Report: Mesonet wind uselist update

14 February 2007
Stan Benjamin – NOAA/ESRL/GSD

1. Previous mesonet wind uselist, based on study by Tom Schlatter – GSD – 15 March 2005

Mar 2005	Current – 14 Feb 2007
> OK-Meso	Use
> WT-Meso	Use
> APG	Do not use
> CODOT	Use
> FLDOT	No data under this name
> INDOT	Do not use
> MNDOT	Use
> DCNet	Use (preliminary)
> GoMOOS	Use
> K-Meso	Use
> GPSMET	No winds

Using the NetCDF MADIS-based mesonet data at GSD, we cannot Distinguish between MesoWest subproviders. But the overall wind speed behavior for MesoWest appears to be reasonable.

> MesoWestAGRIMET	
> MesoWestAQ	
> MesoWestARL FRD	
> MesoWestARL SORD	
> MesoWestDOERD	
> MesoWestDUGWAY	
> MesoWestITD	
> MesoWestMT DOT	
> MesoWestTOOELE	
> MesoWest	Use all
> NOS-PORT	Use
> RAWS	Use

See full current recommended uselist in Section 2 below.

2. **New mesonet wind provider uselist (14 Feb 2007):**

(Uselist extracted from RUC 3dvar code from "dev RUC13" version at GSD)

```
C  -- Accepted mesonet wind providers are below
      if (i.eq.534) go to 772  ! RAWS
      if (i.eq.536) go to 772  ! FAWN
      if (i.eq.539) go to 772  ! NE-DOR
      if (i.eq.540) go to 772  ! FL-SFWMD
      if (i.eq.542) go to 772  ! MO-ComAg
      if (i.eq.543) go to 772  ! CO-Alert
      if (i.eq.545) go to 772  ! DC-Net
      if (i.eq.546) go to 772  ! CO-AvalInfo
      if (i.eq.551) go to 772  ! CO-DOT
      if (i.eq.552) go to 772  ! KS-DOT
      if (i.eq.553) go to 772  ! IA-DOT
      if (i.eq.556) go to 772  ! ME-DOT
      if (i.eq.557) go to 772  ! MN-DOT
      if (i.eq.558) go to 772  ! ND-DOT
      if (i.eq.561) go to 772  ! OK-Meso
      if (i.eq.562) go to 772  ! UT-Meso
      if (i.eq.564) go to 772  ! WT-Meso
      if (i.eq.568) go to 772  ! WY-DOT
      if (i.eq.570) go to 772  ! NOS-PORT
      if (i.eq.571) go to 772  ! NOS-NWLON
      if (i.eq.572) go to 772  ! GoMOOS
      if (i.eq.575) go to 772  ! HADS
```

Full list of mesolist providers from MADIS:
http://madis.noaa.gov/mesonet_providers.html

GSD will provide recommended uselist using provider names as currently given in PrepBUFR data in the near future.

3. Mesonet providers currently considered in RUC O-B evaluation

```
a_otype(500)='METAR              '
a_otype(502)='sfc-profiler       '
a_otype(510)='ASOS               '
a_otype(515)='mesonet- other     '
a_otype(520)='buoy               '
a_otype(531)='mesonet- APRSWXNET '
a_otype(532)='mesonet- AWS       '
a_otype(533)='mesonet- WXforYou  '
a_otype(534)='mesonet- RAWS      '
a_otype(535)='mesonet- KYTC-RWIS '
a_otype(536)='mesonet- FAWN      '
a_otype(537)='mesonet- DDMET/GPS '
a_otype(538)='mesonet- SNET      '
a_otype(539)='mesonet- NE-DOR    '
a_otype(540)='mesonet- FL-SFWMD  '
a_otype(541)='mesonet- MD-AberPG '
a_otype(542)='mesonet- MO-ComAg  '
a_otype(543)='mesonet- CO-Alert  '
a_otype(544)='AWOS - nonFed      '
a_otype(545)='mesonet- DCNet     '
a_otype(546)='mesonet- CO AvInfo '
a_otype(550)='mesonet- AK-DOT    '
a_otype(551)='mesonet- CO-DOT    '
a_otype(552)='mesonet- KS-DOT    '
a_otype(553)='mesonet- IA-DOT    '
a_otype(554)='mesonet- IN-DOT    '
a_otype(555)='mesonet- MD-DOT    '
a_otype(556)='mesonet- ME-DOT    '
a_otype(557)='mesonet- MN-DOT    '
a_otype(558)='mesonet- ND-DOT    '
a_otype(559)='mesonet- NH-DOT    '
a_otype(560)='mesonet- OH-DOT    '
a_otype(561)='mesonet- OK-Meso   '
a_otype(562)='mesonet- UT-Meso   '
a_otype(563)='mesonet- WI-DOT    '
a_otype(564)='mesonet- West Texas'
a_otype(565)='mesonet- VA-DOT    '
a_otype(566)='mesonet- DC-DOT    '
a_otype(567)='mesonet- GA-DOT    '
a_otype(568)='mesonet- WY-DOT    '
a_otype(570)='mesonet- NOS-PORT  '
a_otype(571)='mesonet- NOS-NWLON '
a_otype(572)='mesonet- GoMOOS    '
a_otype(573)='mesonet- GPSMET    '
a_otype(574)='mesonet- Anything Wx'
a_otype(575)='mesonet- HADS      '
```

4. Basis for new uselist

The RUC 3dvar tracks obs-minus-background (O-B) differences stratified by observation type, variables, and levels. These O-B diagnostics were recently extended for wind speed including stratification by different mesonet providers.

The B (background) in these statistics shown below is for the RUC 1-h forecast. O-B differences shown in the compilation below are after the first of the 4 O-B checks listed below applied at different points in RUC 3dvar analysis.

O-B stats are shown in the RUC analysis after separate steps:

- Initial stats, only gross error check applied so far. All innovations are initially calculated from a pure 3-d interpolation forward operator from the 3-d RUC native data (usually 1-h forecast). Thus, surface winds are taken from lowest prognostic level at 5-m AGL.
- After innovations for surface observations are recalculated for
    - Change to 2-m for temperature (θ_v) and 10-m winds (precalculated in post-processing of background forecast).
    - Background value modified to use nearby points to match land-water type for surface or buoy obs, if temp innovation is reduced.
    - Buoys are retained at 5-m wind level.
- After innovation range check and buddy-check QC.
- After analysis increment is applied (O-A difference).

Here are the criteria for identifying mesonet provider uselist for winds:

- Wind speed **bias** is revealing for mesonet provider systematic siting problems. Statistics for u-component or v-component O-B differences are not adequate.
- Observation wind speed biases become most apparent during the daytime, so 18z is a good time to check. Wind speed O-B bias checks at night time are much less useful in discerning systematic siting problems since winds are much lighter then.
- Wind speed bias of 1.0 m/s showing up day after day is indicative of widespread siting problems for a given mesonet provider. Usually the O-B bias is negative for problematic mesonet providers, meaning that the observed wind speed is systematically lower than the RUC 1-h forecast.

The following O-B wind speed bias output is from the 18z RUC 3dvar run on Wed 14 Feb 2007.

ivar	otype	ob type /	num sta	mean-abs O-B	mean O-B
8	203	profiler-NOAA	2358	2.283	-0.8855
8	204	profiler-external	1261	2.757	-1.366
8	210	VAD	979	3.034	-1.481
8	422	aircraft-TAMDAR	1232	1.218	-0.8297E-02
8	428	aircraft-Canadian	1632	3.058	-0.8479E-02
8	400	aircraft	67	2.795	1.312
8	424	aircraft-DL	956	2.841	0.2028
8	425	aircraft-AA	607	2.664	-0.6672
8	423	aircraft-UP	647	2.729	-0.5983
8	421	aircraft-UA	1115	2.658	0.2804
8	420	aircraft-NW	106	2.833	0.6466
8	500	METAR	2041	1.545	0.8898E-03
8	510	ASOS	2	1.306	-0.7106
8	520	buoy	149	2.399	-0.8489E-01
8	502	sfc-profiler	29	0.1244	-0.3319E-01
8	532	mesonet- AWS	3346	2.268	-2.006
8	557	mesonet- MN-DOT	80	0.8484	0.6789E-01
8	543	mesonet- CO-Alert	16	0.2664	-0.1856
8	564	mesonet- West Texas	34	0.8618	0.3370
8	542	mesonet- MO-ComAg	14	0.8205	-0.5446
8	556	mesonet- ME-DOT	7	1.793	-1.793
8	555	mesonet- MD-DOT	52	3.055	-2.740
8	536	mesonet- FAWN	27	2.281	-1.506
8	567	mesonet- GA-DOT	26	1.470	-1.267
8	568	mesonet- WY-DOT	11	1.089	1.089
8	575	mesonet- HADS	24	0.3363	-0.1210
8	537	mesonet- DDMET/GPS	43	0.0000E+00	0.0000E+00
8	531	mesonet- APRSWXNET	3008	3.014	-2.777
8	559	mesonet- NH-DOT	12	2.874	-2.874
8	515	mesonet- other	78	1.078	-0.1450
8	538	mesonet- SNET	120	1.460	-1.089
8	563	mesonet- WI-DOT	34	1.251	-1.030
8	554	mesonet- IN-DOT	21	1.907	-1.153
8	535	mesonet- KYTC-RWIS	35	2.865	-2.789
8	560	mesonet- OH-DOT	157	2.955	-2.703
8	570	mesonet- NOS-PORT	66	1.533	-0.9706
8	571	mesonet- NOS-NWLON	81	0.8781	-0.5367
8	553	mesonet- IA-DOT	53	0.9532	-0.3548
8	540	mesonet- FL-SFWMD	22	1.675	0.9012
8	539	mesonet- NE-DOR	39	0.7583	-0.1382
8	541	mesonet- MD-AberPG	5	3.139	-3.139
8	561	mesonet- OK-Meso	116	1.024	0.6574
8	551	mesonet- CO-DOT	61	0.5242	-0.1267
8	558	mesonet- ND-DOT	19	0.7025	0.2148
8	574	mesonet- Anything Wx	9	2.034	-1.922
8	533	mesonet- WXforYou	107	2.341	-2.116
8	565	mesonet- VA-DOT	30	2.183	-1.955
8	534	mesonet- RAWS	417	0.9764	-0.6718
8	552	mesonet- KS-DOT	48	1.071	-0.6810
8	572	mesonet- GoMOOS	5	0.0000E+00	0.0000E+00
8	301	raob-72xxx	113	6.640	-4.316
8	340	raob-GPS	46	6.180	0.2654

Other comments:

- Wind speed biases within a limited area (e.g., state) can be dependent on
    - The weather regime on a given day and possible RUC wind speed bias that day in that area.

    - Possible unrepresentativeness in roughness length used by the RUC (from the USGS database) in that area.
- GSD will work toward getting real-time RUC-based O-B statistic summaries online.
- RUC O-B statistics are also calculated for other variables: height, temperature, RH, precipitable water. Other “uselists” can be produced out of these O-B statistics.