Verification datasets

HRRR-TLE

Need to verify:

- Probability of precipitation exceeding a threshold (0.1, 0.25, 0.5, 1.0, 2.0, 3.0") over 6 hr period (water equivalent)
- Probability of snowfall accumulation exceeding a threshold (1, 3, 6") over a 6 hr period
- Probability of snowfall rate exceeding a threshold (0.5, 1, 2") over 1 hr

Snow analyses

WPC snow depth analysis

Email from Trevor (Feb 11, 2016):

For sub-24-h periods, WPC creates their own snowfall analysis using 1-h Stage-IV QPE, identifying areas where RAP profiles indicate a precipitation type of snow, and multiplying QPE there by 10 (2:1 for sleet). Given the 10:1 ratio, this isn't a good way to verify HRRR forecasts that use a variable snow ratio algorithm. The hourly Stage-IV is also radar-based and uses virtually no observations. So you could certainly use this analysis to test out MET/MODE on HRRR snowfall, but we would need to take any results with a grain of salt. Mike Bodner is willing to provide the sub-24-h analyses, though he needs to find a way to convert from GEMPAK format. I'll put you both in touch when he makes some progress there.

UPDATE from Mike (29 Feb):

I made a large tar file of all the verification data and uploaded on the directory you created (our ftp site). The data is through Feb 26 (there's a 2/2 day lag due to QC'd Stage 4 availability.

Starting around Feb 1 or 2, I started writing out the 6 and 24 hr fields on the grid. Prior to this, the 1-hour only is listed. However, GEMPAK will read and make a 6 and 24 hour on the fly.

Data: dakota:/d3/projects/USWRP_ENSHAZ/WPC_Snowfall_Analysis

NOHRSC: http://www.nohrsc.noaa.gov/nsa/

This data set contains output from the NOAA National Weather Service's National Operational Hydrologic Remote Sensing Center (NOHRSC) SNOw Data Assimilation System (SNODAS), beginning 1 October 2003. SNODAS is a modelling and data assimilation system developed by the NOHRSC to provide the best possible estimates of snow cover and associated variables to support hydrologic modelling and analysis. The aim of SNODAS is to provide a physically consistent framework to integrate snow data from satellite and airborne platforms, and ground stations with model estimates of snow cover (Carroll et al. 2001). SNODAS includes procedures to ingest and downscale output from Numerical Weather Prediction (NWP) models; a physically based, spatially-distributed energy- and mass-balance snow model; and procedures to assimilate satellite-derived, airborne and ground-based observations of snow covered area and snow water equivalent. The NOHRSC products available from NSIDC are gridded data sets for the continental United States at 1-km spatial resolution and 24-hour temporal resolution.

SNODAS is run each day, with analysts deciding whether or not to use remote sensing and ground based observations to update the snow water equivalent state in the model.

- The monthly files, named SNODAS_YYYYMM, are **.tar** archives that contain a series of the following daily files.
- The daily files, named SNODAS_YYYYMMDD, are **.tar** archives that contain a series of smaller **.tar.gz** files that correspond to different physical elements.

Example:		
us_ssmv01025SlL00T0024TTNATS2006010105DP001.tar.gz	--	Non-snow precipitation, 24-hour total
us_ssmv01025SlL01T0024TTNATS2006010105DP001.tar.gz	--	Snow precipitation, 24-hour total
us_ssmv11034tS__T0001TTNATS2006010105HP001.tar.gz	--	Modeled snow water equivalent
us_ssmv11036tS__T0001TTNATS2006010105HP001.tar.gz	--	Modeled snow depth
us_ssmv11038wS__A0024TTNATS2006010105DP001.tar.gz	--	Modeled snowpack average temperature, 24-hour average
us_ssmv11039lL00T0024TTNATS2006010105DP000.tar.gz	--	Modeled blowing snow sublimation rate, 24-hour total
us_ssmv11044bS__T0024TTNATS2006010105DP000.tar.gz	--	Modeled melt rate, 24-hour total
us_ssmv11050lL00T0024TTNATS2006010105DP000.tar.gz	--	Modeled snowpack sublimation rate, 24-hour total

- Each of these files, in turn, can be uncompressed into two separate files, a text header file with a **.Hdr** suffix, and a binary raster file containing "big-endian" values with a **.dat** suffix.
- See: http://www.nohrsc.noaa.gov/archived_data/instructions.html for more information on the data.
- Download: ftp://sidads.colorado.edu/DATASETS/NOAA/G02158/

For 24-h forecasts at WWE the NOHRSC snowfall analysis was used: http://www.nohrsc.noaa.gov/snowfall/

- Trevor sent this link. I can't seem to figure out where to get to it from the main NORSCH webpage...strange.
- Past data is available back to 2006, it appears.

AFWA:

Snow depth (SNODEP) is estimated daily by the Air Force by merging satellite-derived snow cover data with daily snow depth reports from ground stations. Snow depth reports are updated by additional snowfall data or decreased by calculated snow melt. If no new snow depth or accumulation information is available, surface temperature data is used to calculate a possible snow melt for temperatures above 32-degree Fahrenheit. The merged product estimates daily snow depth in centimeters.

From Jacob (email Feb 6, 2016):

The AFWA snow depth has had a roller-coaster like history with the NAM. It was looking really bad prior to the Aug. 2014 implementation and so we took it out and started cycling the snow depth along with some trimming from the IMS snow cover. Of course in the winter of 2014/2015 the AFWA snow depth got its act together and was much better (go figure!). So we're now putting it back in with an 'envelope approach' which is done in the following way:

> *If the first guess depth is within 1/2 or 2x the analysis depth, the model snow is cycled. If the first guess depth is less than 1/2 the analysis depth, the model depth is increased to 1/2 the analysis depth. If the first guess depth is more than twice the analysis depth, the model depth is reduced to twice the analysis depth.*
> *blocked URL*

So with this approach we aren't so heavily dependent on the AFWA snow but we still use its information in a reasonable way to make adjustments to the model's snow depth.

In terms of verification of snow depth, we don't have anything running right now to do that but it's probably something we ought to at least start looking into. It might be worth doing a comparison of AFWA depth, NOHRSC snow, and IMS to get an idea of strengths/weaknesses.

- Available on NOAA HPSS (GRIB1):
  - ARCHM24=/NCEPPROD/hpssprod/runhistory/rh${YYYY_tm24}/${YYYYMM_tm24}/${PDY_tm24}
    - htar -xvf ${ARCHM24}/dcom_us007003_${PDY_tm24}.tar ./wgrbbul/imssnow96.grb (IMS product)
    - htar -xvf ${ARCHM24}/dcom_us007003_${PDY_tm24}.tar ./wgrbbul/NPR.SNWN.SP.S1200.MESH16 (Northern Hemisphere)
    - htar -xvf ${ARCHM24}/dcom_us007003_${PDY_tm24}.tar ./wgrbbul/NPR.SNWS.SP.S1200.MESH16 (Southern Hemisphere)

IMS: https://nsidc.org/data/G02156

The operational data set from NESDIS provides snow cover area (SCA) and ice cover area maps for the Northern Hemisphere from February 1997 to the present from the National Ice Center's Interactive Multisensor Snow and Ice Mapping System (IMS). It is derived from a variety of data products including satellite imagery and in situ data. The data are provided in ASCII text and GeoTIFF formats in three different resolutions: 1 km, 4 km, and 24 km. Daily temporal resolution.

- Download: http://nsidc.org/data-set/G02156/versions/1/form
- Other datasets: https://nsidc.org/data/search/#

METAR data

From Greg (email: 2/8/16 at 10:30am)

I just enabled the real-time ingest, decode, storage of real-time PIREPs in the MySQL 'weather' database on Pileus for use in our TAIWIN project. Starting about 30minutes ago, data is flowing, however, I did not populate *before* this time (yet).

I also have many resources to *retrieve* the data (harmlessly) from the DB-tables and produce simple ascii format outputs like CSV files that can readily be imported into R-programs or Excel or whatever. The vast majority of my code for this is in Perl - but that's just a way to rapidly retrieve from tables and dump to simple flat files.

mPING data

Link to **mPing data** on TAIWIN page.

MRMS: http://www.nssl.noaa.gov/projects/mrms/

MRMS is an automated system that rapidly and intelligently integrates data from multiple radars and radar networks, surface and upper air observations, and numerical weather prediction (NWP) models. It serves as an international testbed for research, development, evaluation and science to operations infusion of high resolution 3D radar mosaic for NWP model data assimilation and aviation applications. It also generates a suite of quantitative precipitation estimation ("Q3") products for the monitoring and warnings of floods and flash floods and in support of comprehensive hydrologic and ecosystem modeling.

- GRIB2 IDs for MRMS: http://www.nssl.noaa.gov/projects/mrms/operational/tables.php
- Application suite: http://mrms.ou.edu/
- R2O Google doc explaining data: https://docs.google.com/document/d/1LeVcn_taIXZgzZb5JgWqaVr0xVs7GmA6RpHcb8ZGiwk/edit
- Available on NOAA HPSS:

- htar -tf /NCEPPROD/hpssprod/runhistory/rhyyyy/yyyymm/yyyymmdd/ldmdata.gyre.yyyymmdd.tar
- (Currently looking at PrecipFlag files)

WSHCA paper?

UTMA (formerly RTMA)

What fields? Temporal frequency?