



Briefing to NPMC

Marine Forecast Performance October 2010 to March 2011

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Overview of Briefing

Performance of forecaster and gridded guidance

Focus: Skill in Forecasting High Wind Speeds and Gusts

Data Shown (all verification done at data points)

- Days 1-2 Wind Gust Grids
- Days 1-7 Sustained Wind Speed Grids
- Day 1 Wind Speed Point Forecasts w/ Point MOS

Conclusions

- Forecasters easily improve upon gridded MOS
- Forecasters vs. point MOS: about equal performance



Alaska Region Coastal Waters Wind Gust Forecasts

October 2010 to March 2011
(Cool Season)

A lot of data were missing for this cool season, but the signals noted in this year's data (October, November, and half of January) were still similar to the signals noted during the entire cool seasons of 2008-09 and 2009-10.



Alaska Region Coastal Waters Wind Gust Forecasts

Cool Season 2010-11 Day 1 (thru 24 hr)

Gridded NDFD

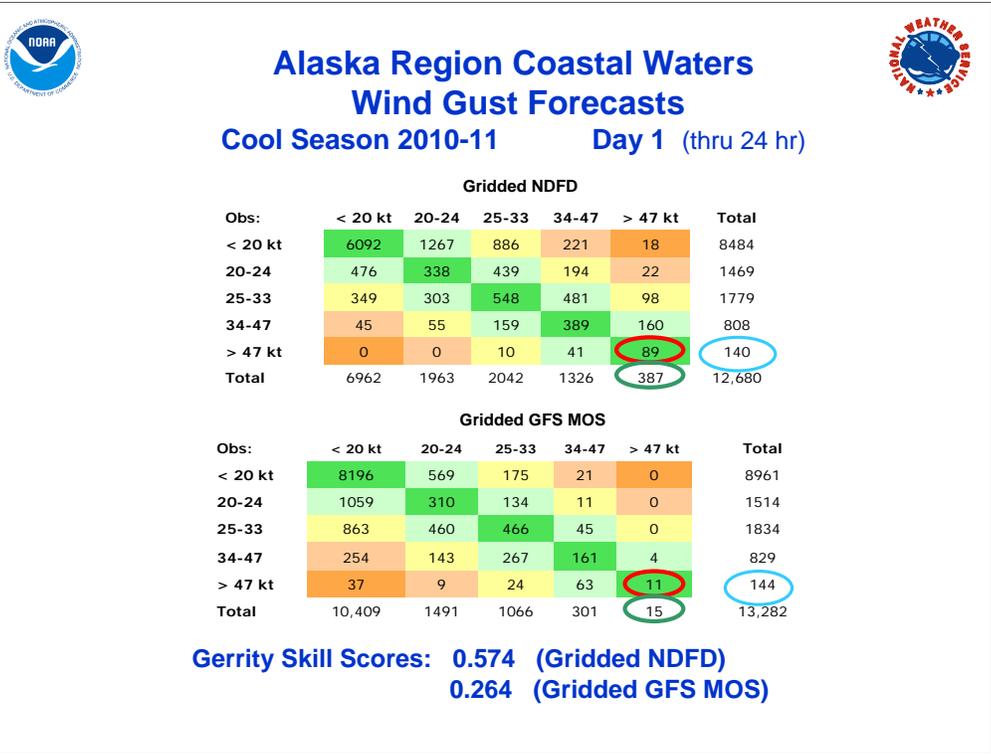
Obs:	< 20 kt	20-24	25-33	34-47	> 47 kt	Total
< 20 kt	6092	1267	886	221	18	8484
20-24	476	338	439	194	22	1469
25-33	349	303	548	481	98	1779
34-47	45	55	159	389	160	808
> 47 kt	0	0	10	41	89	140
Total	6962	1963	2042	1326	387	12,680

Gridded GFS MOS

Obs:	< 20 kt	20-24	25-33	34-47	> 47 kt	Total
< 20 kt	8196	569	175	21	0	8961
20-24	1059	310	134	11	0	1514
25-33	863	460	466	45	0	1834
34-47	254	143	267	161	4	829
> 47 kt	37	9	24	63	11	144
Total	10,409	1491	1066	301	15	13,282

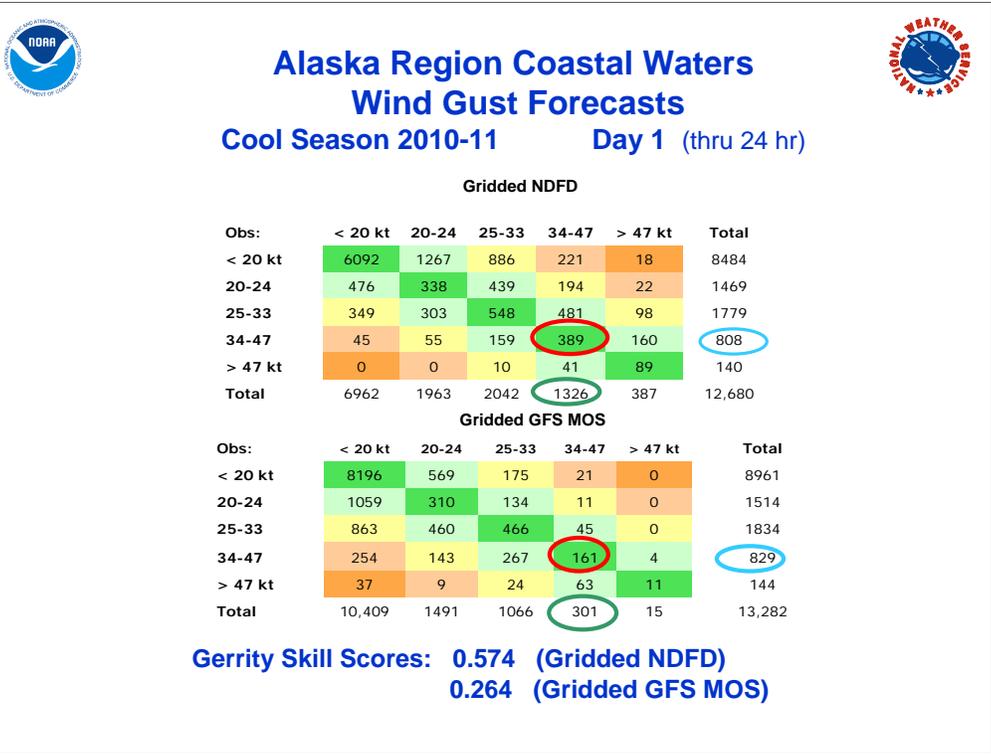
**Gerrity Skill Scores: 0.574 (Gridded NDFD)
 0.264 (Gridded GFS MOS)**

These are contingency tables of Day 1 forecast wind gusts (columns) vs. verifying observations for cool season 2010-11 in Alaska Region. The upper table provides forecast data from the NDFD (NWS gridded forecasts), and the lower table provides forecast data from the gridded GFS MOS. Counts of the categorically correct forecasts can be found along the upper left to lower right diagonal, and the boxes are shaded green. Largest forecast errors are shaded orange. The Gerrity skill score points out the superior performance of the NDFD (0.574) vs. GFS MOS (0.264). This superiority does not hold in the low-end categories, but it is very true in the upper-end categories, during which times lives and property can be at jeopardy due to gale- and storm-force winds. The Gerrity score was developed to reward forecasters for taking the risk to predict rare events, when such risks are scientifically appropriate to take.



This slide gives the same data as the last slide: Day 1 NDFD and gridded GFS MOS forecasts for wind gusts during cool season 2010-11 in Alaska Region. In this slide, we emphasized the high-end forecast hits. The gridded GFS MOS (lower table) had a strong bias of under-forecasting storm-force wind gusts (15 cases forecast vs. 144 cases observed, bias = $15/144 = 0.10$), whereas the NDFD (upper table) tended to over-forecast storm-force wind gusts (387 forecast cases vs. 140 observed cases, bias = $387/140 = 2.76$). The column and row totals used to calculate these biases are respectively circled in green and blue.

The values used to calculate the POD (hit rate) for storm-force winds are circled in red and blue: 89 cases out of 140 cases of storm-force wind gusts were correctly forecasted by the NDFD (64% hit rate), whereas only 11 cases out of 144 cases of storm-force wind gusts were correctly forecasted by gridded GFS MOS (8% hit rate). In terms of the guidance, not much was ventured and not much was gained. Forecasters seized upon the opportunities and added value when it most mattered.



This is the same data as the last two slides: Day 1 NDFD and gridded GFS MOS forecasts for wind gusts during cool season 2010-11 in Alaska Region. In this slide, we emphasized the high-end forecast hits. The gridded GFS MOS (lower table) had a strong bias of under-forecasting gale-force wind gusts (301 cases forecast vs. 829 cases observed, bias = $301/829 = 0.36$), whereas the NDFD (upper table) tended to over-forecast gale-force wind gusts (1326 forecast cases vs. 808 observed cases, bias = $1326/808 = 1.64$). The column and row totals used to calculate these biases are respectively circled in green and blue.

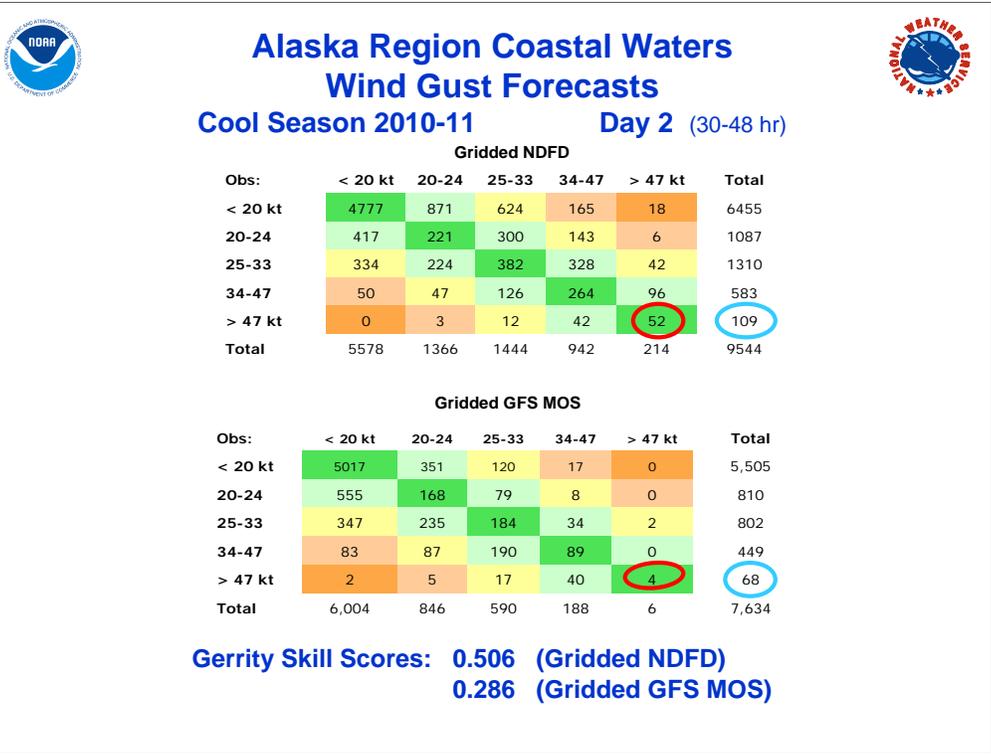
The values used to calculate the POD (hit rate) for gale-force winds are circled in red and blue: 389 out of 808 cases of gale-force wind gusts were correctly forecasted by the NDFD (48% hit rate), whereas only 161 out of 829 cases of gale-force wind gusts were correctly forecasted by gridded GFS MOS (19% hit rate). In terms of the guidance, not much was ventured and not much was gained. Forecasters seized upon the opportunities and added value when it most mattered.



Alaska Region Coastal Waters Wind Gust Forecast Scoring Matrix Cool Season 2010-11 Day 1 (thru 24 hr)

Obs:	Gridded NDFD					Total
	< 20 kt	20-24	25-33	34-47	> 47 kt	
< 20 kt	0.215	-0.159	-0.477	-0.747	-1	8484
20-24	-0.159	0.597	0.278	0.008	-0.245	1469
25-33	-0.477	0.278	1.441	1.171	0.918	1779
34-47	-0.747	0.008	1.171	4.515	4.262	808
> 47 kt	-1	-0.245	0.918	4.262	26.91	140

This is the Gerrity scoring matrix for the aforementioned dataset. Each element of the table contains the weight given to each forecast/observation pair tallied in the contingency table. Note how much more weight is given to correct forecasts (shaded green) of rare events (storm-force winds, greater than 47 knots) than to common events (less than 20 knots).



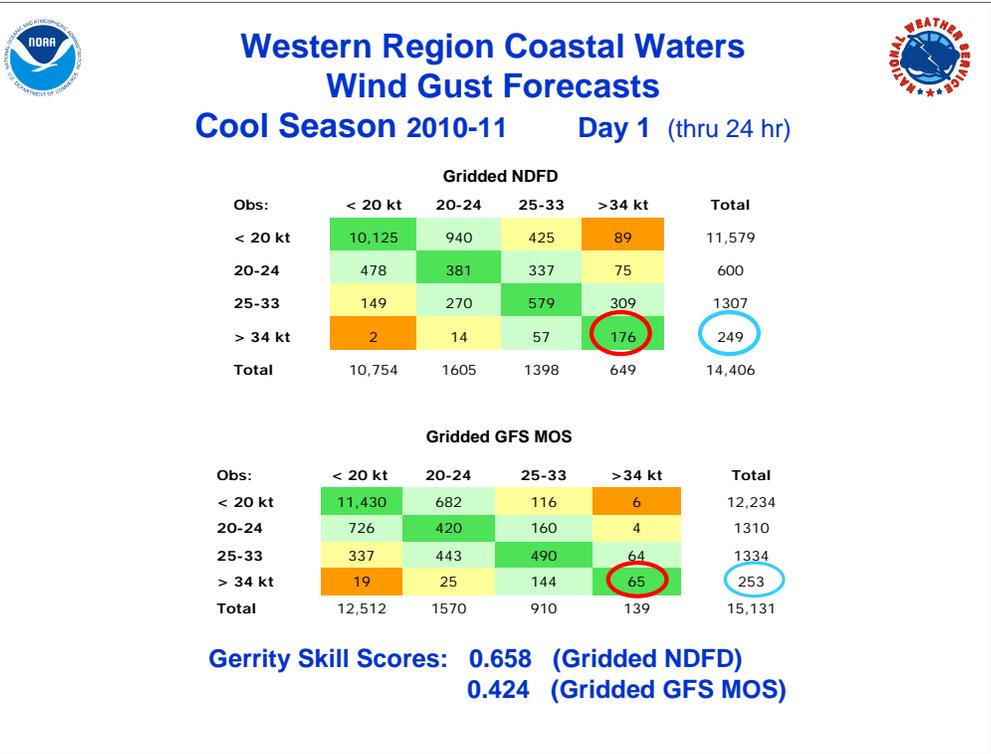
Same as slide 6, except for Day 2 (projection hours: 30-48). The same strong biases and skill signals for Day 1 were true for Day 2.



Western Region Coastal Waters Wind Gust Forecasts

Cool Season 2010-11

A lot of data were missing for this cool season, but the signals noted in this year's data (October, November, and half of January) were still similar to the signals noted during the entire cool seasons of 2008-09 and 2009-10.



These are contingency tables of Day 1 forecast wind gusts (columns) vs. verifying observations for cool season 2010-11 in Western Region coastal waters. The upper table provides forecast data from the NDFD (NWS gridded forecasts), and the lower table provides forecast data from the gridded GFS MOS. Counts of the categorically correct forecasts can be found along the upper left to lower right diagonal, and the boxes are shaded green. Largest forecast errors are shaded orange. The Gerry skill score points out the superior performance of the NDFD (0.658) vs. gridded GFS MOS (0.424). This superiority does not hold in the low-end categories, but it is very true in the upper-end categories, during which times lives and property can be at jeopardy due to gale-force winds. The Gerry score was developed to reward forecasters for taking the risk to predict rare events, when such risks are scientifically appropriate.



Western Region Coastal Waters Wind Gust Forecasts Cool Season 2010-11 Day 2 (30-48 hr)

Gridded NDFD

Obs:	< 20 kt	20-24	25-33	> 34 kt	Total
< 20 kt	7771	745	265	48	8769
20-24	425	263	201	42	931
25-33	200	206	396	186	988
> 34 kt	11	16	60	103	190
Total	8347	1230	922	379	10,878

Gridded GFS MOS

Obs:	< 20 kt	20-24	25-33	> 34 kt	Total
< 20 kt	8368	633	140	8	9149
20-24	512	305	124	12	953
25-33	272	318	362	56	1008
> 34 kt	17	13	114	43	187
Total	9169	1269	740	110	11,297

Gerry Skill Scores: 0.557 (Gridded NDFD)
0.406 (Gridded GFS MOS)

Same as slide 10, except for Day 2.



Alaska and Western Regions Coastal Waters Sustained Wind Speed Forecasts Cool Season 2010-11

A lot of data were missing for this cool season, but the signals noted in this year's data (October, November, and half of January) were still similar to the signals noted during the entire cool seasons of 2008-09 and 2009-10.

The following slides contain Alaska and Western Region sustained wind speed data. Earlier slides provided wind gust data.



Alaska and Western Region Coastal Waters Gridded Sustained Wind Speed Forecasts Cool Season 2010-11 Day 1 (thru 24 hr)



Gridded NDFD

OBS\FST	< 8 KNOTS	8-12 KNOTS	13-17 KNOTS	18-22 KNOTS	23-27 KNOTS	28-33 KNOTS	> 33 KNOTS	Subtotal
< 8 KNOTS	8,808	6,102	2,856	934	209	84	27	20,105
8-12 KNOTS	2,795	4,272	3,113	1,210	418	181	88	12,170
13-17 KNOTS	685	1,939	2,983	1,693	663	252	114	8,229
18-22 KNOTS	185	546	1,508	1,736	983	383	188	5,529
23-27 KNOTS	98	183	416	887	946	608	276	3,348
28-33 KNOTS	4	13	95	195	331	423	414	1,501
> 33 KNOTS	0	0	14	44	63	115	158	596
Subtotal	19,515	13,179	10,890	6,699	3,678	2,031	1,486	51,478

Gridded GFS MOS

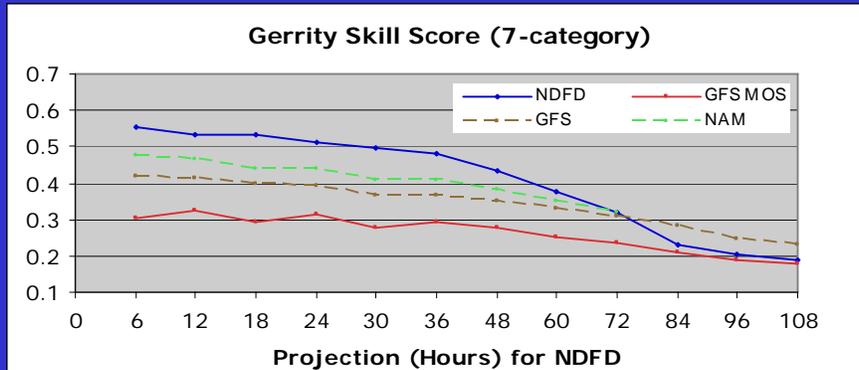
OBS\FST	< 8 KNOTS	8-12 KNOTS	13-17 KNOTS	18-22 KNOTS	23-27 KNOTS	28-33 KNOTS	> 33 KNOTS	Subtotal
< 8 KNOTS	13,043	6,889	965	156	24	10	8	21,087
8-12 KNOTS	4,297	6,106	1,813	255	31	13	4	12,515
13-17 KNOTS	1,359	3,759	2,535	603	99	16	8	8,371
18-22 KNOTS	473	1,700	2,124	1,822	239	21	1	5,580
23-27 KNOTS	133	601	1,043	978	937	111	6	3,289
28-33 KNOTS	16	213	302	362	391	571	14	1,499
> 33 KNOTS	0	16	32	83	131	153	175	599
Subtotal	19,344	19,336	8,874	3,459	1,432	493	102	53,040

**Gerrity Skill Scores: 0.533 (Gridded NDFD)
0.309 (Gridded GFS MOS)**

These are contingency tables of Day 1 forecast sustained wind speed (columns) vs. verifying observations for cool season 2010-11 in Alaska and Western Regions. The upper table provides forecast data from the NDFD (NWS gridded forecasts), and the lower table provides forecast data from the gridded GFS MOS. Counts of the categorically correct forecasts can be found along the upper left to lower right diagonal, and they are shaded green. The largest forecast errors are shaded red. The Gerrity skill score points out the superior performance of the NDFD (0.533) vs. GFS MOS (0.309). This superiority does not hold in the low-end categories, but it is very true in the high-end categories, during which times lives and property can be at jeopardy due to strong winds. The Gerrity score was developed to reward forecasters for taking the risk of predicting rare events, when such risks are scientifically appropriate.



Alaska and Western Region Coastal Waters Gridded Sustained Wind Speed Forecasts Cool Season 2010-11



Gerrity skill scores for gridded sustained wind speed forecasts, as a function of projection time, Alaska and Western Regions, cool season 2010-11. NDFD results are plotted, along with three guidance products.



Alaska and Western Region Coastal Waters Sustained Wind Speed Forecasts - Marine Data Points (buoys) Cool Season 2010-11 Day 1



Point Forecasts

OBS\FST	< 8	8 - 12	13 - 17	18 - 22	23 - 27	28 - 32	> 32	TOTAL
< 8	1,333	1,518	549	138	25	8	0	3,571
8 - 12	675	1,773	1,145	402	154	55	32	4,236
13 - 17	207	761	1,251	785	194	78	91	3,367
18 - 22	83	266	597	888	537	165	79	2,615
23 - 27	19	100	177	321	376	234	170	1,397
28 - 32	6	33	44	78	137	157	177	632
> 32	1	15	8	51	37	71	171	354
TOTAL	2,324	4,466	3,771	2,663	1,460	768	720	16,172

Point GFS MOS

OBS\FST	< 8	8 - 12	13 - 17	18 - 22	23 - 27	28 - 32	> 32	TOTAL
< 8	1,558	1,655	318	37	3	0	0	3,571
8 - 12	693	2,311	1,028	176	25	3	0	4,236
13 - 17	111	1,206	1,445	511	80	8	6	3,367
18 - 22	40	384	993	824	294	58	22	2,615
23 - 27	4	92	325	435	362	134	45	1,397
28 - 32	0	25	69	146	198	110	84	632
> 32	0	3	25	49	79	73	126	354
TOTAL	2,406	5,675	4,203	2,178	1,041	386	283	16,172

**Gerry Skill Scores: 0.477 (Point Forecasts)
0.445 (Point GFS MOS)**

Similar to slide 13, these contingency tables contain Day 1 forecasted sustained wind speeds vs. verifying observations for cool season 2010-11 in Alaska and Western Regions. Different from slide 13, these tables contain point forecast data. While the point forecasts in the top contingency table came from the NDFD, the lower contingency table contains point GFS MOS data, which were developed solely for individual points (buoys and other marine observation stations). The point GFS MOS data did not come from any gridded products. Note how much better the point GFS MOS forecasts (this slide) did than the gridded GFS MOS forecasts (slide 13). This is probably due to the fact that it is difficult to build a grid of GFS MOS forecasts in data sparse areas, such as marine forecast zones. The point GFS MOS guidance forecasts appear to be superior to gridded GFS MOS, but NWS forecasters are responsible for large marine forecast zones, not just single points. Therefore, today's MOS products need to be presented on a grid.

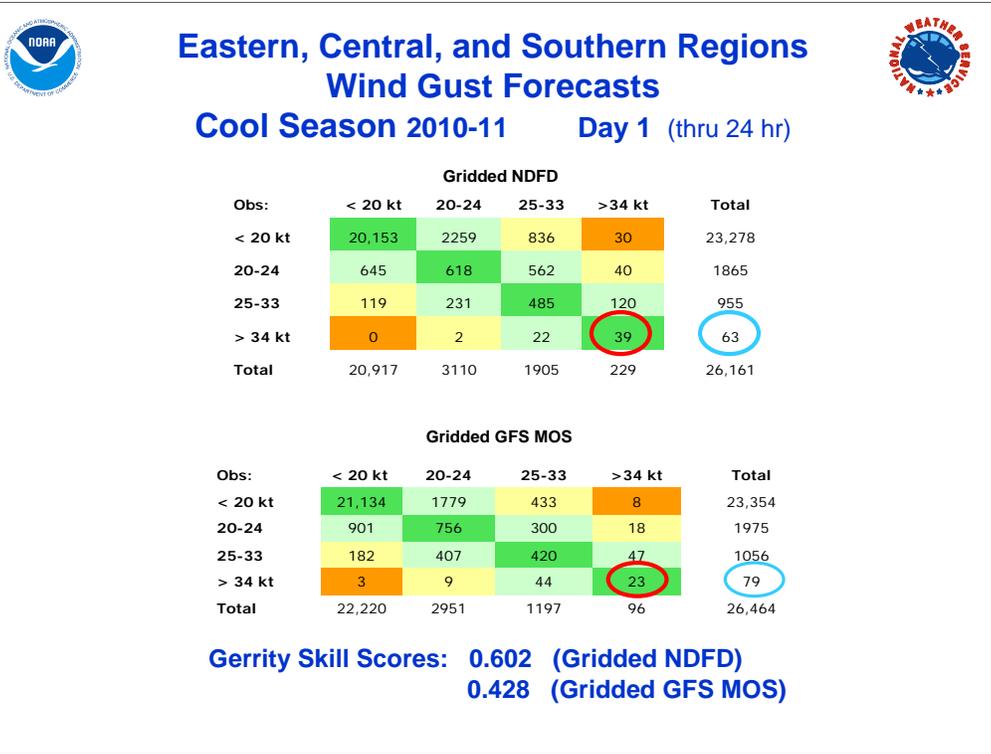


Eastern, Central, and Southern Regions Coastal and Great Lakes Waters

Wind Gusts

Cool Season 2010-11

A lot of data were missing for this cool season, but the signals noted in this year's data (October, November, and half of January) were still similar to the signals noted during the entire cool seasons of 2008-09 and 2009-10.



These are contingency tables of Day 1 forecast wind gusts (columns) vs. verifying observations for cool season 2010-11 in Eastern, Central and Southern Regions coastal and Great Lakes waters. The upper table provides forecast data from the NDFD (NWS gridded forecasts), and the lower table provides forecast data from the gridded GFS MOS. Counts of the categorically correct forecasts can be found along the upper left to lower right diagonal, and the boxes are shaded green. Largest forecast errors are shaded orange. The Gerrity skill score points out the superior performance of the NDFD (0.602) vs. gridded GFS MOS (0.428). This superiority does not hold in the low-end categories, but it is very true in the upper-end categories, during which times lives and property can be at jeopardy due to gale-force winds. The Gerrity score was developed to reward forecasters for taking the risk to predict rare events, when such risks are scientifically appropriate.

The NDFD was correct on 39 out of 63 gale-force and greater cases (hit rate = 62%), whereas the gridded GFS MOS was correct on 23 out of 79 gale-force and greater cases (hit rate = 29%).



Eastern, Central, and Southern Regions Wind Gust Forecasts



Cool Season 2010-11 Day 2 (30-48 hr)

Gridded NDFD

Obs:	< 20 kt	20-24	25-33	>34 kt	Total
< 20 kt	15,589	1920	637	15	18,161
20-24	597	490	452	17	1556
25-33	140	230	401	74	845
> 34 kt	4	6	27	32	68
Total	16,329	2646	1517	138	20,630

Gridded GFS MOS

Obs:	< 20 kt	20-24	25-33	>34 kt	Total
< 20 kt	15,531	1666	388	11	17,596
20-24	702	606	249	11	1568
25-33	161	329	357	38	885
> 34 kt	2	11	44	26	83
Total	16,396	2612	1038	86	20,132

Gerry Skill Scores: 0.517 (Gridded NDFD)
0.433 (Gridded GFS MOS)

Same as slide 17, except for Day 2. The NDFD hit rate for gale-force and greater cases $(32/68) = 47\%$; the gridded GFS MOS hit rate for gale-force and greater cases $= (26/83) = 31\%$

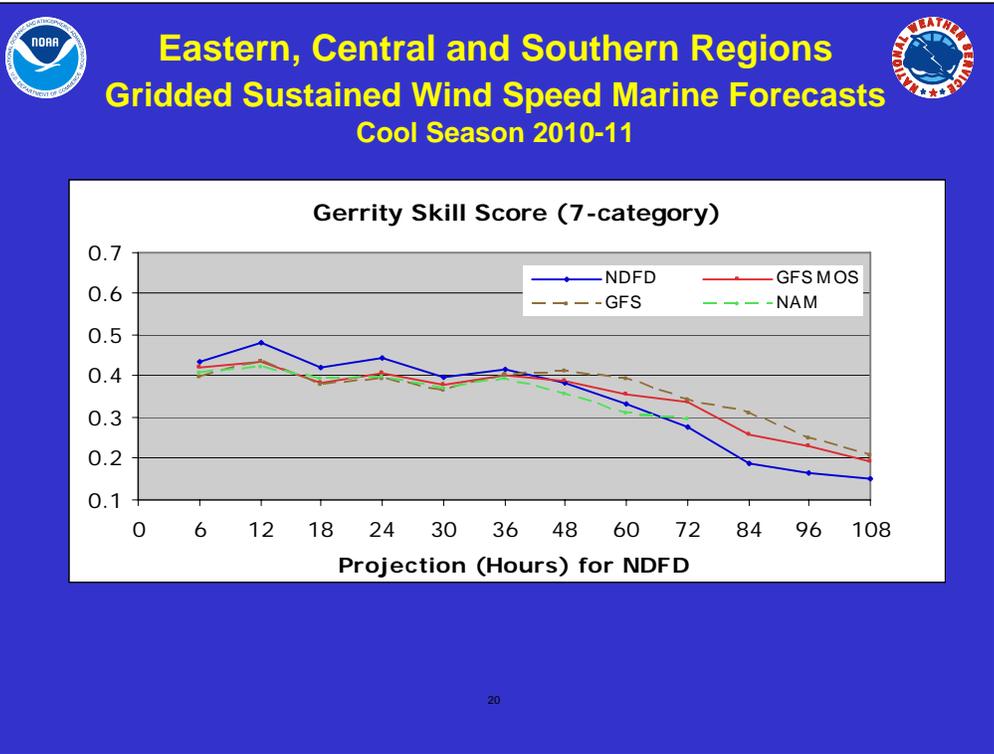


Eastern, Central, and Southern Regions Coastal Waters and Great Lakes

Sustained Wind Speed

Cool Season 2010-11

A lot of data were missing for this cool season, but the signals noted in this year's data (October, November, and half of January) were still similar to the signals noted during the entire cool seasons of 2008-09 and 2009-10.



Gerrity skill scores for gridded sustained wind speed forecasts, as a function of projection time, Alaska and Western Regions, cool season 2010-11. NDFD results are plotted, along with three guidance products.



Eastern, Central, and Southern Regions Sustained Wind Speed Forecasts for Buoy and C-MAN Points Cool Season 2010-11 Day 1



Point Forecasts

obs\FST	< 8	8 - 12	13 - 17	18 - 22	23 - 27	28 - 32	> 32	TOTAL
< 8	2,037	1,688	208	21	1	0	0	3,955
8 - 12	878	3,739	1,844	180	14	1	1	6,657
13 - 17	86	1,396	3,064	936	58	7	0	5,547
18 - 22	17	185	1,071	1,524	277	14	2	3,090
23 - 27	4	10	121	537	465	113	7	1,257
28 - 32	3	1	9	91	169	89	17	379
> 32	0	0	2	8	45	44	40	141
TOTAL	3,025	7,019	6,319	3,297	1,029	268	69	21,026

Point GFS MOS

obs\FST	< 8	8 - 12	13 - 17	18 - 22	23 - 27	28 - 32	> 32	TOTAL
< 8	2,257	1,531	150	15	1	1	0	3,955
8 - 12	1,012	4,058	1,445	130	11	1	0	6,657
13 - 17	97	1,692	2,020	866	76	6	0	5,547
18 - 22	9	202	1,209	1,277	357	35	1	3,090
23 - 27	2	17	127	409	444	164	14	1,257
28 - 32	3	1	11	60	159	192	23	379
> 32	0	0	2	6	35	48	40	141
TOTAL	3,380	7,491	5,764	2,843	1,083	377	88	21,026

Gerrity Skill Scores: 0.485 (Point Forecasts)
0.522 (Point GFS MOS)

Same as slide 15, except for Eastern, Central, and Southern Regions coastal and Great Lakes forecast waters.