Consortium Meeting
June 6, 2013

Now
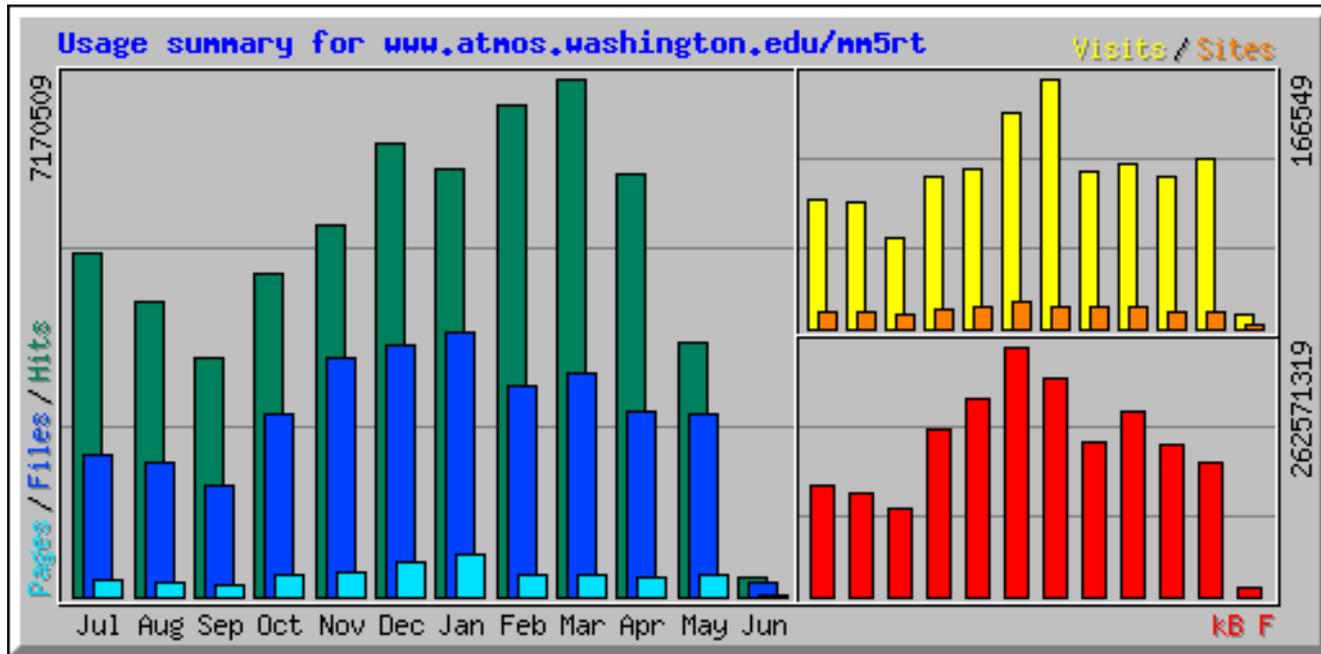
Early 2011

May 2013
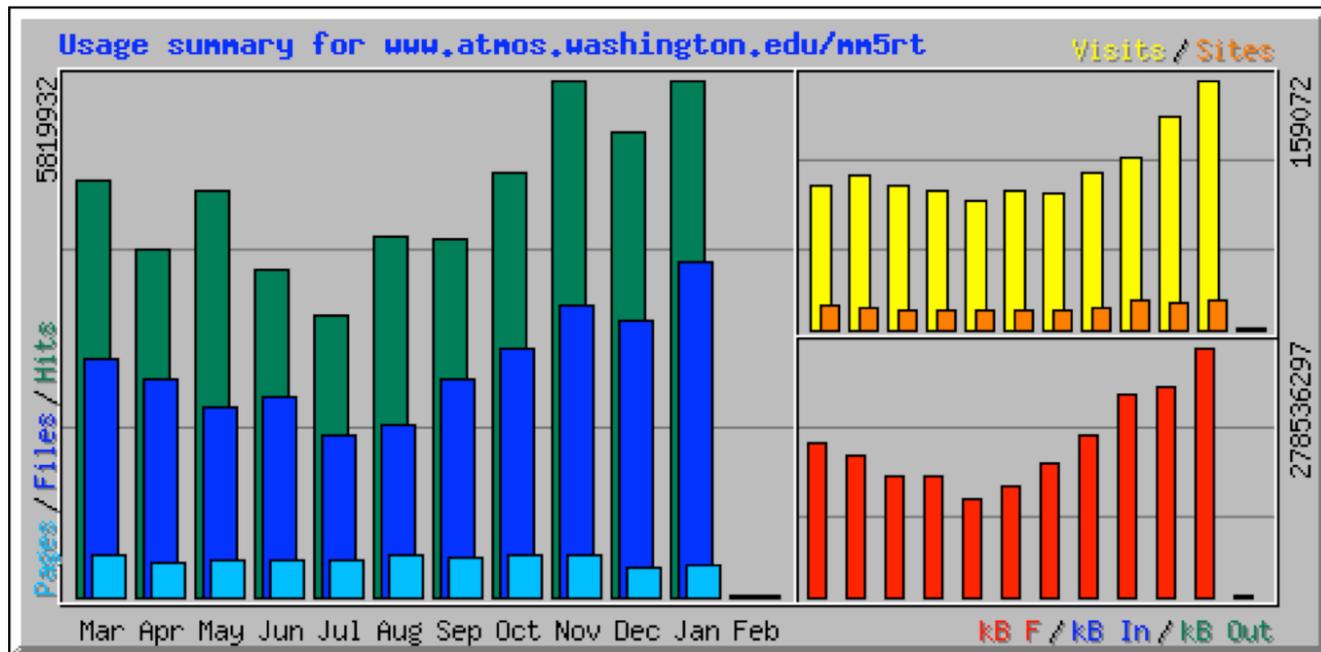
#	Hits		Files		kB F		kB In		kB Out		Visits		Hostname
							Top 30 of 11195 Total Sites						
1	361874	10.25%	361814	14.33%	1281369	0.91%	0	0.00%	0	0.00%	0	0.00%	h67-240.state.id.us
2	209017	5.92%	127025	5.03%	8471440	6.04%	0	0.00%	0	0.00%	1	0.00%	c-98-247-225-219.hsd1.wa.comcast.net
3	166710	4.72%	83948	3.33%	5986447	4.27%	0	0.00%	0	0.00%	1	0.00%	base-address.mcast.net
4	92010	2.61%	12792	0.51%	554758	0.40%	0	0.00%	0	0.00%	5150	4.56%	174-31-83-85.spkn.qwest.net
5	82535	2.34%	23149	0.92%	1517892	1.08%	0	0.00%	0	0.00%	0	0.00%	67.20.55.121
6	79530	2.25%	17390	0.69%	559726	0.40%	0	0.00%	0	0.00%	6056	5.36%	global.ci.seattle.wa.us
7	76631	2.17%	24384	0.97%	689679	0.49%	0	0.00%	0	0.00%	0	0.00%	tornado.unbc.ca
8	76535	2.17%	55342	2.19%	3960194	2.82%	0	0.00%	0	0.00%	2	0.00%	c-98-247-225-154.hsd1.wa.comcast.net
9	73711	2.09%	7483	0.30%	103770	0.07%	0	0.00%	0	0.00%	6538	5.79%	c-67-171-134-21.hsd1.or.comcast.net
10	45550	1.29%	8486	0.34%	471998	0.34%	0	0.00%	0	0.00%	285	0.25%	lewipx8100.lewis.army.mil
11	42971	1.22%	39440	1.56%	2344710	1.67%	0	0.00%	0	0.00%	1347	1.19%	proxy.belo.com
12	41321	1.17%	6511	0.26%	164761	0.12%	0	0.00%	0	0.00%	2683	2.38%	a-129-196-226-176.ext.fluke.com
13	35479	1.01%	35418	1.40%	9302666	6.63%	0	0.00%	0	0.00%	130	0.12%	styx.apl.washington.edu
14	29791	0.84%	19927	0.79%	1284472	0.92%	0	0.00%	0	0.00%	1020	0.90%	206-192-230-35.cmc.net
15	26575	0.75%	26520	1.05%	1692579	1.21%	0	0.00%	0	0.00%	325	0.29%	s106.avahost.net
16	24994	0.71%	22490	0.89%	1447857	1.03%	0	0.00%	0	0.00%	704	0.62%	74-202-210-98.static.twtelecom.net
17	23803	0.67%	21132	0.84%	1364255	0.97%	0	0.00%	0	0.00%	439	0.39%	s01060026f32c8d6f.gv.shawcable.net
18	23135	0.66%	22479	0.89%	1757297	1.25%	0	0.00%	0	0.00%	359	0.32%	24-113-218-219.wavecable.com
19	22449	0.64%	17299	0.69%	907843	0.65%	0	0.00%	0	0.00%	414	0.37%	vicce018.net.gov.bc.ca
20	19844	0.56%	19700	0.78%	1203179	0.86%	0	0.00%	0	0.00%	314	0.28%	cc-3-dhcp-96.46.17.16.genext.net
21	19105	0.54%	16625	0.66%	803019	0.57%	0	0.00%	0	0.00%	951	0.84%	165.151.220.12
22	18691	0.53%	16623	0.66%	695976	0.50%	0	0.00%	0	0.00%	5	0.00%	moriah.canvasdreams.com
23	16774	0.48%	3837	0.15%	273368	0.19%	0	0.00%	0	0.00%	0	0.00%	phpmailer.apian.com
24	16439	0.47%	2819	0.11%	95579	0.07%	0	0.00%	0	0.00%	1379	1.22%	c-98-237-153-27.hsd1.wa.comcast.net
25	16437	0.47%	9899	0.39%	230033	0.16%	0	0.00%	0	0.00%	5501	4.87%	c-71-197-249-28.hsd1.wa.comcast.net
26	16017	0.45%	9729	0.39%	577609	0.41%	0	0.00%	0	0.00%	123	0.11%	vicce015.net.gov.bc.ca
27	15960	0.45%	1591	0.06%	21055	0.02%	0	0.00%	0	0.00%	1422	1.26%	d-128-95-81-195.dhcp4.washington.edu
28	14815	0.42%	1763	0.07%	16056	0.01%	0	0.00%	0	0.00%	1323	1.17%	d154-20-80-227.bchsia.telus.net
29	14034	0.40%	9492	0.38%	744611	0.53%	0	0.00%	0	0.00%	562	0.50%	smtp-1.rl.gov
30	13603	0.39%	9229	0.37%	721845	0.51%	0	0.00%	0	0.00%	561	0.50%	daoutside.hanford.gov

On KING-TV

Verification Improvements
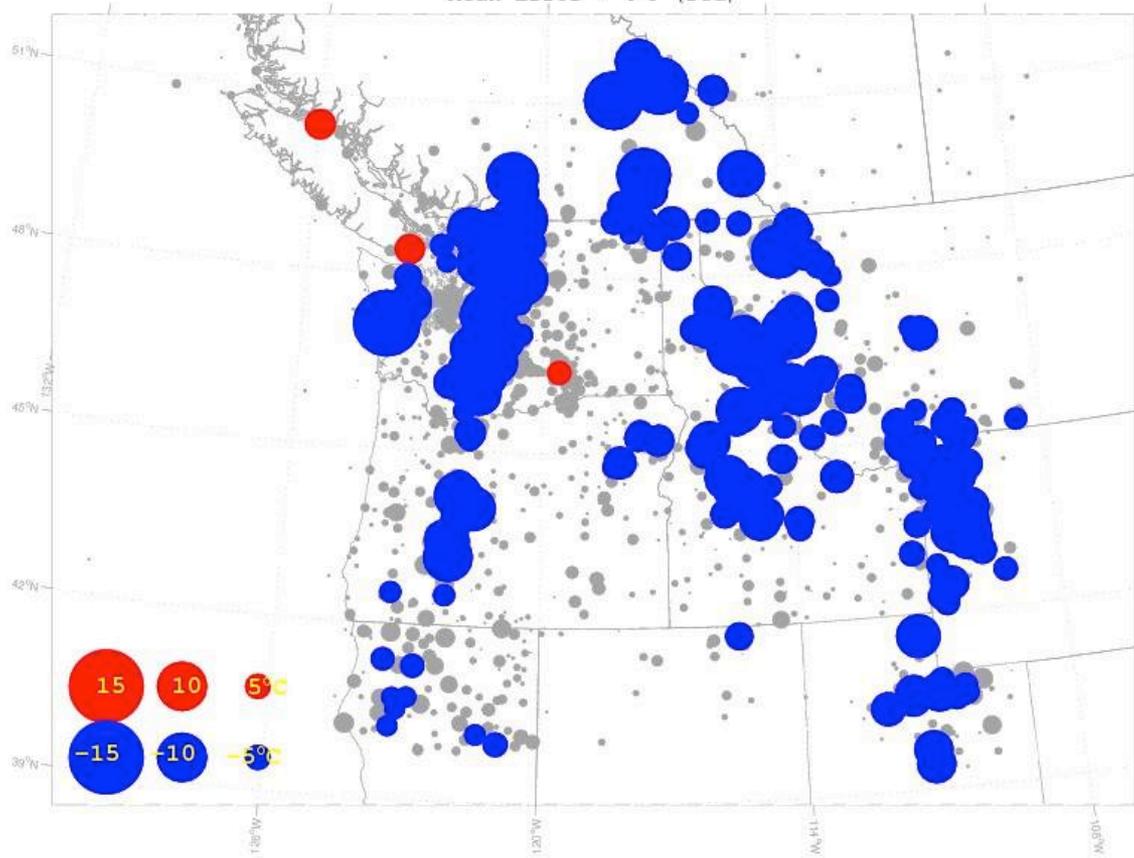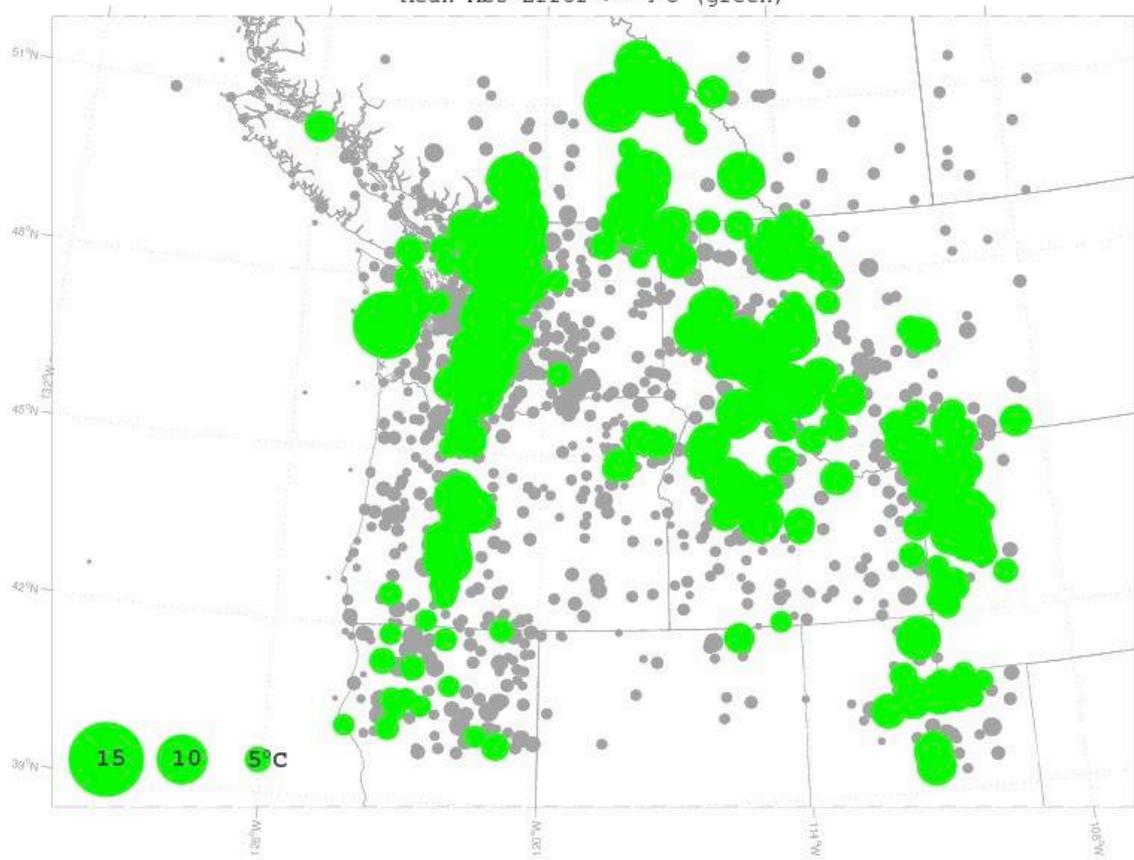
Average MEs, Temperature, WRFGFS-12km, 01-May-2013 - 31-May-2013, 12Z, fhr 12
Mean Error < -4°C (blue)
Mean Error > 4°C (red)

Average MAEs, Temperature, WRFGFS-12km, 01-May-2013 - 31-May-2013, 12Z, fhr 12
Mean Abs Error >= 0°C and < 4°C (gray)
Mean Abs Error >= 4°C (green)

| f12 | f24 | f36 | f48 | f60 | f72 |

Domain Average Bias (knots)

| Valid Date	MM5ETAD2	WRFGFSD2
02-Jun-2013-00Z	-0.85	-0.24
01-Jun-2013-00Z	-0.41	0.05
31-May-2013-00Z	1.23	1.72
30-May-2013-00Z	1.64	2.63
29-May-2013-00Z	0.58	0.93
28-May-2013-00Z	0.65	1.48
27-May-2013-00Z	-0.43	0.83
26-May-2013-00Z	-0.62	-1.02
25-May-2013-00Z	0.20	0.79
24-May-2013-00Z	-0.46	0.03
23-May-2013-00Z	0.59	1.69
22-May-2013-00Z	1.80	2.21
21-May-2013-00Z	-1.30	-0.24
20-May-2013-00Z	0.48	1.43
19-May-2013-00Z	-0.17	0.73
18-May-2013-00Z	-0.78	-0.75
17-May-2013-00Z	-1.58	-1.33
16-May-2013-00Z	-1.00	-0.27
15-May-2013-00Z	-0.40	-0.08
14-May-2013-00Z	2.96	2.59
13-May-2013-00Z	0.89	0.29
12-May-2013-00Z	-0.00	0.19
11-May-2013-00Z	-1.85	-1.12
10-May-2013-00Z	-1.35	-0.66
09-May-2013-00Z	-1.60	-0.84
08-May-2013-00Z	-1.62	-0.87
07-May-2013-00Z	-2.03	-1.20
06-May-2013-00Z	0.16	0.55
05-May-2013-00Z	2.14	1.57
04-May-2013-00Z	1.08	0.81
03-May-2013-00Z	-1.31	-0.70
02-May-2013-00Z	-1.03	-0.15
01-May-2013-00Z	0.39	1.07
30-Apr-2013-00Z	0.38	-0.22
29-Apr-2013-00Z	2.55	1.14

spd errors, spd > 3 knots,MM5ETA12km, fhr12,2013060112
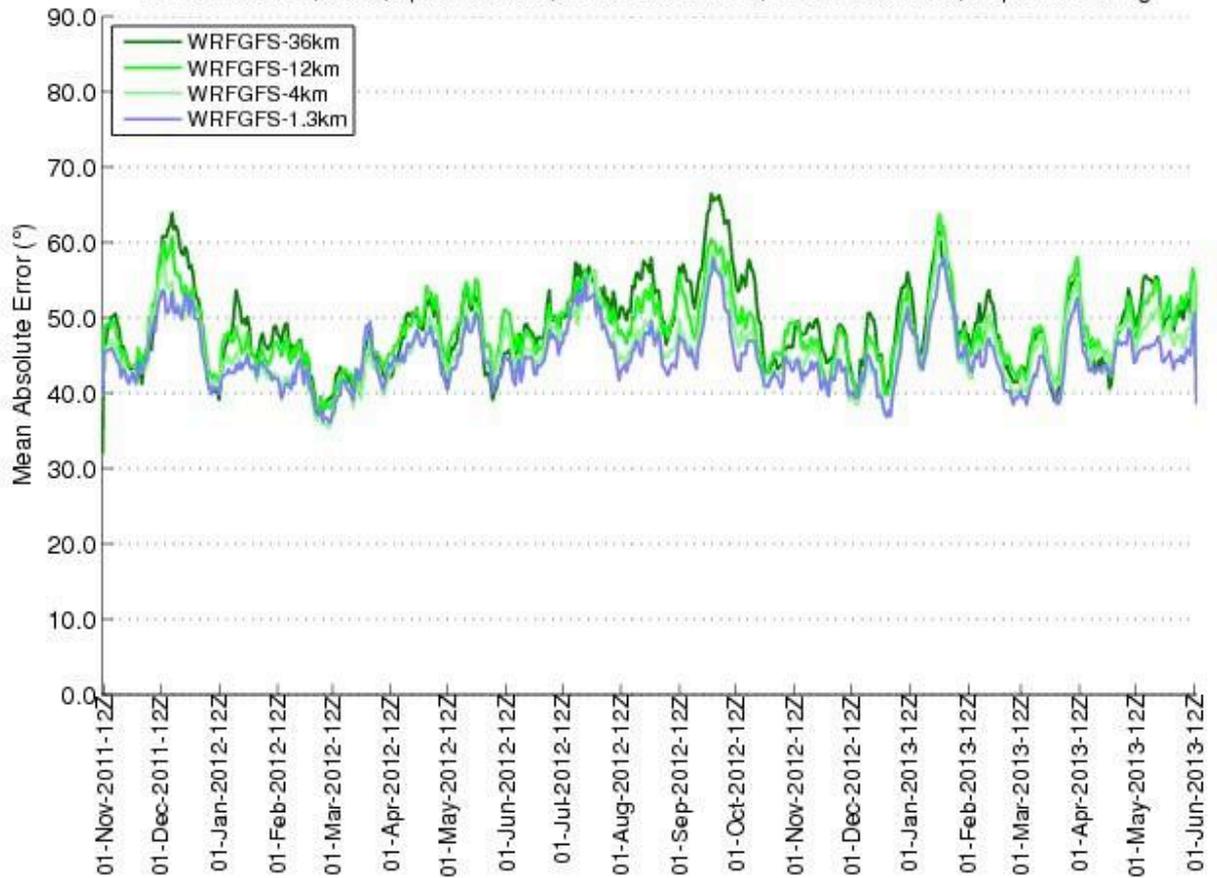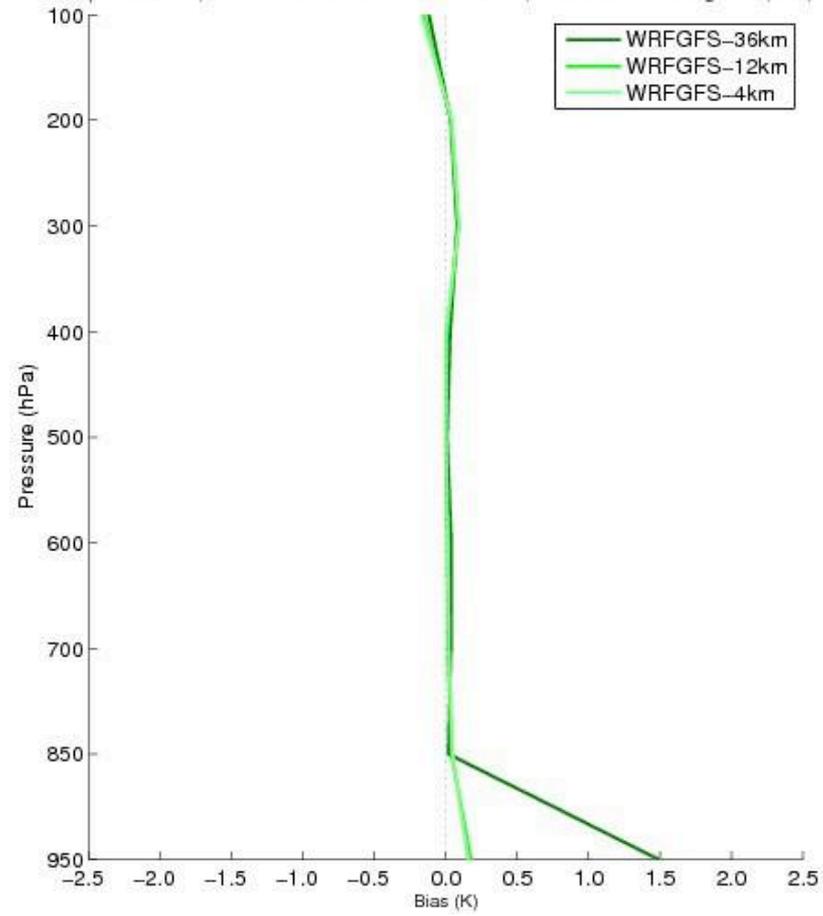error <-5knots (blue)
error >5knots (red)
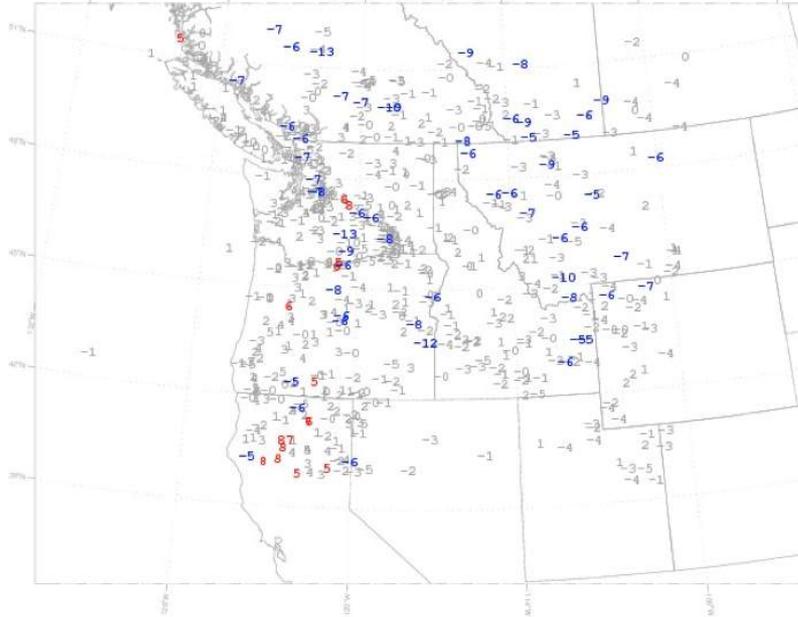
Enhanced IR Image
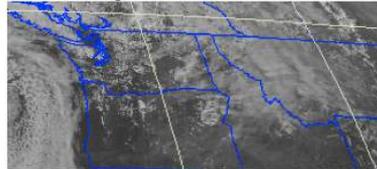
Wind Direction, MAE, spd > 3 knots, Forecast Hour 36, 00Z Initialization,10-pt Smoothing
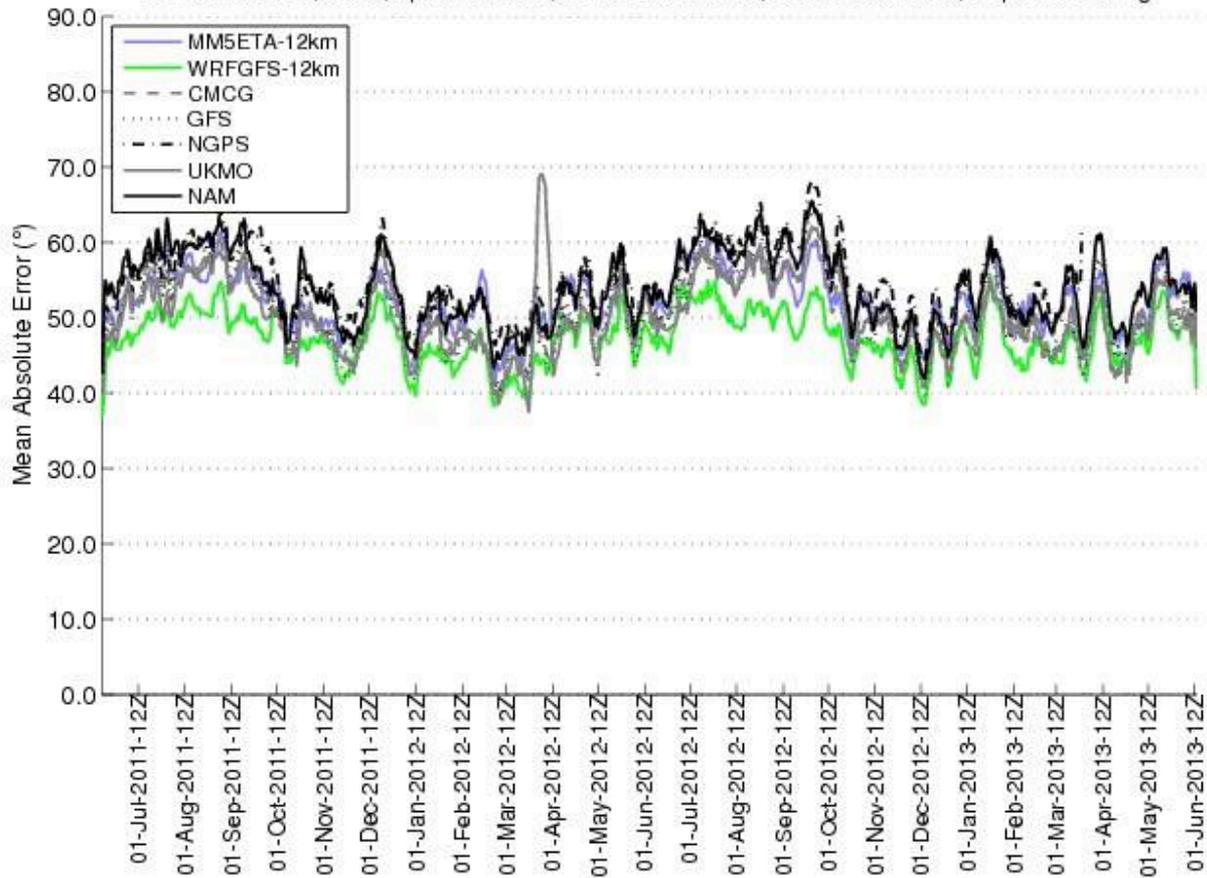
Wind Direction, MAE, spd > 3 knots, Forecast Hour 24, 12Z Initialization, 10-pt Smoothing

Temperature Bias, verified vs radiosonde and ACARS obs, 17–Jul–2011–16–Aug–2011, 12Z, f36

Even More Detailed Verification for Development

4/3-km Simulations of WRF version 3.1.1 for Cases Nov 2009-Jan 2010

Last Modified: Wed Jun 05 2013 11:49:52 GMT-0700 (PDT)

The Problems

Winds are too strong over the land. Daytime high temperatures over the Intermountain West are too cold.

Working on Solutions

To help fix these, several approaches have been tried:
1) turning off the Noah LSM
2) modifying surface friction through roughness length or vertical diffusion
3) modifying the roughness length or friction velocity based upon the variance (36-km variance WA 36-km variance, 12-km variance, WA 12-km variance) of the subgrid scale terrain.

Click here for the statistics and plots that use lowest sigma level temperatures and winds instead of the PBL-scheme 2-m and 10-m values.

The loops in this table illustrate the attempts and how they impact the simulations.

Table 1. Standard Plots

Initialization	Domain	Product	Hour	Cases (control click to select multiple)
				All Cases
				1. Std (aka wrfgfs)
				2. wrfapr08 (std for summer2008)
				2. wrfv311stauffer2
				3. wrfv311stauffer3
				5. wrfv311ustar3
				6. wrfv311ustar4
00Z Jan 7, 2010 is a really bad case for standard runs	00Z Jan 15, 2010			7. wrfv311ovens1
Obs: 21Z Oct 25, 2010				8. wrfv311u3s2
Obs: 0Z Oct 26, 2010	12-km	Western WA Surface Wind Speed	Hour 12	9. wrfv311u3s2oldlsm1
NOTE: to see how and why the RUC LSM affects offshore winds in the July 8, 2008 case, load this loop of difference plots which shows that				10. wrfv311oldqn
the thermal trough over California is enhanced with RUC.				11. wrfv311modis
				12. wrfv311nolsm
				12b. wrfv311lsm
				13. wrfv311u4nolsm
				14. wrfv311sfz2
				15. wrfv311sfz3
				16. wrfv311sfz4

Reset | Load

Table 2. Geographic, Mean Statistics, and New Frequency Distribution Plots

Period	Field	Statistic	Hour	Station Group	Cases (control click to select multiple)

Statistics:
- Mean or Bias
- Mean Absolute Error
- Root Mean Square Error
- Std Dev of Error

Scatter Plots
- Scatterplot ME
- Scatterplot MAE
- Scatterplot RMS
- Scatterplot Std Dev

David's Frequency Distribution Plots
- Frequency Distribution

Choose a Period:
- Jan 1 - Feb 8 2010
- Jul 1 - Aug 31 2008
- Feb 1 - Apr 30 2013
- Mar 22 - Apr 5 2013
- Oct 25, 2010 windstorm

Choose a field:
- 2-m Temp
- 2-m Dewpoint Temp
- 10-m Wind Direction
- 10-m Wind Speed
- SLP

Hour:
- Init 0, FHr 24
- Init 0, FHr 12

- All sites
- All sites, speeds >= 3 knots
- All sites, speeds <= 3 knots
- All sites, speeds >= 20 knots
- SA sites
- SA sites, speeds >= 3 knots
- Buoys
- Buoys, speeds >= 3 knots
- - Below, compare 2m/10m to lowest sigma -
- All sites 2m/10m vs lowest
- All sites, speeds >= 3 knots 2m/10m vs lowest
- All sites, speeds <= 3 knots 2m/10m vs lowest
- All sites, speeds >= 20 knots 2m/10m vs lowest
- SA sites 2m/10m vs lowest
- SA sites, speeds >= 3 knots 2m/10m vs lowest
- Buoys 2m/10m vs lowest
- Buoys, speeds >= 3 knots 2m/10m vs lowest

59. wrfv341cu4noahrad
60. wrfv341cu4noahmp
61. wrfv341cu4noahmprad
62. wrfv341cu4noahmpgrd
------ Spring 2013 Cases ------
All Cases
wrfgfs (std)
wrfoct11
wrfv311ustar71 old snow
wrfv341cu4rucrad
wrfv35cu4
wrfv35cu4acm2
wrfv35cu4br
wrfv35cu4clm
wrfv35cu4newsnow
wrfv35cu4nmpgfs
wrfv35cu4noahmp
wrfv35cu4noshade

Plot type:
- Geographic Loop
- Bar Chart
- Bar Chart for all Station Groups
- Time series table at a site
(does not work with the All Cases option) Load Reset

Old Wind Speed frequency distribution plots

59. wrfv341cu4noahrad [partially cut off] namelist.input diff from std	like case 58. wrfv341 with cu_physics=4, Noah LSM and RRTMG shortwave and longwave radiation schemes instead of RRTM longwave and Dudhia shortwave schemes.
60. wrfv341cu4noahmp namelist.input diff from std	like case 58. wrfv341cu4 with cu_physics=4 except using the new Noah MP LSM.
61. wrfv341cu4noahmprad namelist.input diff from std	like case 60. wrfv341cu4 with cu_physics=4 with Noah MP LSM and RRTMG radiation -- this setup is problematic for the compilers to run.
62. wrfv341cu4noahmpgrd namelist.input diff from std	like case 61. wrfv341cu4 with cu_physics=4 with Noah MP LSM but with the new Goddard radiation schemes (ra_lw/sw_physics=5) which does not have the unstable code problems that RRTMG does.
63. wrfv35cu4newzssib namelist.input diff from std	like wrfv35cu4 with cu_physics=4 but using the 3rd generation Simplified Simple Biosphere Model (SSiB) LSM: (description from the WRF User's Guide). SSiB is developed for land/atmosphere interaction studies in the climate model. The aerodynamic resistance values in SSiB are determined in terms of vegetation properties, ground conditions and bulk Richardson number according to the modified Monin-Obukhov similarity theory. SSiB-3 includes three snow layers to realistically simulate snow processes, including destructive metamorphism, densification process due to snow load, and snow melting, which substantially enhances the model's ability for the cold season study. To use this option, ra_lw_physics and ra_sw_physics should be set to either 1, 3, or 4. The second full model level should be set to no larger than 0.982 so that the height of that level is higher than vegetation height. New in Version 3.4.

Stats for 25 Oct 2010 are here

Statistics Jan 1-Feb 8 2009 for wind speeds >= 3 knots	Statistics Jul 1-Aug 31 2008 for wind speeds >= 3 knots

24-hr Forecast 00 UTC (4 pm PST) 12-km verification statistics for SA stations >= 3 knots

Field	ME	MAE	RMS	STDEV	COUNT	Case	Field	ME	MAE	RMS	STDEV	COUNT	Case
dir10m	8.29	47.51	66.00	65.48	4933	wrfv311sfz7d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	2.63	41.33	58.22	58.16	10345	wrfv311ustar72d2.Jul-Aug2008.00.24.diffs.stats2
dir10m	9.61	47.68	66.25	65.56	4933	wrfv311sfz2d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	2.55	41.45	58.31	58.25	10345	wrfv311ustar6d2.Jul-Aug2008.00.24.diffs.stats2
dir10m	9.75	47.77	66.41	65.69	4933	wrfv311sfz9d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	4.41	41.58	58.48	58.32	10345	wrfv311ustar79d2.Jul-Aug2008.00.24.diffs.stats2
dir10m	10.01	47.89	66.56	65.81	4933	wrfv311sfz4d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	4.50	41.65	58.60	58.43	10345	wrfv311u7d2.Jul-Aug2008.00.24.diffs.stats2
dir10m	10.72	48.36	67.00	66.14	4933	wrfv311u7d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	4.53	41.75	58.69	58.52	10345	wrfv311u71t14b3d2.Jul-Aug2008.00.24.diffs.stats2
dir10m	7.04	48.48	67.20	66.84	4933	wrfv311ustar81d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	4.49	41.77	58.69	58.52	10345	wrfv311ustar71wspl0xd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	6.42	48.48	67.20	66.90	4933	wrfv341u7lstabwsd2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	5.16	41.83	58.70	58.47	10345	wrfv341ustar71d2.Jul-Aug2008.00.24.diffs.stats2
dir10m	6.02	48.31	67.21	66.94	4933	wrfv311ustar6d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	4.50	41.83	58.77	58.60	10345	wrfv311ustar78d2.Jul-Aug2008.00.24.diffs.stats2
dir10m	5.21	48.45	67.23	67.04	4933	wrfv311ustar71d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	5.09	42.08	59.03	58.81	10345	wrfv311u7d2.Jul-Aug2008.00.24.diffs.stats2
dir10m	7.88	48.51	67.27	66.82	4933	wrfv311ustar8d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	4.08	42.03	59.16	59.03	10345	wrfv311nolsmd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	11.25	48.63	67.30	66.36	4933	wrfv311u4nolsmd2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	6.92	42.27	59.22	58.82	10345	wrfv311modisd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	9.05	48.66	67.42	66.82	4933	wrfv311ustar74d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	5.77	42.29	59.28	59.00	10345	wrfv311ustar71pbl115d2.Jul-Aug2008.00.24.diffs.stats2
dir10m	7.36	48.66	67.50	67.11	4933	wrfv311ustar62d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	5.39	42.35	59.31	59.07	10345	wrfv311ustar71rid2.Jul-Aug2008.00.24.diffs.stats2
dir10m	7.32	48.71	67.55	67.16	4933	wrfv311ustar72d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	6.78	42.63	59.59	59.20	10345	wrfapr08d2.Jul-Aug2008.00.24.diffs.stats2
dir10m	9.43	48.87	67.67	67.01	4933	wrfv311sfz4d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	5.90	42.60	59.65	59.36	10345	wrfv311ustar71pbl51d2.Jul-Aug2008.00.24.diffs.stats2
dir10m	11.67	49.08	67.70	66.70	4933	wrfv311sfz9d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	6.43	42.73	59.68	59.33	10345	wrfgfsd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	10.38	49.09	67.81	67.02	4933	wrfv311ustar9d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	6.21	42.72	59.79	59.47	10345	wrfv311ustar71stradd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	10.17	49.13	67.99	67.23	4933	wrfv311ustar7d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	6.39	42.81	59.88	59.54	10345	wrfv311ustar71stabwsd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	10.62	49.29	68.08	67.26	4933	wrfv341cu4d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	7.25	42.90	59.94	59.50	10345	wrfv341lsmd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	11.06	49.30	68.11	67.21	4933	wrfv341u7lstabwsd2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	7.54	42.89	59.98	59.51	10345	wrfv341kfnoahd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	10.84	49.37	68.17	67.31	4933	wrfv311ustar71pbl115d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	7.18	42.99	60.00	59.58	10345	wrfv311u7lstabwsd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	9.57	49.32	68.17	67.50	4933	wrfv341d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	7.21	42.88	60.02	59.59	10345	wrfv311lsmd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	9.72	49.40	68.20	67.51	4933	wrfv341frfd2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	6.10	42.92	60.02	59.71	10345	wrfv311nolsmd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	11.86	49.48	68.24	67.20	4933	wrfv341ustar78d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	7.41	43.02	60.06	59.61	10345	wrfv341frfd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	11.86	49.50	68.25	67.22	4933	wrfv341ustar71stabd2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	7.36	43.04	60.07	59.62	10345	wrfv341d2.Jul-Aug2008.00.24.diffs.stats2
dir10m	11.02	49.49	68.31	67.43	4933	wrfv341cu4rucradd2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	8.23	43.35	60.17	59.61	10345	wrfv341cu4noahmpd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	11.69	49.57	68.33	67.32	4933	wrfv311ustar71wspl0xd2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	7.57	43.16	60.30	59.83	10345	wrfv341cu4d2.Jul-Aug2008.00.24.diffs.stats2
dir10m	10.61	49.56	68.33	67.51	4933	wrfv341cu4noahradd2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	8.47	43.55	60.33	59.73	10345	wrfv341cu4noahmpradd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	10.66	49.68	68.33	67.50	4933	wrfv341cu4radd2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	8.86	43.56	60.38	59.73	10345	wrfv341cu4noahmpgrdd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	11.55	49.58	68.41	67.43	4933	wrfv311ustar71pbl51d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	8.25	43.38	60.53	59.97	10345	wrfv341cu4noahradd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	9.59	49.50	68.45	67.78	4933	wrfv341cu4rucismd2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	7.82	43.40	60.60	60.09	10345	wrfv341cu4radd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	11.87	49.81	68.60	67.57	4933	wrfv311ustar71stabwsd2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	7.55	43.41	60.65	60.18	10345	wrfv341cu4noahd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	11.68	49.63	68.66	67.67	4933	wrfv311u71t14b3d2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	8.19	44.93	62.46	61.92	10345	wrfv341cu4rucradd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	12.41	49.94	68.75	67.63	4933	wrfv341ustar7ad2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	7.53	44.91	62.48	62.03	10345	wrfv341cu4rucismd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	7.20	50.13	68.79	68.42	4933	wrfv341cu4noahmpd2.Jan1-Feb82010.00.24.diffs.stats2	dir10m	5.42	45.60	62.51	62.28	10345	mm5etad2.Jul-Aug2008.00.24.diffs.stats2
dir10m	9.42	49.90	68.92	68.28	4933	wrfv341kfnoahd2.Jan1-Feb82010.00.24.diffs.stats2							
dir10m	7.61	50.26	68.98	68.57	4933	wrfv341cu4noahmpradd2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.78	3.27	4.33	4.26	10939	wrfv311modisd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	9.05	49.97	69.02	68.43	4933	wrfv341lsmd2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.60	3.27	4.33	4.29	10939	wrfv341kfnoahd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	9.74	50.13	69.20	68.51	4933	wrfv341cu4noahd2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.60	3.27	4.34	4.29	10939	wrfv341cu4noahd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	5.06	51.30	70.02	69.84	4933	wrfv341cu4noahmpgrdd2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.70	3.28	4.34	4.29	10939	wrfv311lsmd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	13.66	51.26	70.05	68.71	4933	wrfv311ustar71rid2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.63	3.31	4.38	4.33	10939	wrfapr08d2.Jul-Aug2008.00.24.diffs.stats2
dir10m	14.04	51.50	70.20	68.79	4933	wrfv311nolsmd2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.68	3.32	4.38	4.33	10939	wrfv341d2.Jul-Aug2008.00.24.diffs.stats2
dir10m	15.76	52.44	71.06	69.28	4933	wrfapr08d2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.63	3.32	4.38	4.34	10939	wrfv311nolsmd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	13.66	53.20	71.52	70.21	4933	mm5etad2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.78	3.32	4.39	4.32	10939	wrfv311ustar71stabd2.Jul-Aug2008.00.24.diffs.stats2
dir10m	15.69	53.15	71.80	70.08	4933	wrfgfsd2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.54	3.33	4.39	4.35	10939	wrfv341lsmd2.Jul-Aug2008.00.24.diffs.stats2
							wsp10m	-0.54	3.33	4.39	4.35	10939	wrfv341frfd2.Jul-Aug2008.00.24.diffs.stats2
wsp10m	-1.04	3.34	4.60	4.48	5028	wrfv311u4nolsmd2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.67	3.32	4.39	4.35	10939	wrfv341u7lstabwsd2.Jul-Aug2008.00.24.diffs.stats2
wsp10m	-1.27	3.35	4.61	4.43	5028	wrfv311sfz4d2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.76	3.32	4.40	4.33	10939	wrfv311ustar71stabwsd2.Jul-Aug2008.00.24.diffs.stats2
wsp10m	-0.96	3.39	4.67	4.57	5028	wrfv311u71t14b3d2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.67	3.31	4.40	4.35	10939	wrfv341cu4noahradd2.Jul-Aug2008.00.24.diffs.stats2
wsp10m	-0.97	3.40	4.68	4.58	5028	wrfv311u7d2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.53	3.31	4.40	4.36	10939	wrfv341cu4noahradd2.Jul-Aug2008.00.24.diffs.stats2
wsp10m	-0.86	3.40	4.68	4.60	5028	wrfv311ustar71stabd2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.92	3.32	4.41	4.32	10939	wrfv311ustar71pbl51d2.Jul-Aug2008.00.24.diffs.stats2
wsp10m	-0.68	3.40	4.68	4.63	5028	wrfv311ustar78d2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.50	3.35	4.42	4.39	10939	wrfv341cu4radd2.Jul-Aug2008.00.24.diffs.stats2
wsp10m	-0.41	3.41	4.68	4.67	5028	wrfv311ustar9d2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.67	3.37	4.46	4.41	10939	wrfv341cu4d2.Jul-Aug2008.00.24.diffs.stats2
wsp10m	-1.80	3.42	4.71	4.36	5028	wrfv311sfz2d2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-1.26	3.34	4.47	4.29	10939	wrfv311ustar71pbl115d2.Jul-Aug2008.00.24.diffs.stats2
wsp10m	-1.23	3.43	4.71	4.55	5028	wrfv311ustar79d2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.10	3.40	4.47	4.47	10939	wrfv341cu4noahmpd2.Jul-Aug2008.00.24.diffs.stats2
wsp10m	-0.19	3.42	4.71	4.71	5028	wrfv341cu4noahradd2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-1.21	3.39	4.48	4.31	10939	wrfv311ustar71rid2.Jul-Aug2008.00.24.diffs.stats2
wsp10m	-0.17	3.43	4.72	4.72	5028	wrfv341kfnoahd2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	0.07	3.42	4.48	4.48	10939	wrfv341cu4noahmpradd2.Jul-Aug2008.00.24.diffs.stats2
wsp10m	-0.10	3.42	4.73	4.73	5028	wrfv341cu4radd2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-1.69	3.35	4.49	4.16	10939	wrfv311ustar7ad2.Jul-Aug2008.00.24.diffs.stats2
wsp10m	-0.18	3.43	4.73	4.73	5028	wrfv341frfd2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.46	3.38	4.49	4.47	10939	wrfv341cu4d2.Jul-Aug2008.00.24.diffs.stats2
wsp10m	-0.15	3.43	4.73	4.73	5028	wrfv341d2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	0.05	3.45	4.50	4.50	10939	wrfv341cu4noahmpgrdd2.Jul-Aug2008.00.24.diffs.stats2
wsp10m	-1.29	3.45	4.74	4.56	5028	wrfv311ustar7d2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-0.58	3.39	4.54	4.50	10939	wrfv341cu4rucismd2.Jul-Aug2008.00.24.diffs.stats2
wsp10m	-0.52	3.43	4.74	4.72	5028	wrfv341cu4noahmpradd2.Jan1-Feb82010.00.24.diffs.stats2	wsp10m	-1.98	3.42	4.60	4.15	10939	wrfv311ustar78d2.Jul-Aug2008.00.24.diffs.stats2

What new verification capabilities are needed by consortium members?

- Rob Elleman suggested adding the capability to look at verification at single stations.

- Doable if folks want it. What kind of interface?

- Anything else?

Pressing Hardware Needs

- To maintain reliability we have found it is important to replace hardware older than approximately 5 years old.

- Also difficult to repair old hardware.

- We also need more disk space due to demand for more and more products.

Node Replacement

Nodes >= 5 years Compute Nodes (Sage)		Age	Replacement system	Cost
	Blades (Nodes n9 – n14)	5 yrs (6/2008)	iServ R4410.v3	$13,830.00
			(4 nodes in 2u box) each with 64 gig ram And 120 gig boot ssd QDR infiniband to match exiting ones.	

Disk Array Replacement and Enhancement

Raid Systems

Size	System	Age	Replacement system	Cost
5.5TB	clr	7 yrs (10/2006)	iServ R518.v3	$12,771.00
9.2TB (4.6x2)	trof	6 yrs (5/2007)	(36 disk system replaces	
9.6TB	si	6 yrs (8/2007)	All 3)	
			64 gig ram, 120G boot ssd	
			12x4TB drives in raid 6 for	
			40TB usable space and	
			room for 24 more	

All the other
systems are

Model Changes

- At the last consortium meeting (in Feb), I proposed two major changes:
  - Moving to a better solar radiation scheme (RRTMG)
  - Using the RUC Land Surface Model
    - Would greatly improve near surface dewpoints and RH
    - Better low-level clouds
    - Allow snow to evolve in time
   - Generally improved verification

Problems

- Everything seemed fine in our testing protocols (6 weeks in summer and winter), but we lost a run on April 12th.

- Went back to previous system and did extensive testing. Found some bugs in WRF code and made fixes.

- The new version of WRF (3.5) became available around that time, so we decided to test it before we made any changes.

WRF 3.5

- Bottom line: did not find any major improvements in performance for any variable.
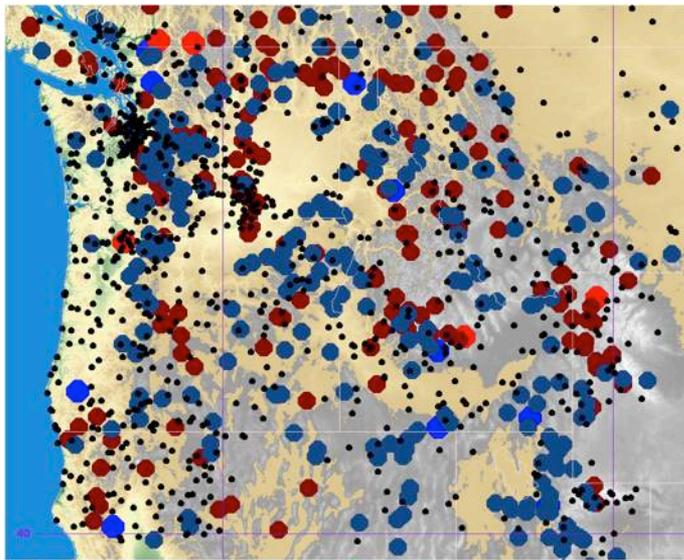
WRFGFS 12-km t2m Bias I00Z/F12 Mar22-Apr52013
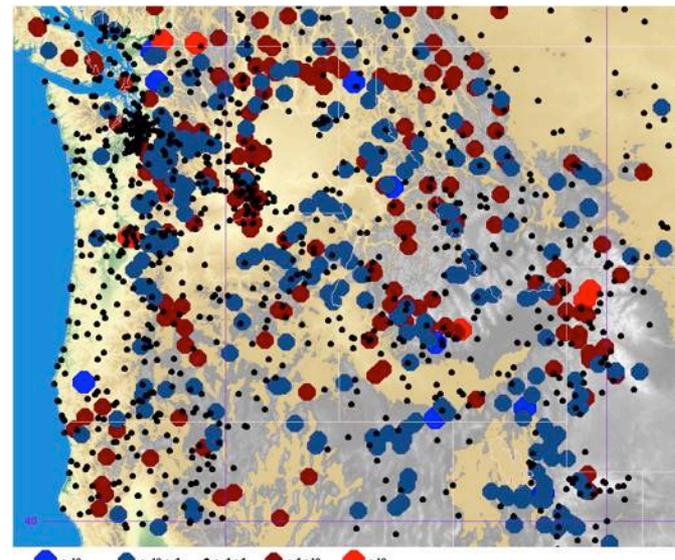
WRFV35CU4 12-km t2m Bias I00Z/F12 Mar22-Apr52013

But a bigger problem was evident... major increase in cold bias in spring

Temperature, MAE, Forecast Hour 12, 12Z Initialization, 10-pt Smoothing
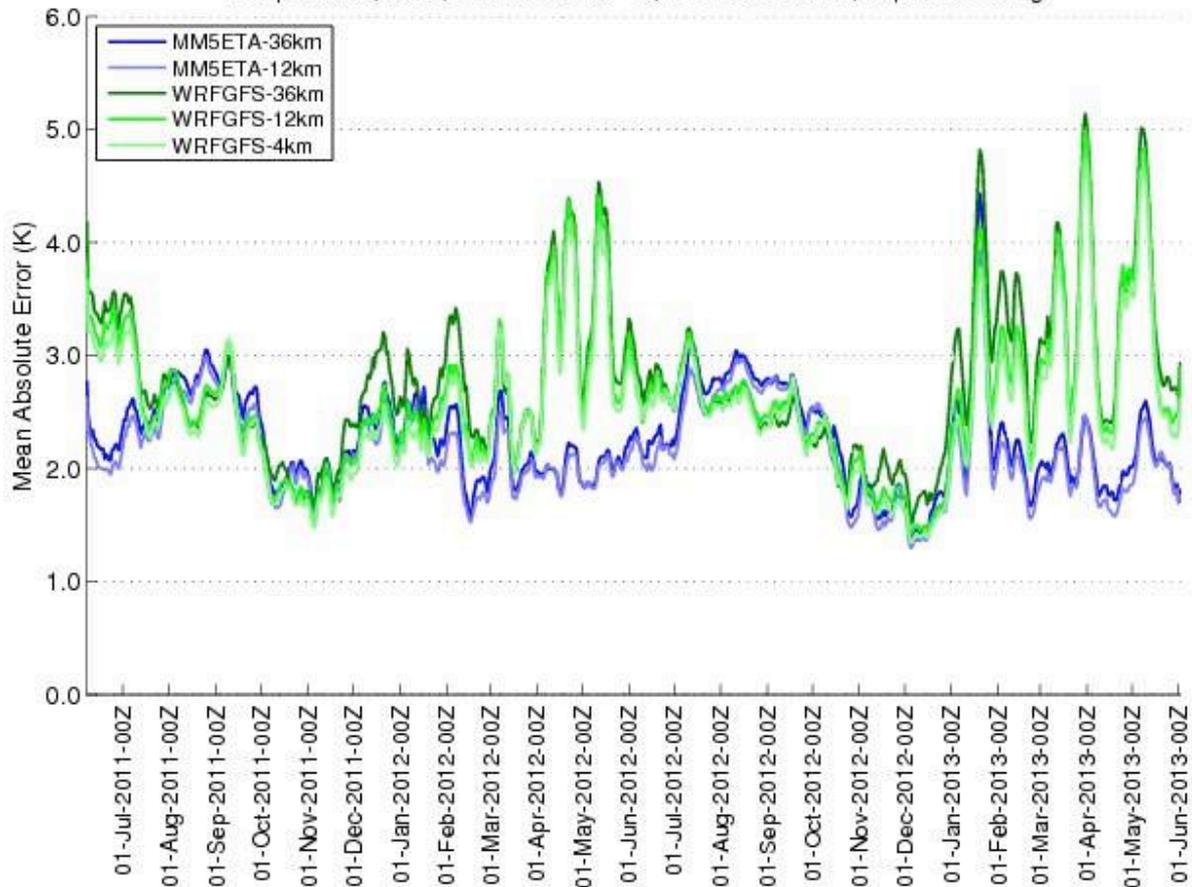
Temperature, Bias, Forecast Hour 12, 12Z Initialization,10-pt Smoothing
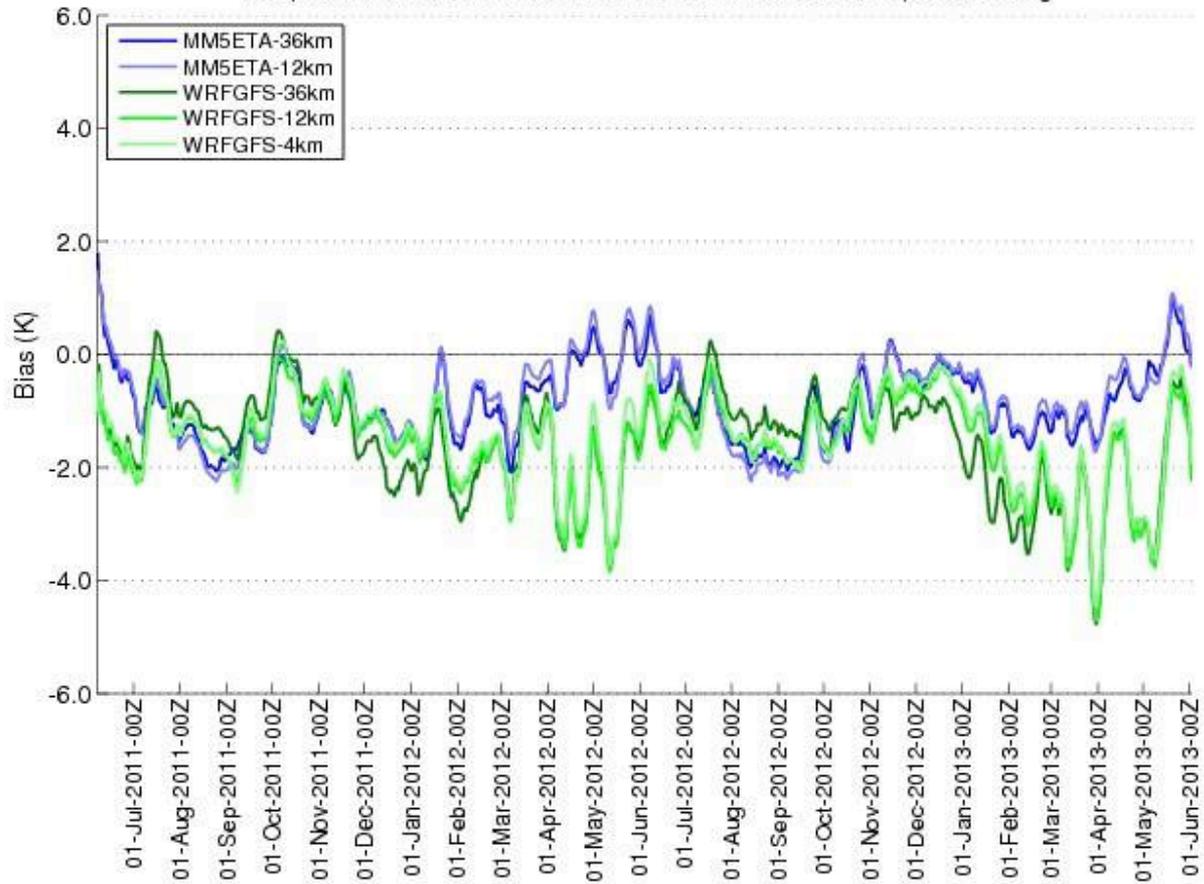
But the bias was limited to the warm time of the day

Temperature, MAE, Forecast Hour 24, 12Z Initialization, 10-pt Smoothing
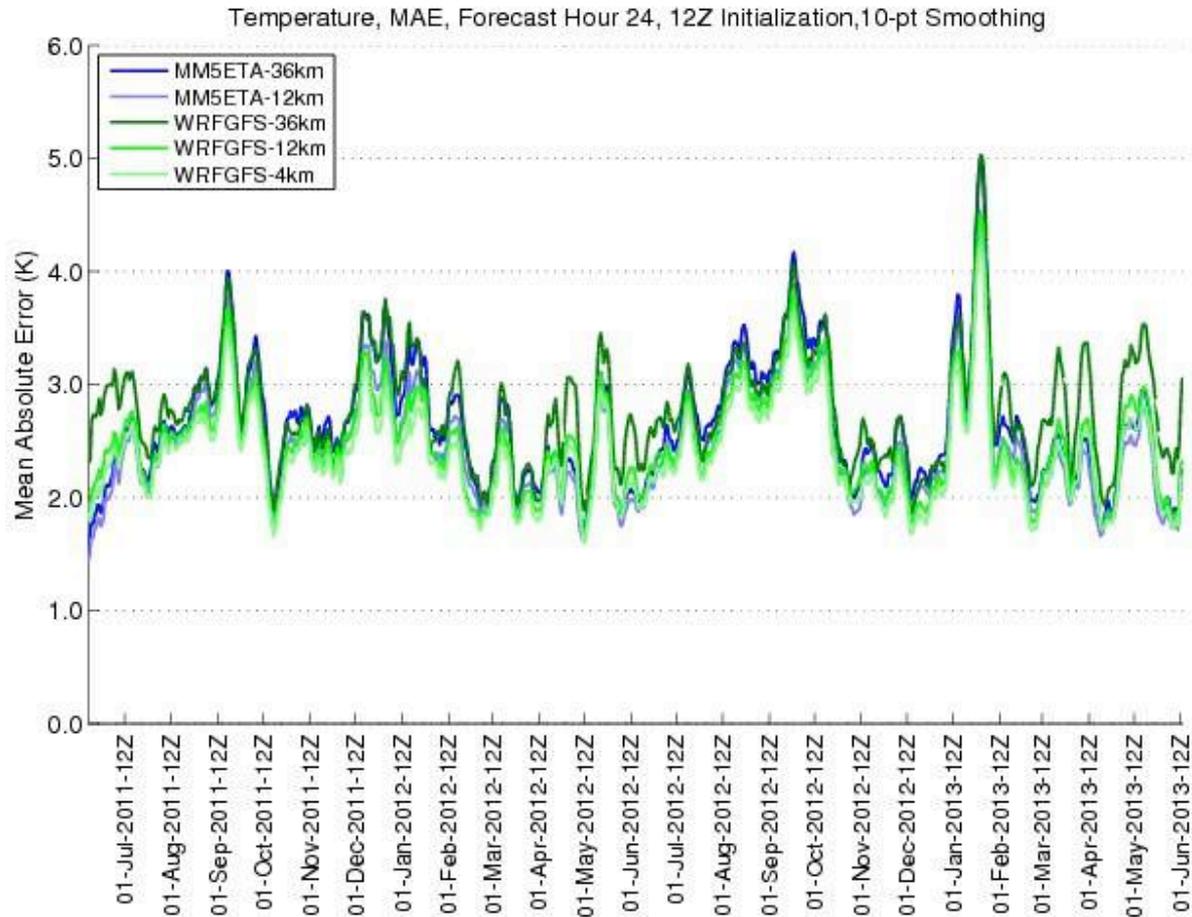
We have had this problem for years…but worse this year because of additional sun and warmth

- Turns out the problem only exists over snow.
- When air temperature is in the 40s or 50s during the day, the 2-m air temperature is near freezing.

⬢ < -10		⬢ > -10 < -4		● > -4 < 4		⬢ > 4 < 10		⬤ > 10
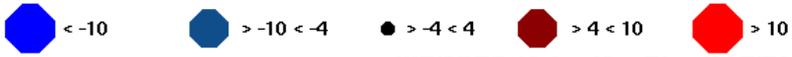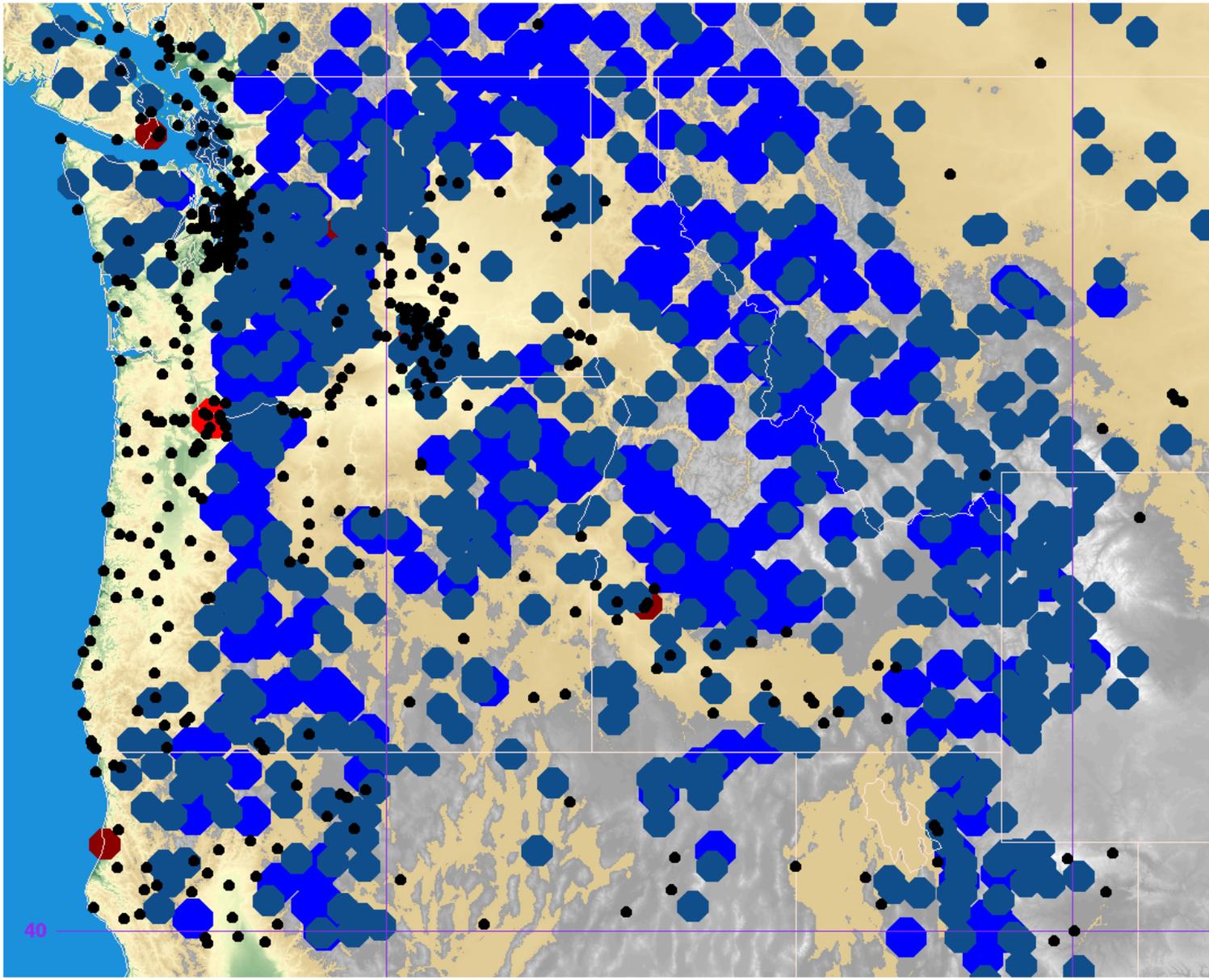
WRFGFS 12-km t2m Bias I00Z/F24 Mar22-Apr52013

No snow

Legend: < -10 | > -10 < -4 | > -4 < 4 | > 4 < 10 | > 10

WRFV35CU4NOSNOW 12-km t2m Bias I00Z/F24 Mar22-Ap

No snow

< -10   > -10 < -4   > -4 < 4   > 4 < 10   > 10

WRFV35CU4NOSNOW 12-km t2m Bias I00Z/F24 Mar22-Ap
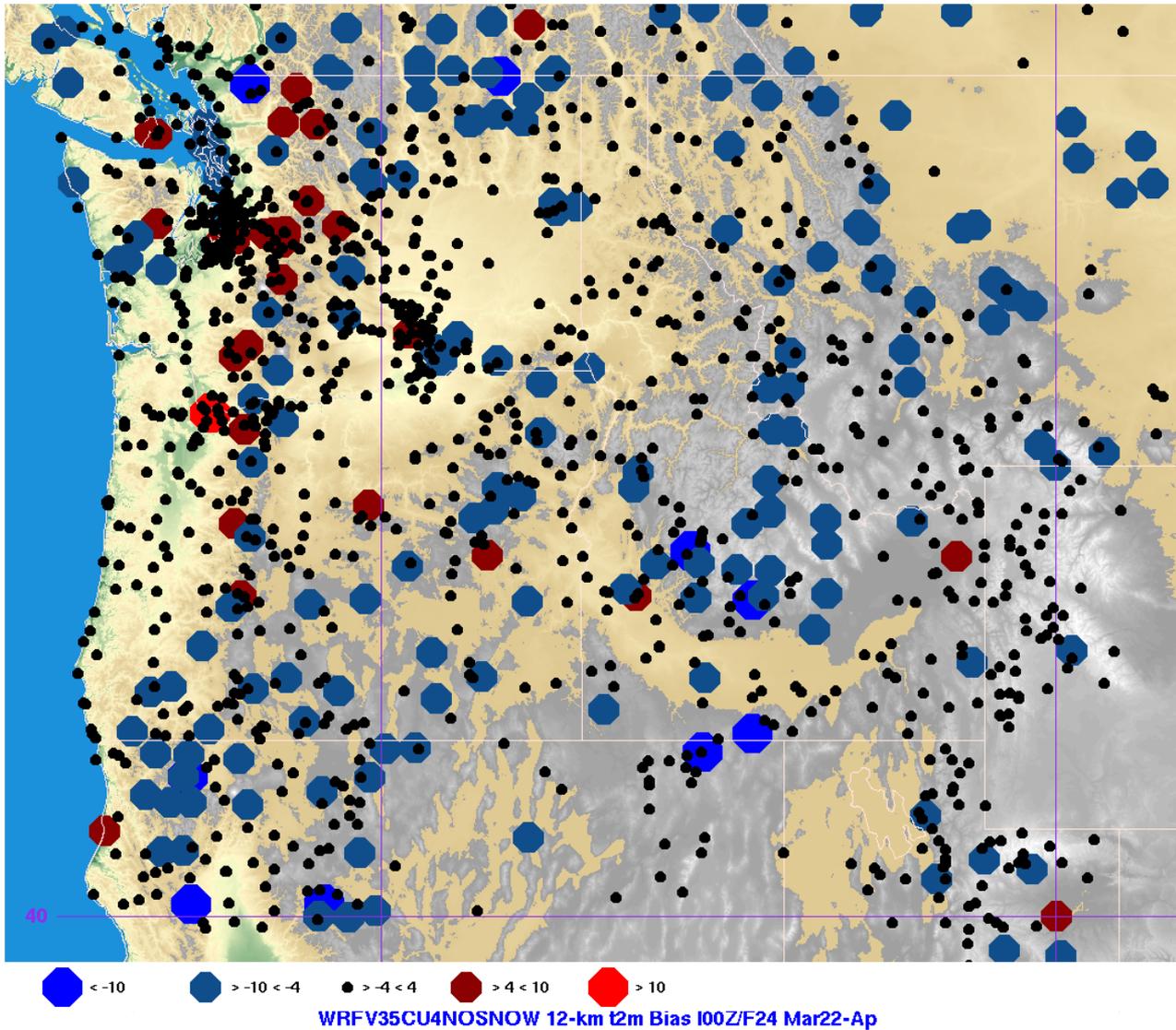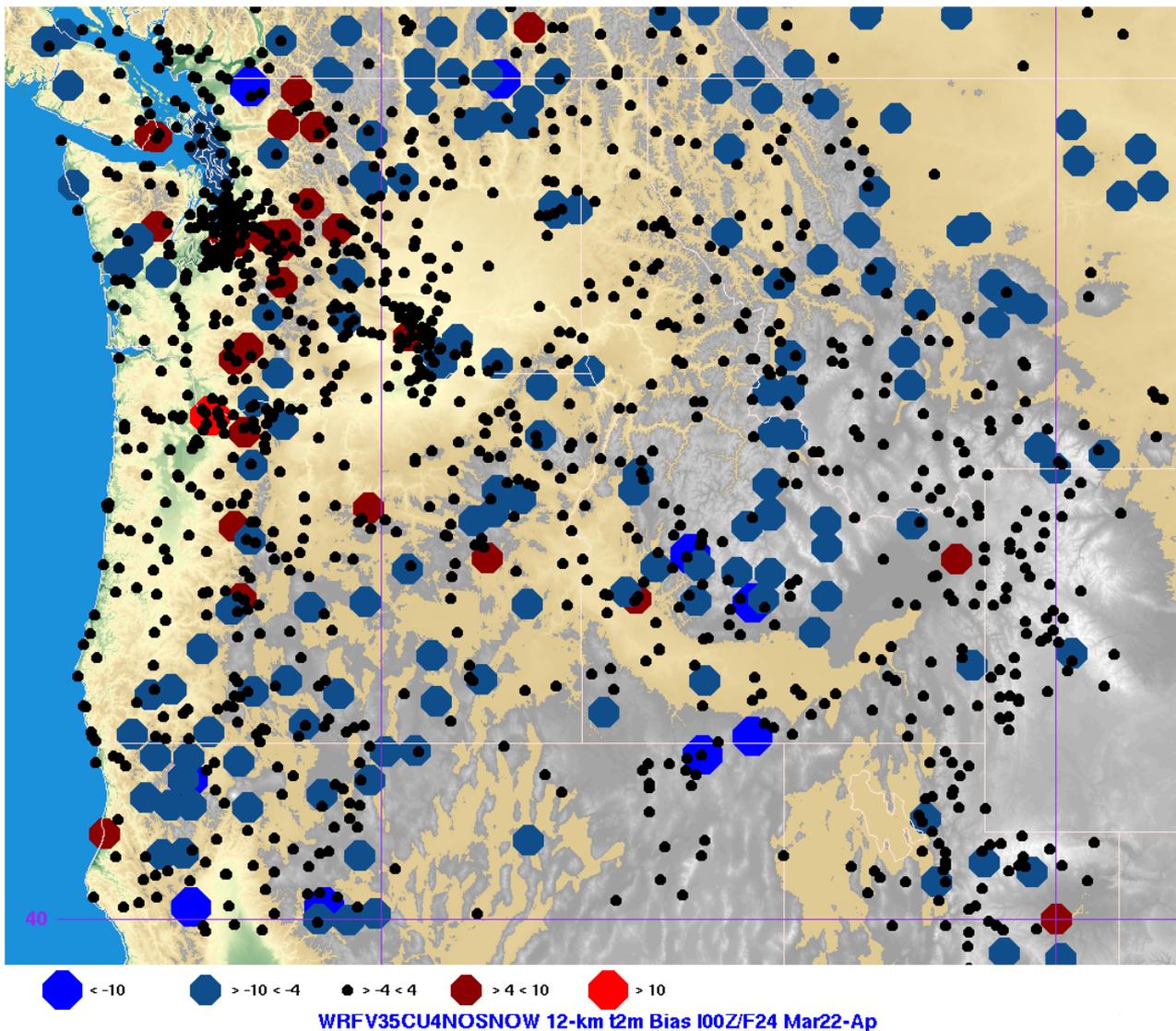
Fixing the Problem

- Have done massive testing to find the issue, experimenting with PBL schemes, Land Surface Models, etc.

- Talked to NCAR experts…they know there is a problem.

- The most promising option so far is:

  3rd generation Simplified Simple Biosphere Model (SSiB) LSM

Legend: < -10 | > -10 < -4 | > -4 < 4 | > 4 < 10 | > 10

WRFGFS 12-km t2m Bias I00Z/F24 Mar22-Apr52013

WRFV35CU4NEWZSSIB 12-km t2m Bias I00Z/F24 Mar22-

But much worse for minimum temps

Some New Products

mb)

4km Other Forward Trajectories

Downtown Seattle from 50 m	LOOP	0	6	12	18	24	30	36	42	48	54	60	66	72	78
Tacoma from 50 m	LOOP	0	6	12	18	24	30	36	42	48	54	60	66	72	78
Everett from 50 m	LOOP	0	6	12	18	24	30	36	42	48	54	60	66	72	78
Downtown Portland from 50 m	LOOP	0	6	12	18	24	30	36	42	48	54	60	66	72	78
Downtown Boise from 50 m	LOOP	0	6	12	18	24	30	36	42	48	54	60	66	72	78

4km Back Trajectories

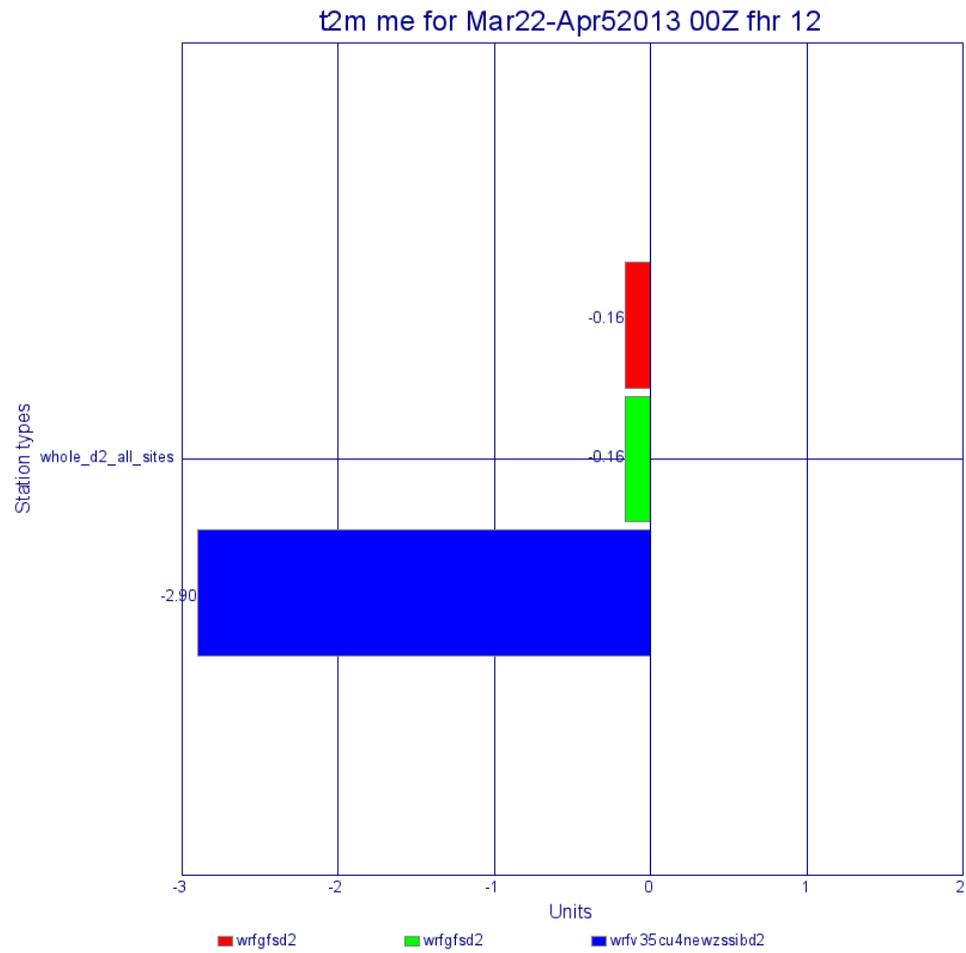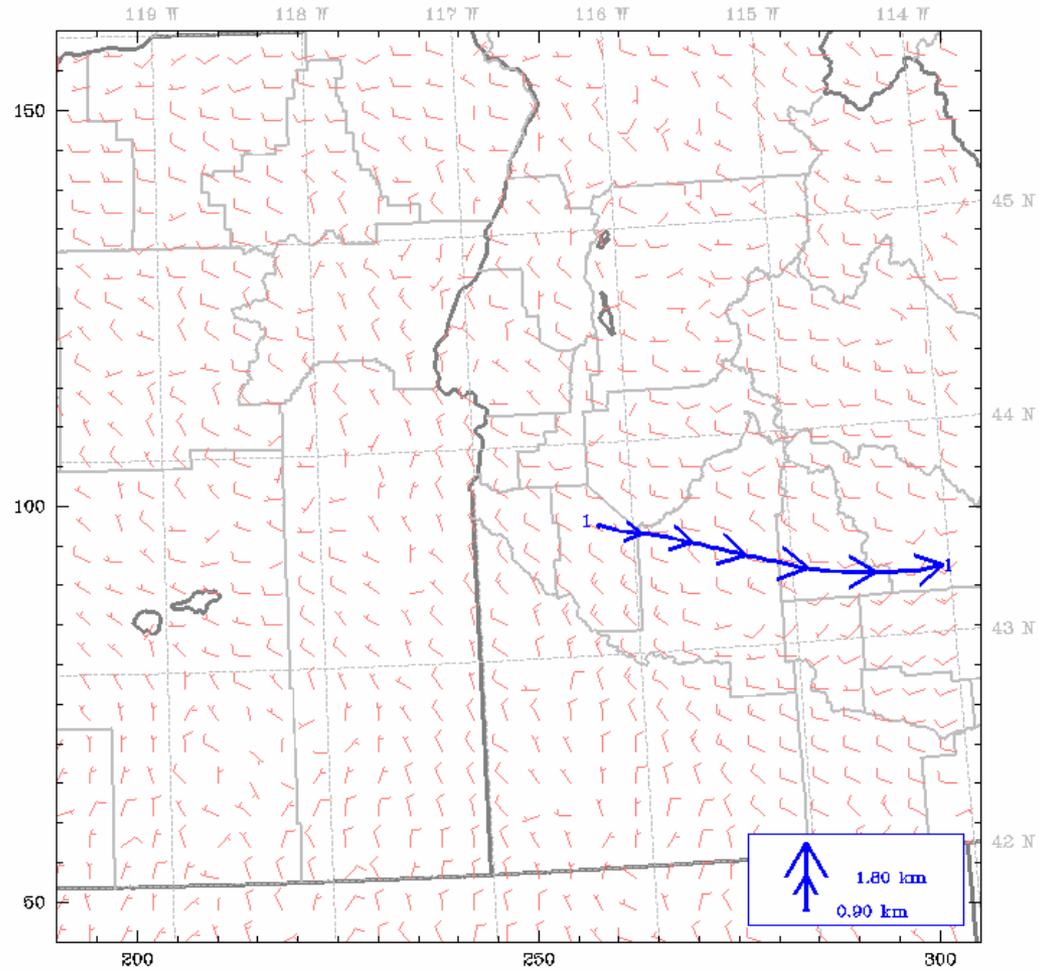|																											
to North Bend at 50 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
to Mud Mtn/Enumclaw at 50 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
to SeaTac at 20 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
to Swinomish Reservation at 50 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
to Wenatchee at 50 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
to Yakima at 50 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
to Toppenish WA at 50 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
to Walla Walla at 200 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
to Pullman WA at 100 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
to Boise ID at 50 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
to Pocatello ID at 50 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
to Nezperce ID at 50 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
to Pinehurst ID at 50 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
to Salmon ID at 50 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
to Portland OR at 50 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
to Klamath Falls OR at 50 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
to Bend OR at 50 m	LOOP	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84

Soundings

UW WRF-GFS downtown Boise ID - 4km Traj   Init: 12 UTC Wed 05 Jun 13
Fcst: 54 h   Valid: 18 UTC Fri 07 Jun 13 (11 PDT Fri 07 Jun 13)
Release Time Wind(kts) and Trajectory starting at 50m
Trajectories from hour 54.000 to 60.000

Model Info: V3.4.1   SAS Sch YSU PBL Thompson   Ther-Diff 4.0 km, 37 levels,   24 sec
LW: RRTM SW: Dudhia DIFF: simple KM: 2D Smagor

Recommendation

- If we can't find a fix for the snow problem (which is rapidly going away), probably should return to the RUC LSM with the RRTMG radiation scheme.

- Will work with NCAR over the summer on the snow problem

Financial Situation

Clifford F. Mass – P.I. University of Washington		Amount
JULY 1, 2013 to JUNE 30, 2014		
Salaries		**Amount**
Clifford Mass	P.I. for 1.5 month summer @ 100%	
David Ovens	Research Meteorologist, 12 months @ 100%	
Richard Steed	Research Meteorologist, 12 months @ 25%	
Jeffrey Baars	Research Meteorologist, 12 months @ 45%	
Mark Albright	Research Meteorologist, 12 months @ 25%	
Neal Johnson	Research Scientist, 12 months @ 10%	
Total Salaries		**184,627**
Benefits	Faculty/Res. Assoc 25.3%, Prof. Staff 31.4%, Hourly 15.3%	53,326
Services	Computing Services - machine/user upkeep *82.5 mach, 33 user/process accounts each month*	32,100
Supplies		8,000
Equipment		20,000
Total Direct Costs		**298,053**
Indirect Costs	54.5% of Direct Costs Excl. Equipment Idaho - 30% Indirect Costs FS - 10% Indirect Costs	93,864
Total		**391,917**

Funding

Budget	Agency	Amount		Starts	Expires	
63-5671	Idaho DEQ	190,000	30% IC	continuing	6/30/14	
	PSCAA	*via Idaho*				
pending	Seattle City Light (maintenance onl	40,000		1/1/13	12/31/13	
62-2873	Forest Service	25,000	10% limited	9/1/13	8/31/14	
63-6745	Seattle Public Utilities	25,000		continuing	12/31/13	
pending	King 5	20,000		7/1/13	6/30/14	
pending	NANOOS data	10,000		6/1/13	5/31/14	
	WA DOT	0				was $88,500
	Total	**310,000**				