Hi all,

Friday map discussion resumed this week with the usual suspects present. Eric Bunker and Tomer Burg assisted with the discussion. Key links used during the discussion can be found here: http://www.atmos.albany.edu/mapdisco/20180119/

We opened with a brief discussion of the winter to date. According to WeatherBell, the CONUS temperature anomaly for Jan 2018 is ~ -1.0 C while the global anomaly is ~ +0.3 C. Although there has been a lot of complaining about the cold in much of the CONUS east of the Rockies, and especially in the south, what has been striking in contrast to recent years is the duration of the cold. Most CONUS Cold spells in recent years have been like a meteorological version of California's In-N-Out Burger: the the cold arrives and then the cold air departs. Beginning in late December and continuing until recently the cold air has stayed around like an unwelcome house guest. From a meteorological perspective, however, I have been unable to find 1000–500-hPa thickness values any lower than a few very small pockets of sub 480 dam values over North America between 1 Dec 2017 and today. Look back 20–30 and more years and you will find ample evidence of closed 474dam (and even pockets of closed 468 dam) thickness values over North America by 1 Jan. Low 1000–500-hPa thickness values are bering "dumbed-up" in recent years.

The bulk of the discussion was devoted to the unusually intense western Atlantic cyclone of 4 January 2018. This cyclone was well-advertised by existing global operational prediction models more than a week in advance. This long lead time may have contributed to "media hype amplification" and bomb cyclone and bombogenesis becoming new household words. I have attached a screen shot of the 360 h GFS deterministic forecast from 0600 UTC 20 Dec 2017 verifying 0600 UTC 4 Jan 2018 that helped get the hype going well before Christmas (the verifying map for 1800 UTC 4 Jan 2018 is attached; source: Tropical Tidbits). Whether the deterministic GFS had latched onto something about the atmosphere being unusually susceptible to the possible occurrence of an extreme weather event or whether the aforementioned 360 h GFS deterministic forecast is like a broken clock being right twice per day I will to others to ponder. Given the relatively long-lead good forecasts for the 4 Jan 2018 storm, one should ask what was the Norwegian cruise ship Breakaway doing trying to transit the backside of the storm in the vicinity of the bent-back front and sting jet (http://newyork.cbslocal.com/2018/01/05/cruise-through-storm/) setting the company up for "stinging" criticism about their ability to assimilate and act on critical meteorological information. Jim Steenburgh's informative post to map from 9 Jan 2018 on the likely presence of a sting jet in the 4 Jan 2018 cyclone is appended below for reference purposes.

Two science comments come to mind:

1. Are there some large-scale patterns that are inherently more predictable (broadly defined) beyond the Lorenzian 14-day limit for day-to-day intrinsic internal variability

and, if so, why and how?

2. My impression, albeit lacking hard evidence, is that strong cold season cyclogenesis events, especially over the ocean, are increasing in intensity, but not necessarily in frequency. Although impressions are more often wrong than right, the issue is probably worth pursuing as an open science question as one possible way to extend the predictability horizon in marking the transition from internal initial condition uncertainty in general to external bottom boundary condition uncertainty at the weather-climate interface in particular.

An additional science issue that emerged from the discussion was how to best understand the gradual westward shift of the storm track toward the 40 N and 70 W benchmark that occurred in the 48–144 h forecast range? Likewise, forecasts from the various operational CAMs appeared to overpredict convective precipitation to the east of the 4 Jan 2018 cyclone on time scales longer than 8–9 hours. This apparent overprediction of convective precipitation was also associated with a slight over deepening (2–4 hPa) of the cyclone to the NE/ENE and a simultaneous tendency to underpredict banded stratiform precipitation closer to shore and just onshore along and to the west of the observed near-coast inverted trough. If a more quantitative analysis would confirm my suspicion, then a question arises as to whether overly vigorous convection and precipitation to the east diminished the westward-directed integrated water vapor transport? If so, was the associated moisture flux convergence in conjunction with lower tropospheric warm-air advection to the west likewise diminished with a resulting underestimate of the forecast precipitation?

Friday map discussion will not be held next week (department awards ceremony).

Thanks.

Lance

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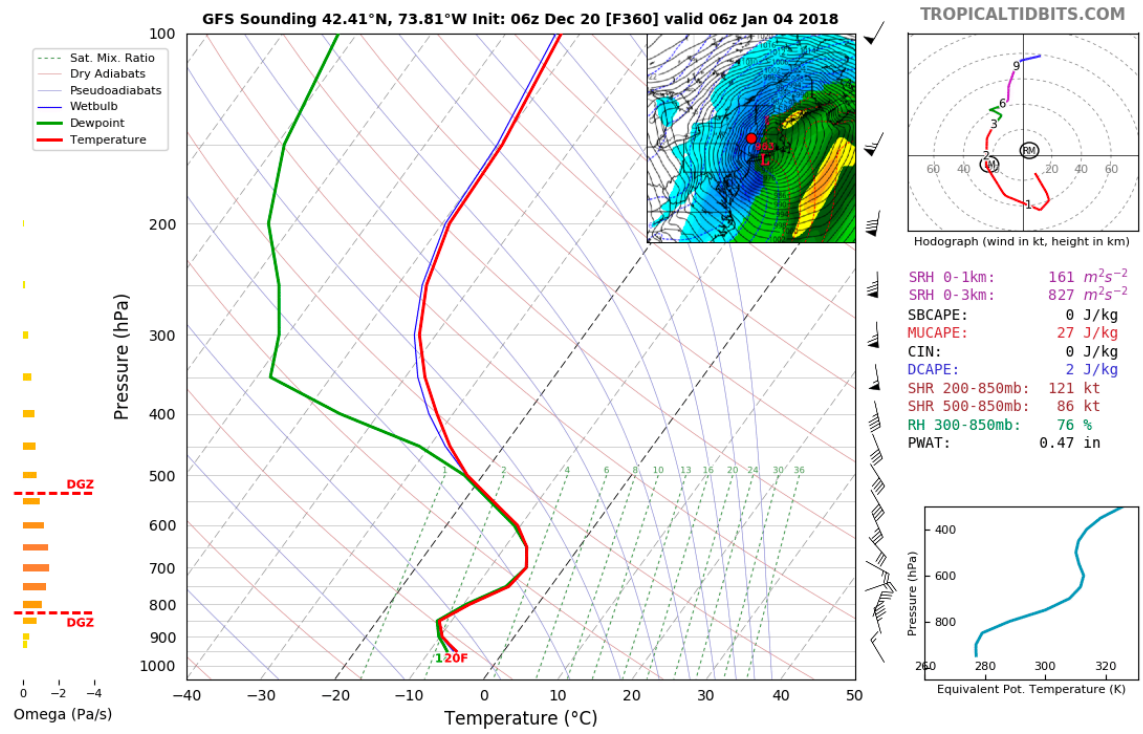


Posted to map by Jim Steenburgh at 1634 UTC 9 Jan 2018

Mappers:

Following up on Brian Mapes' e-mail, attached are a couple of 3-D visualizations of the so-called bomb cyclone based on NAM analyses. I don't know if I've ever seen a better 3-D depiction of the inner structure of an intense extratropical marine cyclone so close to the east coast. This is a great case of sting-jet development, as defined

by Schultz and Browning
(2017, http://onlinelibrary.wiley.com/doi/10.1002/wea.2795/full), with the low-level wind maximum quite distinct (depicted in green is the 50 m/s isosurface showing both the upper-level jet and the distinct sting jet). The 925-mb temperature contours and frontogenesis (red positive, blue negative) and satellite imagery show the sting jet nicely located at the tip of the cloud head at the end of the bent-back front in a region of frontolysis and presumably descent from the mid troposphere.

Although not illustrated with this isosurface level, strong winds wrap encircle the low center and warm-core seclusion, giving it the warm-core appearance that Brian mentioned in his e-mail. Cross sections of this are really fantastic (not shown).

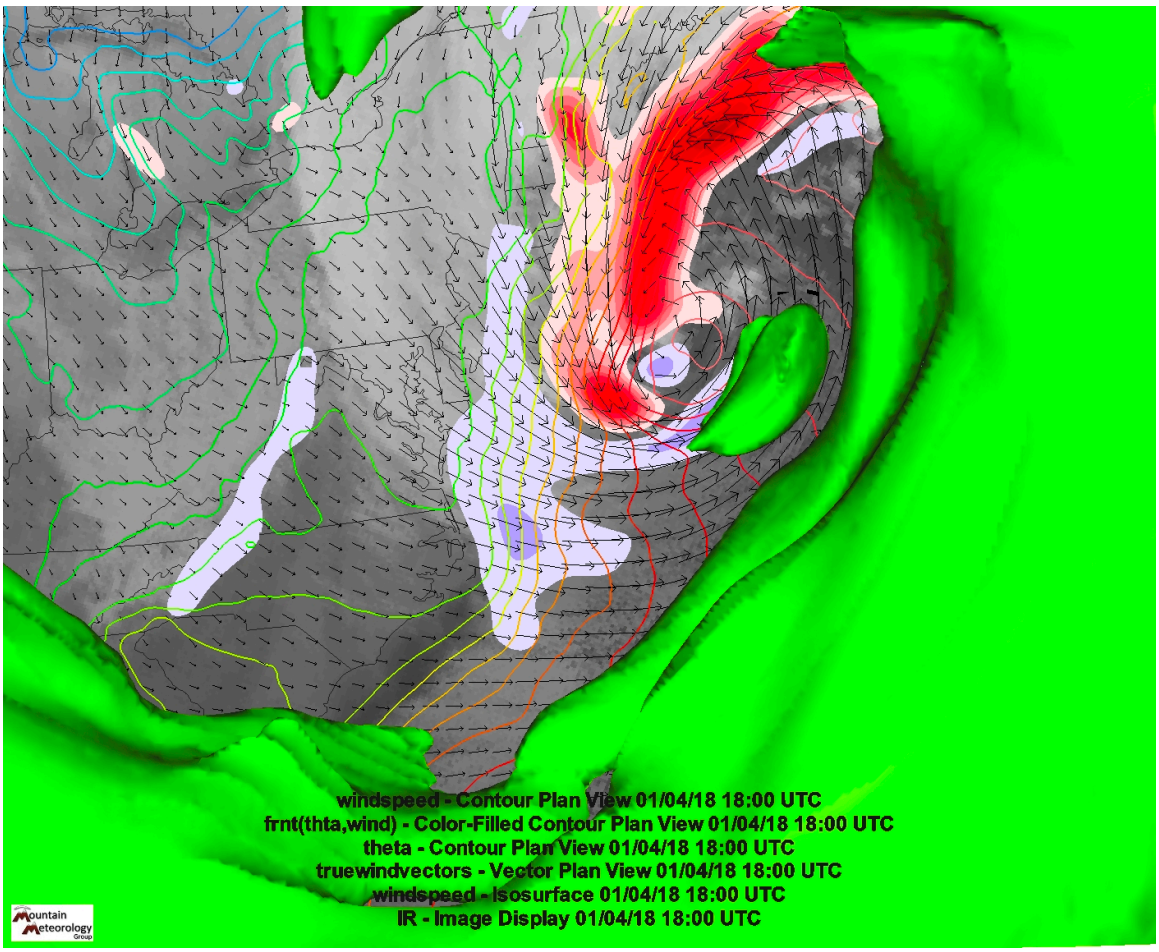
Some of you may have read about the Norwegian cruise ship that was battered in the storm (https://www.cbsnews.com/news/norwegian-cruise-line-passengers-recall-trip-atlantic-ocean-winter-storm-2018/). Perhaps they were stung by the "poisonous tail" of the bent-back occlusion. What an embarrassment for a Norwegian ship! Bergen School meteorologists, first described the seclusion and bent-back front (e.g., Bergeron 1937). As noted by Grønås (1995), and included in Schultz and Browning (2017):

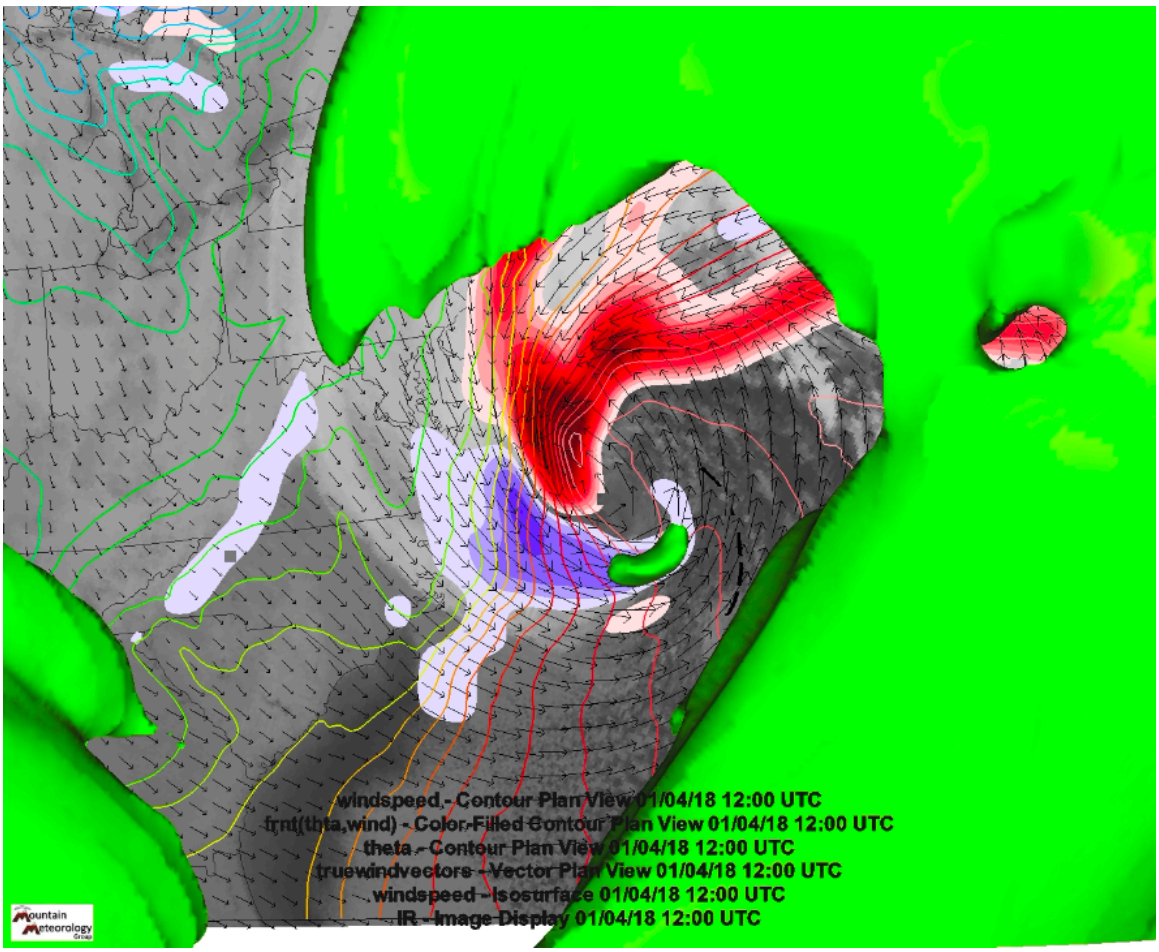
"As a young forecaster in the late 1960s, I was informed that the strongest winds ever recorded in our region have been linked to back-bent occlusions. Such a structure has been called 'the poisonous tail' of the back-bent occlusion (after F. Spinnangr, who in 1939 succeeded S. Pettersen [sic.] as head of the Western Norway Forecasting Office)."

I don't know where that cruise line gets their forecasts from, but they need new meteorologists!

Looking forward to using case for class this semester. I've just revised all of my cyclone notes and activities to take advantage of this case.

Jim


windspeed - Contour Plan View 01/04/18 18:00 UTC
frnt(thta,wind) - Color-Filled Contour Plan View 01/04/18 18:00 UTC
theta - Contour Plan View 01/04/18 18:00 UTC
truewindvectors - Vector Plan View 01/04/18 18:00 UTC
windspeed - Isosurface 01/04/18 18:00 UTC
IR - Image Display 01/04/18 18:00 UTC
Mountain Meteorology Group



With Chris' permission, I took his loops and converted them into .avi movie files. This makes it easier to embed the loops in a presentation, or being a more compact format, easily shared in email or the like. I created full-, medium-, and small-loops for each of the Vis, IR and WV loops Chris created. I placed them on a Google Drive, and you should be able to access and download them via these links:

Visible Fullsize
Visible Medium
Visible Small
IR Fullsize
IR Medium
IR Small
WV Fullsize
WV Medium
WV Small

Peter Neilley