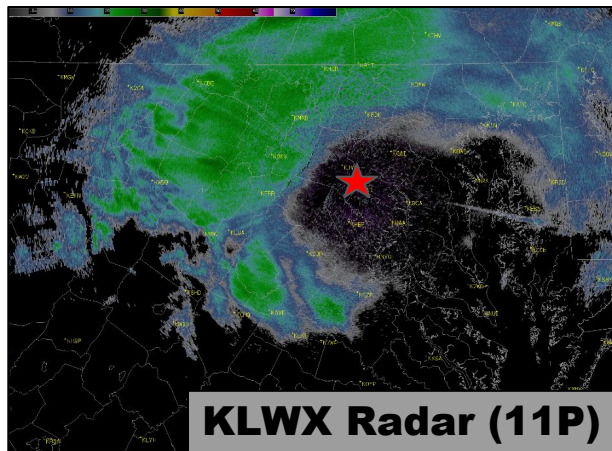
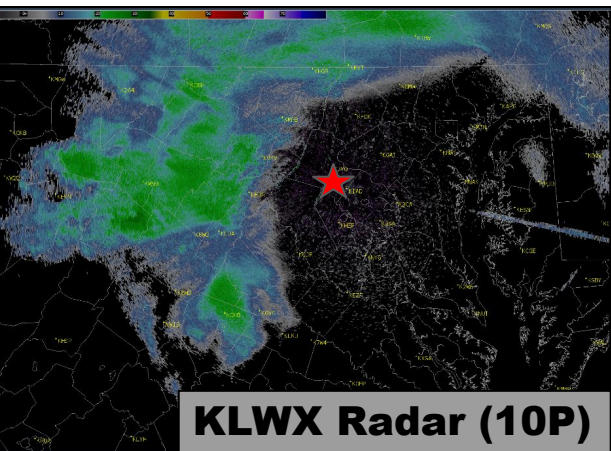
Old Morgantown Road I-68 East at
6:57 AM, 11/28, 2023



Old Morgantown Road I-68 East on
10/22, 2024

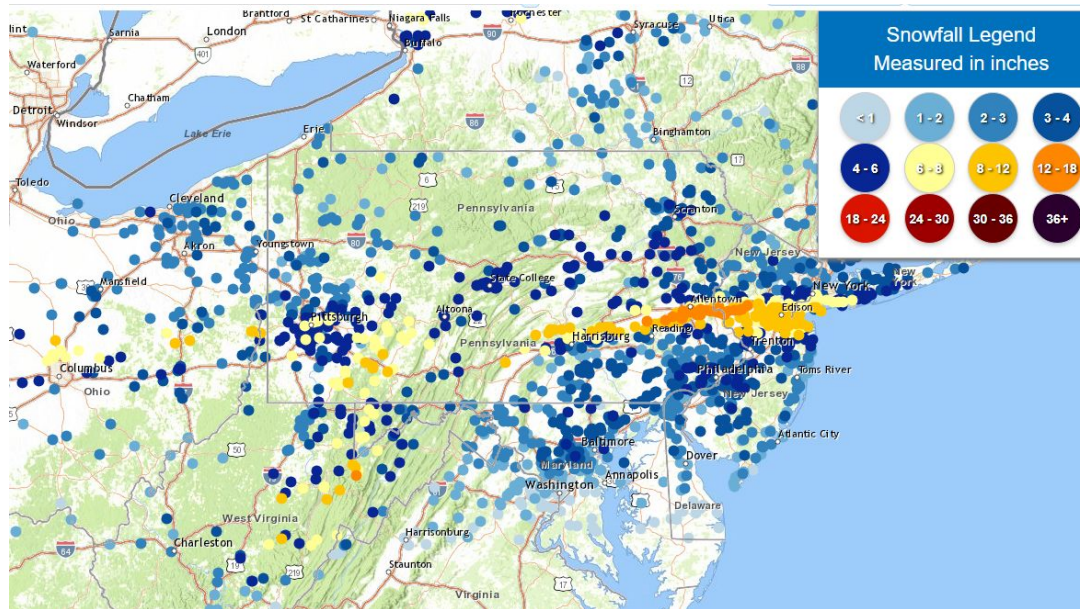
November 28, 2023

Challenges of Aviation Winter Weather; **Start and End Time**



Feb 16th-17th, 2024 (drier air caused snow to start later)

Challenges of Aviation Winter Weather; **Start and End Time of Wintry Precipitation**

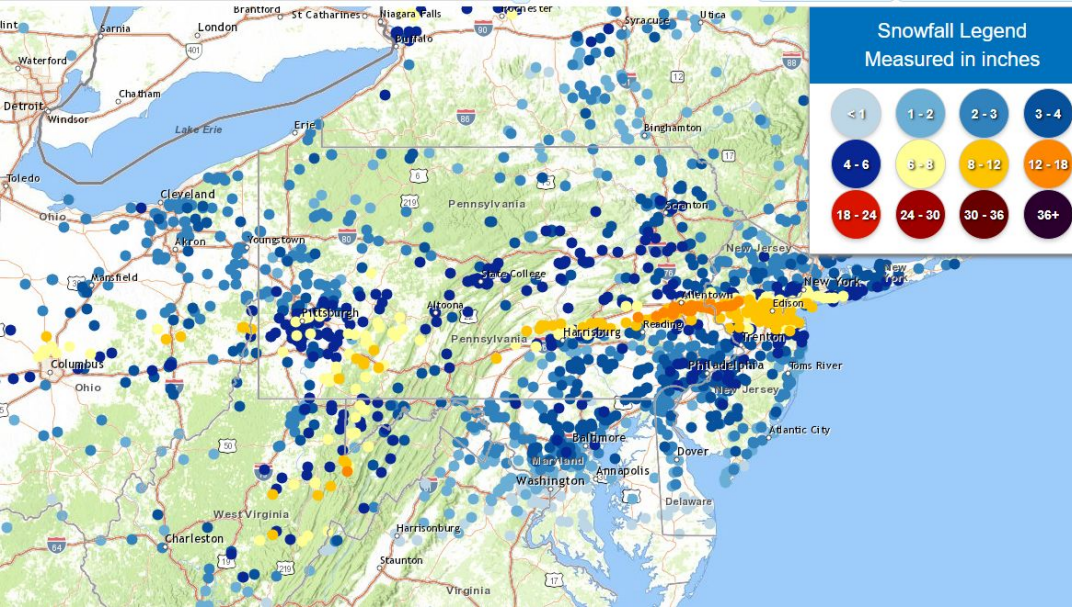


- Later start times led to a shorter event, causing lower snowfall amounts in our area

Feb 16-17, 2024



Multiple Challenges in one Event

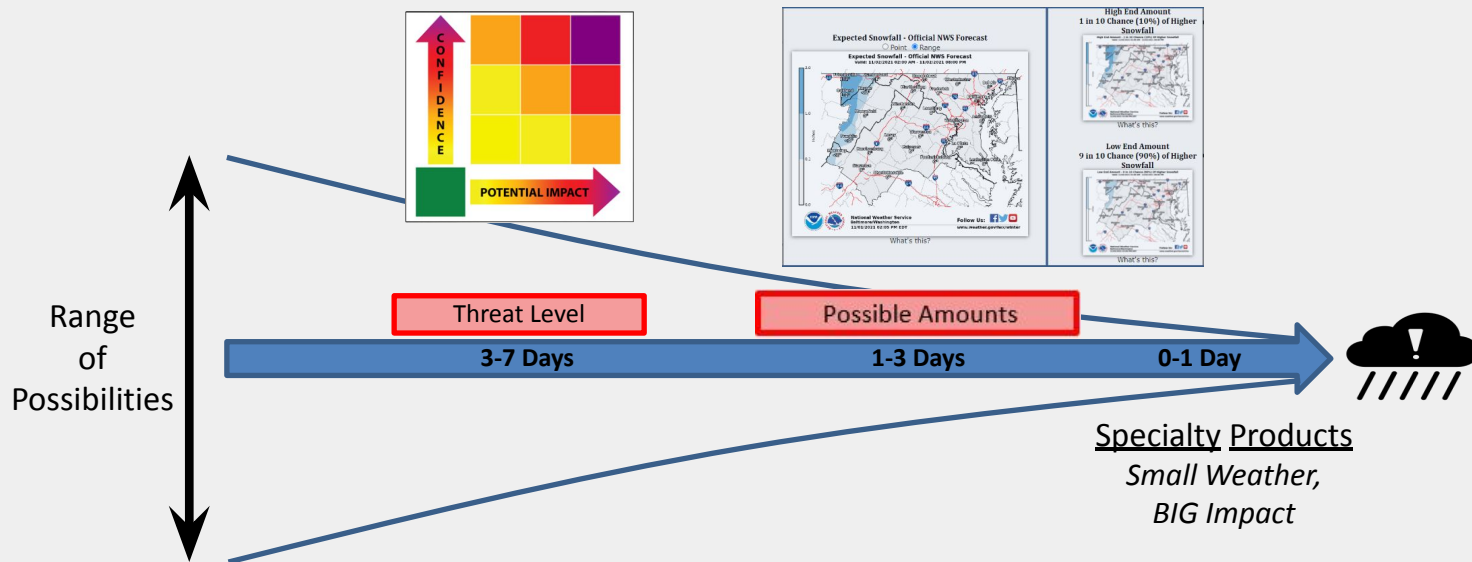


- A tight gradient
- Later start time to the south causing a shorter event in duration
- Snow liquid ratios (ranged from 5-7:1 around DC to 20-25:1 in the Lehigh Valley)
- Snowfall rates around 2-4” per hour in the heavier band

Potential Solutions Communicating Probabilistic Winter Forecasts - weather.gov/lwx/wintermaps



As event nears, “Range of Possibilities” shrinks & forecast detail increases.



Specialty Products
Small Weather,
BIG Impact



NWS_BaltWash

weather.gov/lwx

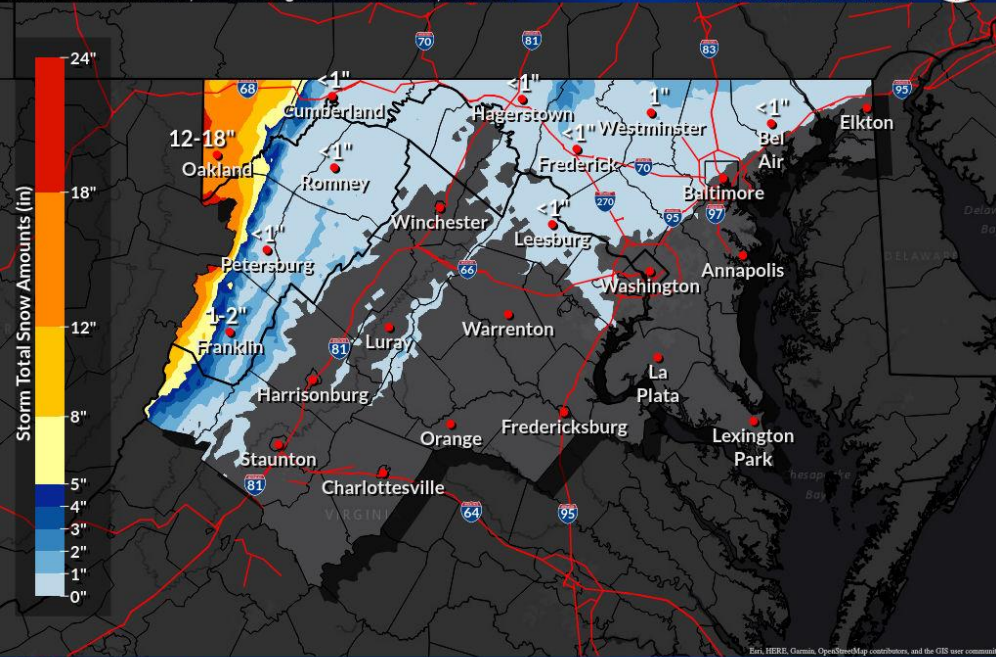


Most Likely Snowfall Forecast for last Event (November 21-23) (weather.gov/lwx/wintermaps)

Event Total Snowfall

Valid 7 PM Wed Nov 20, 2024 through 1 PM Sat Nov 23, 2024 EST

Weather Forecast Office
Baltimore/Washington
Issued Nov 21, 2024 4:45 AM EST



This was updated Thursday morning, November 21, 2024

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weather.gov/lwx



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weather.gov/lwx

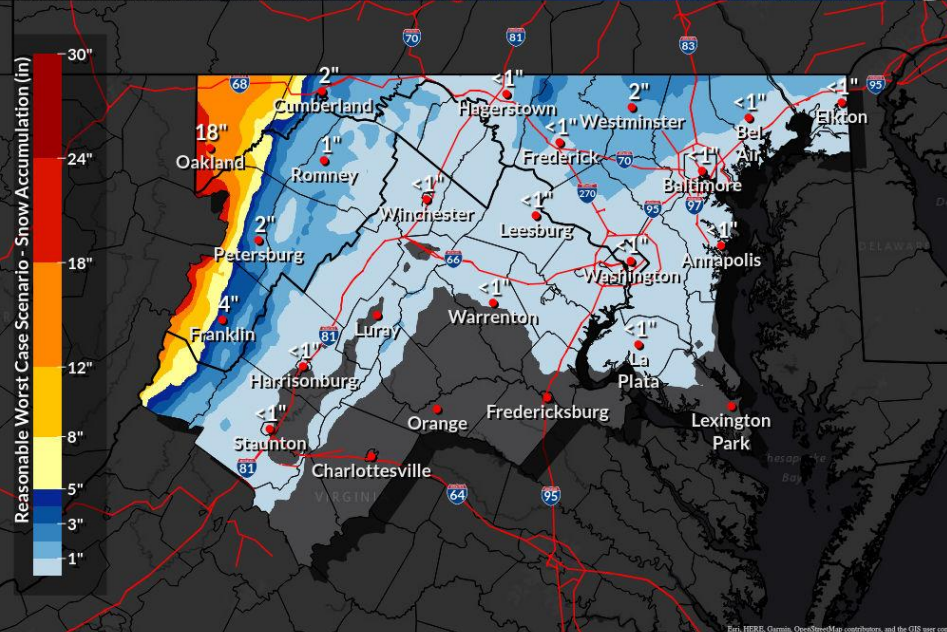
Probabilistic snow for last Event (November 21-23)

(weather.gov/lwx/wintermaps)



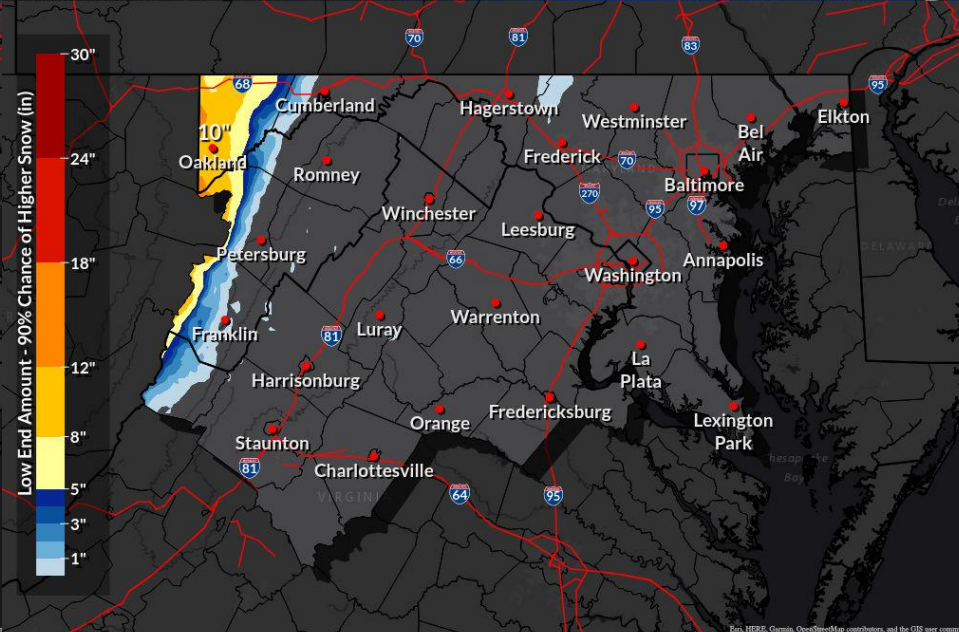
Reasonable Worst Case - Snow Accumulation

Weather Forecast Office
Baltimore/Washington
Valid 7 AM Thu Nov 21, 2024 through 7 AM Sun Nov 24, 2024 EST
Issued Nov 21, 2024 4:45 AM EST



Low End Amount - 9 in 10 Chance (90%) Of Higher Snowfall

Weather Forecast Office
Baltimore/Washington
Valid 7 AM Thu Nov 21, 2024 through 7 AM Sun Nov 24, 2024 EST
Issued Nov 21, 2024 4:45 AM EST



NWS_BaltWash

weather.gov/lwx

Example of Onset/Endtime Graphics

(weather.gov/lwx/wintermaps)



Winter Precip Onset Times

Weather Forecast Office
Baltimore/Washington
Issued Nov 25, 2024 12:20 PM EST

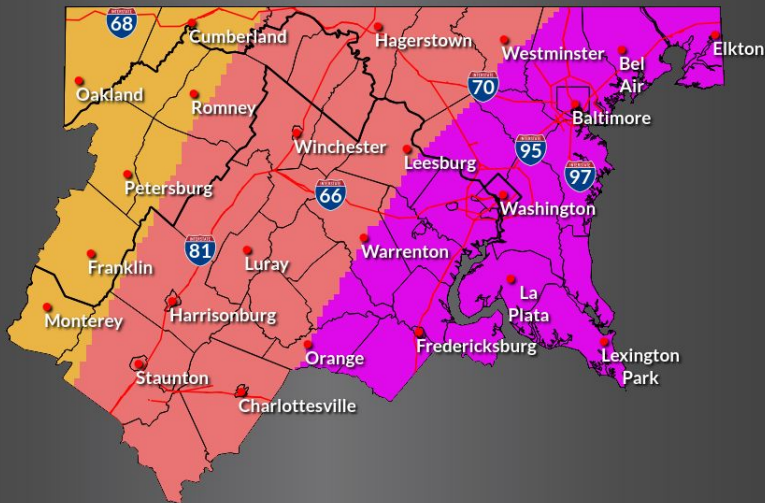


Start Times

1-2 AM

3-5 AM

5-7 AM



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weather.gov/lwx

Winter Precip End Times

Weather Forecast Office
Baltimore/Washington
Issued Nov 25, 2024 12:22 PM EST

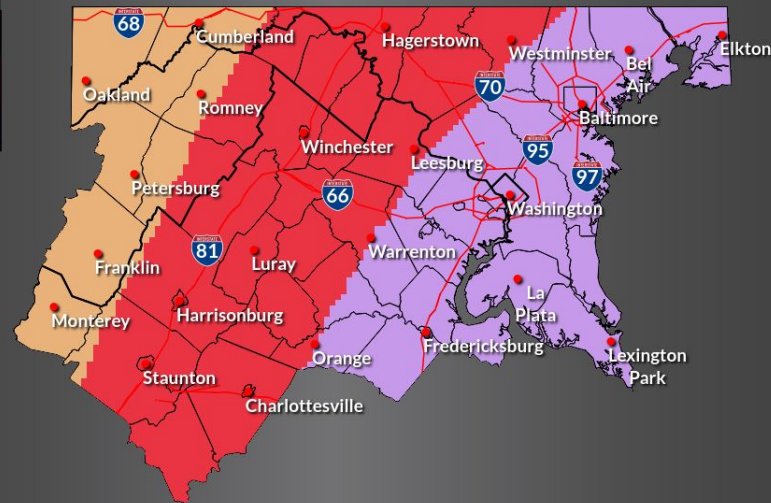


Start Times

1-2 PM

3-5 PM Sun

5-7 PM



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weather.gov/lwx



NWS_BaltWash

weather.gov/lwx

Aviation Forecast Discussion

- Aviation forecast discussion can be obtained from [here](#)
- Details and any uncertainty can be communicated through the discussion

.AVIATION /02Z MONDAY THROUGH FRIDAY/...

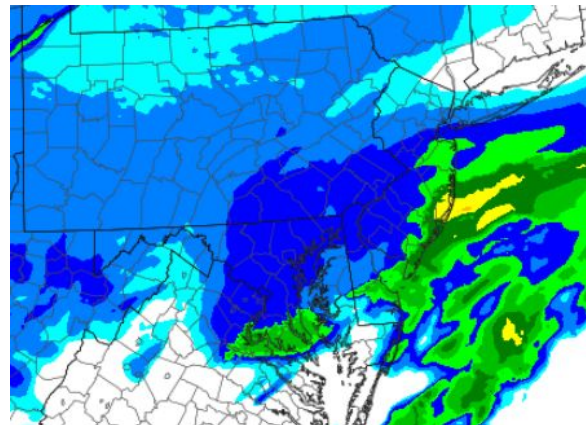
Winds are diminishing this evening, but mid and high clouds are quickly increasing ahead of the next system. Models have come into better agreement regarding two rounds of snow impacting the area. The first round is late tonight through mid Monday morning, mostly affecting DCA, IAD, and especially CHO. Around 1-2 inches of snow accumulation is forecast at CHO, with much more uncertainty with how much makes it to the metro areas. The second round of snow is expected from mid Monday afternoon through Tuesday morning, with another round of 1-4 inches possible. Sub-VFR CIGs and VIS are expected at times, especially in periods of heavier snow. Onset time of steadier snow is one of the more uncertain aspects of the forecast but has the biggest impact on flight conditions. At this time, have that time as mid Monday afternoon in the metro areas, although it could be much earlier in the day if the lull between rounds of snow does not occur. This has already shifted earlier from the previous forecast. Additional refinements to the TAFs will be needed as the Monday night to Tuesday period enter the TAFs.

Snow comes to an end by Tuesday afternoon. Gusty northwest winds are also likely Tuesday afternoon into Tuesday night.

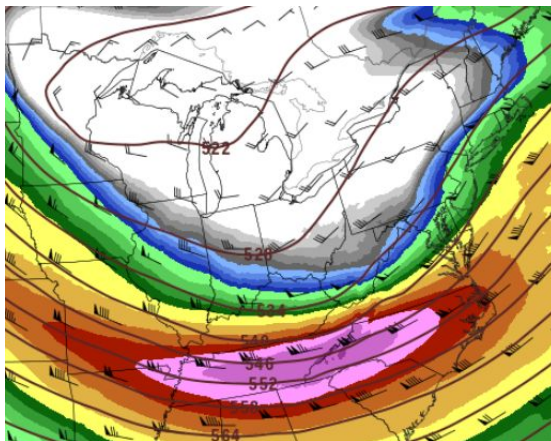
VFR and cold Wed-Thu. Winds W G15-20 kts Wed, briefly becoming light S Wed night-Thu.

Example

TAF
DCA 190520z 1612/1718 03008KT P6SM SCT050 OVC130
FM190900 03008KT 2SM -SN SCT002 OVC008
PROB30 1912/1916 1/2SM OVC002
FM192000 30010G20KT 5SM -SN OVC035
FM200200 27008KT P6SM SKC



00z HRRR valid 15z



500mb valid 15z

HREF link [here](#)



Summary

- There are several aspects of winter weather that can increase uncertainty in a forecast.
- It is important to be able to communicate in probabilistic terms
- The AFD in addition to winter products (weather.gov/lwx/wintermaps) can assist with this in addition to the TAF's.
- Forecaster knowledge of TAF sites is very important
 - EX: DCA things can “go south” quickly with south winds and IFR conditions.



Questions??



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Questions

