



Validation of SAFNWC/MSG PGE09 High Resolution Winds

17th October 2005 Product Assessment Review Workshop, Madrid

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- Validation based on the Comparison of PGE09 Outputs with Radiosounding Winds obtained from the GTS.
 - > Comparison with the nearest Radiosounding.
 - > Only cases where: distance < 150 km.

pressure difference < 25 hPa.

Validation Procedure proofs:

Distances and pressure differences below these values are not affecting validation.

 1200Z Radiosoundings compared to 1145Z PGE09 Slots (closest to the nominal time of Radiosounding launch).



 Validation run on a region centred on Iberian Peninsula during the period Jan – Sep 2005.





- Objectives:
 - To calculate the Statistical Indicators established for Satellite Wind Verification, at Ascona 1996 Wind Workshop

Generally followed by all Satellite Wind Centres; Comparison of results possible

- To define the influence of Parameters associated to Wind Calculation on Validation Results:
 - Quality Index.
 - Quality Tests.
 - Speed Modulus.
 - **Solar Elevation.**
 - Geographical effects.



Comparisons computed monthly for Basic & Detailed winds, for three layers:

HIGH (< 400 hPa) MID (400 – 700 hPa) LOW (> 700 hPa)

- Statistical Parameters considered at Ascona meeting:
 - NC: Number of collocations
 - **SPD**: Mean wind speed
 - BIAS
 - MVD: Mean vector difference
 - RMSVD: Root mean square vector difference
- Besides:
 - Normalized parameters: BIAS/SPD, MVD/SPD, RMSVD/SPD. (Independent of wind magnitude; more easily comparable considering different samples).
 - Correlation between HRW speed and Radiosounding Speed.



General distribution of Wind speeds

Scatter plots show an adequate data distribution (Population maximums generally near the diagonal).

Correlation:

~ 0.70 High layers ~ 0.60 Mid & Low layers

Remarks:

- Population maximums at left of diagonal
 Effect of negative BIAS
- Part of population concentrated on vertical axis at mid & low levels

Blocked tracers

• Some too fast winds at mid & low levels

Thin cirrus, whose motion is detected and erroneusly assigned to lower levels





Influence of Quality Index

- MVD, RMSVD & Correlation reduce significantly when QI Threshold becomes higher.
- BIAS reduces only when QI Threshold is over 80.
- Differences Bas-Det are small (<10%), but MVD & RMSVD tend to be smaller for Basic Winds.

RMSVD









Influence of Quality Index

Criterion to define a QI Threshold:

Which proportion of Wind Population is kept?

Comparing with QI Thr. = 60:

- QI Thr. = 90 keeps 1 out of 20 winds. - QI Thr. = 80 keeps 1 out of 3 winds.
- QI Thr. = 75 keeps 1 out of 2 winds.

Using both Basic and Detailed sets of winds:

- Reduction of population due to a higher QI Threshold compensated by winds contributed by Detailed set.





Validation results with various QI Thresholds

 $QI \ge 60$

Considering Statistics for $QI \ge 80$:

- RMSVD values range:
 5-8 m/s at Low levels;
 8-11 m/s at Mid & High levels.
- MVD values range:
 4-7 m/s at Low levels;
 6-9 m/s at Mid & High levels.
- BIAS values range:
 - -1 to -3 m/s at Low levels;
 - -3 to -7 m/s at Mid levels;
 - -2 to -5 m/s at High levels.

Comparing with Statistics for $QI \ge 60$ (Nominal QI threshold):

- RMSVD & MVD reduces up to 20%.
- BIAS reduces up to 20% at high levels

(No positive effect at mid & low levels).

	BASIC WINDS	JAN 05	FEB 05	MAR 05	APR 05	MAY05	JUN 05	JUL 05	AUG 05	SEP 05
HIGH LEVELS	NC	10	312	973	534	648	680	417	878	1016
	SPD		25,90	20,27	21,08	24,79	22,72	25,56	23,73	21,60
	MVD		9,72	7,99	8,47	9,80	8,95	8,66	8,53	9,49
	RMSVD		12,26	10,58	10,59	12,21	10,77	10,49	10,74	11,85
	RMSVD/SPD		0,47	0,52	0,50	0,49	0,47	0,41	0,45	0,55
	BIAS		-3,59	-3,05	-4,13	-5,59	-3,49	-3,76	-3,26	-3,33
EVELS	NC	992	3250	4104	2657	1966	2247	2009	1965	2429
	SPD	17,71	15,97	13,90	14,65	16,76	14,27	14,59	13,83	12,96
	MVD	11,18	9,42	7,68	7,64	7,69	7,38	7,34	7,24	7,44
ī	RMSVD	12,93	11,25	9,38	9,51	9,39	9,06	8,92	8,90	9,17
M	RMSVD/SPD	0,73	0,70	0,67	0,65	0,56	0,63	0,61	0,64	0,71
	BIAS	-7,55	-5,56	-4,01	-4,35	-3,94	-3,06	-3,24	-3,56	-2,77
	NC	1601	4461	3451	2313	2186	2111	2278	2240	2553
ELS	SPD	11,00	9,48	8,22	8,60	8,68	7,96	8,65	7,72	7,37
LEV	MVD	7,23	5,79	5,43	4,61	4,91	5,45	5,52	4,79	4,89
MO	RMSVD	8,80	7,28	6,71	5,83	6,31	6,72	6,89	6,10	6,31
П	RMSVD/SPD	0,80	0,77	0,82	0,68	0,73	0,84	0,80	0,79	0,86
	BIAS	-3,30	-2,68	-2,28	-1,17	-1,39	-1,93	-2,09	-1,77	-1,28
	BASIC WINDS	JAN 05	FEB 05	MAR 05	APR 05	MAY05	JUN 05	JUL 05	AUG 05	SEP 05
	BASIC WINDS	JAN 05	1998 05 114	MAR 05 349	APR 05	MAY05 235	JUN 05 184	JUL 05 142	AUG 05 305	SEP 05 295
STE	BASIC WINDS NC SPD	JAN 05 5	1910H 05 114 29,45	MAR 05 349 19,98	APR 05 176 22,18	235 26,38	JUN 05 184 22,64	JUL05 142 25,06	AUG 05 305 25,16	295 22,93
EVELS	BASIC WINDS NC SPD MVD	JAN 05	114 29,45 8,61	MAR 05 349 19,98 6,71	APR 05 176 22,18 7,41	235 26,38 8,65	10N 05 184 22,64 8,64	142 25,06 7,79	AUG 05 305 25,16 7,65	295 22,93 8,76
GH LEVELS	BASIC WINDS NC SPD MVD RMSVD	JAN 05	114 29,45 8,61 10,58	MAR 05 349 19,98 6,71 9,12	APR 05 176 22,18 7,41 9,36	MAY05 235 26,38 8,65 10,78	10N 05 184 22,64 8,64 10,47	142 25,06 7,79 9,21	AUG 05 305 25,16 7,65 9,38	295 22,93 8,76 11,05
HIGH LEVELS	HASIC WINDS NC SPD MVD RMSVD RMSVD/SPD	JAN 05	114 29,45 8,61 10,58 0,36	MAR 05 349 19,98 6,71 9,12 0,46	APR 05 176 22,18 7,41 9,36 0,42	235 26,38 8,65 10,78 0,41	JUN 05 184 22,64 8,64 10,47 0,46	142 25,06 7,79 9,21 0,37	AUG 05 305 25,16 7,65 9,38 0,37	295 22,93 8,76 11,05 0,48
HIGH LEVELS	HASICWINDS NC SPD MVD RMSVD RMSVD/SPD BIAS	JAN 05	114 29,45 8,61 10,58 0,36 -2,84	MAR 05 349 19,98 6,71 9,12 0,46 -2,73	APR 05 176 22,18 7,41 9,36 0,42 -4,03	MAY05 235 26,38 8,65 10,78 0,41 -5,31	JUN 05 184 22,64 8,64 10,47 0,46 -3,17	142 25,06 7,79 9,21 0,37 -2,90	AUG 05 305 25,16 7,65 9,38 0,37 -3,16	295 22,93 8,76 11,05 0,48 -3,20
HIGH LEVELS	HASICWINDS NC SPD MVD RMSVD RMSVD/SPD BIAS NC	320	114 29,45 8,61 10,58 0,36 -2,84 1101	MAR 05 349 19,98 6,71 9,12 0,46 -2,73 1466	APR 05 176 22,18 7,41 9,36 0,42 -4,03 959	MAY05 235 26,38 8,65 10,78 0,41 -5,31 753	JUN 05 184 22,64 8,64 10,47 0,46 -3,17 868	142 25,06 7,79 9,21 0,37 -2,90 766	AUG 05 305 25,16 7,65 9,38 0,37 -3,16 698	295 22,93 8,76 11,05 0,48 -3,20 802
HIGH LEVELS	HASICWINDS NC SPD MVD RMSVD RMSVD/SPD BIAS NC SPD	320 18,06	114 29,45 8,61 10,58 0,36 -2,84 1101 17,50	MAR 05 349 19,98 6,71 9,12 0,46 -2,73 1466 14,11	APR 05 176 22,18 7,41 9,36 0,42 -4,03 959 15,31	MAY05 235 26,38 8,65 10,78 0,41 -5,31 753 17,23	10N 05 184 22,64 8,64 10,47 0,46 -3,17 868 15,02	142 25,06 7,79 9,21 0,37 -2,90 766 14,81	AUG 05 305 25,16 7,65 9,38 0,37 -3,16 698 15,67	SEP 05 22,93 8,76 11,05 0,48 -3,20 802 13,36
STEVELS HIGH LEVELS	HASICWINDS NC SPD MVD RMSVD RMSVD/SPD BIAS NC SPD MVD	320 18,06 10,80	114 29,45 8,61 10,58 0,36 -2,84 1101 17,50 9,29	MAR 05 349 19,98 6,71 9,12 0,46 -2,73 1466 14,11 6,90	APR 05 176 22,18 7,41 9,36 0,42 -4,03 959 15,31 6,98	MAY05 235 26,38 8,65 10,78 0,41 -5,31 753 17,23 6,80	10N 05 184 22,64 8,64 10,47 0,46 -3,17 868 15,02 6,65	142 25,06 7,79 9,21 0,37 -2,90 766 14,81 6,86	AUG 05 305 25,16 7,65 9,38 0,37 -3,16 698 15,67 7,06	SEP 05 22,93 8,76 11,05 0,48 -3,20 802 13,36 7,06
STEAT HOH STEAT CIP	HASICWINDS NC SPD MVD RMSVD RMSVD/SPD BIAS NC SPD MVD RMSVD/SPD RMSVD/SPD	320 320 18,06 10,80 12,51	114 29,45 8,61 10,58 0,36 -2,84 1101 17,50 9,29 11,06	MAR 05 349 19,98 6,71 9,12 0,46 -2,73 1466 14,11 6,90 8,54	APR OS 176 22,18 7,41 9,36 0,42 -4,03 959 15,31 6,98 8,62	MAY05 235 26,38 8,65 10,78 0,41 -5,31 753 17,23 6,80 8,08	1UN 05 184 22,64 8,64 10,47 0,46 -3,17 868 15,02 6,65 8,13	111L05 142 25,06 7,79 9,21 0,37 -2,90 766 14,81 6,86 8,25	AUG 05 305 25,16 7,65 9,38 0,37 -3,16 698 15,67 7,06 8,48	SEP 05 22,93 8,76 11,05 0,48 -3,20 802 13,36 7,06 8,42
STEVELS HIGH LEVELS	HASICWINDS NC SPD MVD RMSVD RMSVD/SPD BIAS NC SPD MVD RMSVD/SPD RMSVD/SPD	320 320 18,06 10,80 12,51 0,69	114 29,45 8,61 10,58 0,36 -2,84 1101 17,50 9,29 11,06 0,63	MAR 05 349 19,98 6,71 9,12 0,46 -2,73 1466 14,11 6,90 8,54 0,61	APR 05 176 22,18 7,41 9,36 0,42 -4,03 959 15,31 6,98 8,62 0,56	MAY05 235 26,38 8,65 10,78 0,41 -5,31 753 17,23 6,80 8,08 0,47	10N 05 184 22,64 8,64 10,47 0,46 -3,17 868 15,02 6,65 8,13 0,54	111L 05 142 25,06 7,79 9,21 0,37 -2,90 766 14,81 6,86 8,25 0,56	AUG 05 305 25,16 7,65 9,38 0,37 -3,16 698 15,67 7,06 8,48 0,54	SEP 05 295 22,93 8,76 11,05 0,48 -3,20 802 13,36 7,06 8,42 0,63
WID LEVELS HIGH LEVELS	HASICWINDS NC SPD MVD RMSVD/SPD BIAS NC SPD MVD RMSVD/SPD RMSVD RMSVD/SPD BIAS	320 320 18,06 10,80 12,51 0,69 -8,20	114 29,45 8,61 10,58 0,36 -2,84 1101 17,50 9,29 11,06 0,63 -6,35	MAR 05 349 19,98 6,71 9,12 0,46 -2,73 1466 14,11 6,90 8,54 0,61 -4,04	APR OS 1766 22,18 7,41 9,36 0,42 -4,03 959 15,31 6,98 8,62 0,56 -4,45	MAY05 235 26,38 8,65 10,78 0,41 -5,31 753 17,23 6,80 8,08 0,47 -3,78	10N 05 184 22,64 8,64 10,47 0,46 -3,17 868 15,02 6,65 8,13 0,54 -3,37	111L 05 142 25,06 7,79 9,21 0,37 -2,90 766 14,81 6,86 8,25 0,56 -3,57	AUG 05 305 25,16 7,65 9,38 0,37 -3,16 698 15,67 7,06 8,48 0,54 4,26	SEP 05 295 22,93 8,76 11,05 0,48 -3,20 802 13,36 7,06 8,42 0,63 -2,93
WID LEVELS HIGH LEVELS	HASICWINDS NC SPD MVD RMSVD/SPD BIAS NC SPD MVD RMSVD/SPD BIAS NC RMSVD/SPD BIAS NC RMSVD/SPD BIAS NC	320 320 18,06 10,80 12,51 0,69 -8,20 573	114 29,45 8,61 10,58 0,36 -2,84 1101 17,50 9,29 11,06 0,63 -6,35	MAR 05 349 19,98 6,71 9,12 0,46 -2,73 1466 14,11 6,90 8,54 0,61 -4,04 1154	APR 05 176 22,18 7,41 9,36 0,42 -4,03 959 15,31 6,98 8,62 0,56 -4,45 875	MAY05 235 26,38 8,65 10,78 0,41 -5,31 753 17,23 6,80 8,08 0,47 -3,78 855	10N 05 184 22,64 8,64 10,47 0,46 -3,17 868 15,02 6,65 8,13 0,54 -3,37 825	JULOS 142 25,06 7,79 9,21 0,37 -2,90 766 14,81 6,86 8,25 0,56 -3,57 927	AUG 05 305 25,16 7,65 9,38 0,37 -3,16 698 15,67 7,06 8,48 0,54 4,26 851	SEP 05 295 22,93 8,76 11,05 0,48 -3,20 802 13,36 7,06 8,42 0,63 -2,93 996
STEIAET HEIH STEIAET CIIW STEI	HASICWINDS NC SPD MVD RMSVD/SPD BIAS NC SPD MVD RMSVD/SPD BIAS NC SPD NC SPD NC SPD NC SPD NC SPD	320 320 18,06 10,80 12,51 0,69 -8,20 573 11,16	114 29,45 8,61 10,58 0,36 -2,84 1101 17,50 9,29 11,06 0,63 -6,35 1692 9,95	MAR 05 349 19,98 6,71 9,12 0,46 -2,73 1466 14,11 6,90 8,54 0,61 -4,04 1154 8,53	APR 05 176 22,18 7,41 9,36 0,42 -4,03 959 15,31 6,98 8,62 0,56 -4,45 875 9,15	MAY05 235 26,38 8,65 10,78 0,41 -5,31 753 17,23 6,80 8,08 0,47 -3,78 855 9,12	10N 05 184 22,64 8,64 10,47 0,46 -3,17 868 15,02 6,65 8,13 0,54 -3,37 825 8,98	JULOS 142 25,06 7,79 9,21 0,37 -2,90 766 14,81 6,86 8,25 0,56 -3,57 927 8,83	AUG 05 305 25,16 7,65 9,38 0,37 -3,16 698 15,67 7,06 8,48 0,54 4,26 8,51 7,80	SEP 05 295 22,93 8,76 11,05 0,48 -3,20 802 13,36 7,06 8,42 0,63 -2,93 996 7,93
STEAT HOIH STEAT CIIM STEAT	HASICWINDS NC SPD MVD RMSVD/SPD BIAS NC SPD MVD RMSVD/SPD BIAS NC SPD NC SPD NC SPD NC SPD MVD RMSVD/SPD BIAS NC SPD MVD	320 320 18,06 10,80 12,51 0,69 -8,20 573 11,16 6,74	114 29,45 8,61 10,58 0,36 -2,84 1101 17,50 9,29 11,06 0,63 -6,35 1692 9,95 5,22	MAR 05 349 19,98 6,71 9,12 0,46 -2,73 1466 14,11 6,90 8,54 0,61 -4,04 1154 8,53 4,69	APR 05 176 22,18 7,41 9,36 0,42 -4,03 959 15,31 6,98 8,62 0,56 -4,45 875 9,15 4,27	MAY05 235 26,38 8,65 10,78 0,41 -5,31 753 17,23 6,80 8,08 0,47 -3,78 855 9,12 4,38	10N 05 184 22,64 8,64 10,47 0,46 -3,17 868 15,02 6,65 8,13 0,54 -3,37 825 8,98 5,10	JULOS 142 25,06 7,79 9,21 0,37 -2,90 766 14,81 6,86 8,25 0,56 -3,57 927 8,83 4,82	AUG 05 305 25,16 7,65 9,38 0,37 -3,16 698 15,67 7,06 8,48 0,54 4,26 851 7,80 4,24	SEP 05 295 22,93 8,76 11,05 0,48 -3,20 802 13,36 7,06 8,42 0,63 -2,93 996 7,93 4,45
STEIAET HDIH STEIAET (IIM STEIAET AMO)	HASICWINDS NC SPD MVD RMSVD/SPD BIAS NC SPD MVD RMSVD/SPD BIAS NC SPD NC SPD NC SPD MVD RMSVD/SPD BIAS NC SPD MVD RMSVD/SPD BIAS	320 320 18,06 10,80 12,51 0,69 -8,20 573 11,16 6,74 8,06	114 29,45 8,61 10,58 0,36 -2,84 1101 17,50 9,29 11,06 0,63 -6,35 1692 9,95 5,22 6,50	MAR 05 349 19,98 6,71 9,12 0,46 -2,73 1466 14,11 6,90 8,54 0,61 -4,04 1154 8,53 4,69 5,72	APR 05 176 22,18 7,41 9,36 0,42 -4,03 959 15,31 6,98 8,62 0,56 -4,45 875 9,15 4,27 5,32	MAY05 235 26,38 8,65 10,78 0,41 -5,31 753 17,23 6,80 8,08 0,47 -3,78 855 9,12 4,38 5,76	10N 05 184 22,64 8,64 10,47 0,46 -3,17 868 15,02 6,65 8,13 0,54 -3,37 825 8,98 5,10 6,20	JULOS 142 25,06 7,79 9,21 0,37 -2,90 766 14,81 6,86 8,25 0,56 -3,57 927 8,83 4,82 5,75	AUG 05 305 25,16 7,65 9,38 0,37 -3,16 698 15,67 7,06 8,48 0,54 4,26 851 7,80 4,24 5,34	SEP 05 295 22,93 8,76 11,05 0,48 -3,20 802 13,36 7,06 8,42 0,63 -2,93 996 7,93 4,45 5,58
STEIAET HDIH STEIAET GIM STEIAET MOT	HASICWINDS NC SPD MVD RMSVD/SPD BIAS NC SPD MVD RMSVD/SPD BIAS NC SPD MVD RMSVD/SPD BIAS NC SPD MVD RMSVD/SPD RMSVD/SPD RMSVD/SPD	320 320 18,06 10,80 12,51 0,69 -8,20 573 11,16 6,74 8,06 0,72	114 29,45 8,61 10,58 0,36 -2,84 1101 17,50 9,29 11,06 0,63 -6,35 1692 9,95 5,22 6,50 0,65	MAR 05 349 19,98 6,71 9,12 0,46 -2,73 1466 14,11 6,90 8,54 0,61 -4,04 1154 8,53 4,69 5,72 0,67 0,67	APR 05 176 22,18 7,41 9,36 0,42 -4,03 959 15,31 6,98 8,62 0,56 -4,45 875 9,15 4,27 5,32 0,58	MAY05 235 26,38 8,65 10,78 0,41 -5,31 753 17,23 6,80 8,08 0,47 -3,78 855 9,12 4,38 5,76 0,63	10N 05 184 22,64 8,64 10,47 0,46 -3,17 868 15,02 6,65 8,13 0,54 -3,37 825 8,98 5,10 6,20 0,69 1,69	JULOS 142 25,06 7,79 9,21 0,37 -2,90 766 14,81 6,86 8,25 0,56 -3,57 927 8,83 4,82 5,75 0,65 2,66	AUG 05 305 25,16 7,65 9,38 0,37 -3,16 698 15,67 7,06 8,48 0,54 4,26 851 7,80 4,24 5,34 0,68	SEP 05 295 22,93 8,76 11,05 0,48 -3,20 802 13,36 7,06 8,42 0,63 -2,93 996 7,93 4,45 5,58 0,70



 $QI \ge 80$

9

Influence of Quality Test Flags on Verification

- Five tests are applied on PGE09 winds:
 - At Wind Calculation Algorithm: Tracking.
 - At Quality Control: Guess, Temporal, Spatial test.

Two scale test (Only detailed winds).

 Distribution of Test Flags (Values: 0, 1, 2, 3), when three winds are calculated per tracer:





DISTRIBUTION OF TEST FLAGS

Influence of Quality Test Flags on Verification

- BIAS & RMSVD reduce significantly when Spatial Test Flag is higher.
- BIAS reduces also when Two Scale Test is higher.
- No significant influence on verification for the other tests.
- Only one recommendation without reducing two much the population of winds:

To use only winds with Spatial test = 3 (Reduction of population < 15%)







Influence of Speed modulus on Verification

- Statistical parameters are best in the range of wind speeds 4-29 m/s:
 - BIAS & RMSVD double with speed approaching 0 m/s.
 → Tracers blocked by orography.
 - RMSVD doubles & BIAS becomes positive with speed over 30-40 m/s.
 - → Too fast winds related to thin cirrus undetected by cloud mask and assigned to lower levels.
- 4 m/s Speed Minimum recommended to avoid most of blocked tracers.
 - 2 m/s Speed Min. avoids a great proportion, not reducing excessively wind population
- 40 m/s Speed Maximum recommended to avoid "too fast winds" at low and mid levels.



INFLUENCE OF WIND SPEED ON RMSVD



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12

Improvement of validation results with all conditions $\int QI \ge 80$

Comparing with Statistics for $QI \ge 80$:

• Very important reduction of BIAS at low levels (30-60%);

A slight one at mid levels (up to 10%); No positive impact at high levels.

- Reduction of MVD & RMSVD at all levels (up to 20%).
- New values are obtained with an additional reduction in population of winds of about 20-30%.

Users should consider if these recommendations are useful for their exploitation of the product, specially at low levels.

	BASIC WINDS	JAN 05	FEB 05	MAR 05	APR 05	MAY05	JUN 05	JUL 05	AUG 05	SEP 05
STEVEL HD	NC	5	114	349	176	235	184	142	305	295
	SPD		29,45	19,98	22,18	26,38	22,64	25,06	25,16	22,93
	MVD		8,61	6,71	7,41	8,65	8,64	7,79	7,65	8,76
	RMSVD		10,58	9,12	9,36	10,78	10,47	9,21	9,38	11,05
E	RMSVD/SPD		0,36	0,46	0,42	0,41	0,46	0,37	0,37	0,48
	BIAS		-2,84	-2,73	-4,03	-5,31	-3,17	-2,90	-3,16	-3,20
	NC	320	11 01	1466	959	753	868	766	698	802
TS	SPD	18,06	17,50	14,11	15,31	17,23	15,02	14,81	15,67	13,36
EVE	MVD	10,80	9,29	6,90	6,98	6,80	6,65	6,86	7,06	7,06
ā	RMSVD	12,51	11,06	8,54	8,62	8,08	8,13	8,25	8,48	8,42
N	RMSVD/SPD	0,69	0,63	0,61	0,56	0,47	0,54	0,56	0,54	0,63
	BIAS	-8,20	-6,35	-4,04	-4,45	-3,78	-3,37	-3,57	4,26	-2,93
	NC	573	1692	1154	875	855	825	927	851	996
ST	SPD	11,16	9,95	8,53	9,15	9,12	8,98	8,83	7,80	7,93
EM	MVD	6,74	5,22	4,69	4,27	4,38	5,10	4,82	4,24	4,45
TOWL	RMSVD	8,06	6,50	5,72	5,32	5,76	6,20	5,75	5,34	5,58
	RMSVD/SPD	0,72	0,65	0,67	0,58	0,63	0,69	0,65	0,68	0,70
	BIAS	-3,29	-2,78	-2,09	-1,06	-1,21	-1,99	-2,06	-1,36	-1,40

	BASIC WINDS	JAN 05	FEB 05	MAR 05	APR 05	MAY05	JUN 05	JUL 05	AUG 05	SEP 05
	NC	4	74	280	135	166	125	118	231	236
STE	SPD		27,08	18,87	21,04	25,87	21,22	25,00	24,42	22,12
ENEL HE	MVD		7,71	6,11	7,39	8,25	7,77	7,74	7,21	7,75
	RMSVD		9,88	8,15	9,22	10,42	9,19	9,05	8,83	9,69
Ē	RMSVD/SPD		0,36	0,43	0,44	0,40	0,43	0,36	0,36	0,44
	BIAS		-3,56	-2,57	-4,48	-4,71	-3,10	-2,66	-3,33	-2,81
	NC	255	865	1212	774	615	585	682	546	683
ST	SPD	18,40	17,95	13,94	15,69	16,64	14,11	14,83	15,57	13,25
EVI	MVD	10,10	8,64	6,44	6,65	6,43	5,90	6,81	6,61	6,86
ā	RMSVD	11,68	10,20	7,97	8,23	7,63	7,25	8,15	7,83	8,11
N	RMSVD/SPD	0,63	0,57	0,57	0,52	0,46	0,51	0,55	0,50	0,61
	BIAS	-7,30	- 5,73	-3,57	-3,99	-3,46	-3,12	-3,53	-3,69	-2,85
WILEVELS	NC	401	1179	801	710	733	468	766	678	765
	SPD	11,35	10,79	9,29	9,61	9,31	9,30	9,06	8,23	8,54
	MVD	5,60	4,50	4,24	3,99	4,08	4,94	4,44	3,99	4,43
	RMSVD	6,62	5,44	5,00	4,88	5,33	6,03	5,36	5,01	5,60
H	RMSVD/SPD	0,58	0,50	0,54	0,51	0,57	0,65	0,59	0,61	0,66
	BIAS	-1,14	-1,27	-0,91	-0,44	-0,92	-1,28	-1,34	-0,70	-0,86



 $QI \ge 80$; Spatial test = 3; SPD = [2,40] m/s



Comparison with Eumetsat MPEF HRV Statistics

- RMSVD/SPD at Eumetsat MPEF HRV Statistics: 0.40-0.50
 - > PGE09 similar at high levels (0.35-0.45)
 - > A bit worse at mid & low levels (0.50-0.65)
- BIAS at Eumetsat MPEF HRV Statistics also negative:
 - > PGE09 similar at high (-1 to -5 m/s) and low levels (0 to -2 m/s).
 - > A bit worse at mid levels (-2 to -5 m/s; Eumetsat val: -1 to -3 m/s).

Reasons PGE09 Results may be a bit worse:

 → Geographical working area is rather affected by orography. (Important proportion over land; various mountain systems).

Necessary to recall PGE09 advantages:

- → Winds calculated locally by the users few minutes after MSG data received, in the geographical area they need.
- \rightarrow Bigger density of data, every 15 minutes.



Influence of Orography on Verification

- Best values of BIAS, RMSVD & Correlation in sea and low plain areas.
- Worst values in mountain areas, specially at low levels.
 - > Differences in BIAS & RMSVD between both regions at least 4 m/s.
 - > Correlation (with QI > 80): 0.2-0.4 in mountain regions.



0.6-0.9 in sea and low plain regions.



Influence of Orography on Verification





Influence of Solar elevation on Verification

- BIAS, RMSVD & Correlation improve progressively when solar elevation is higher.
- No Threshold recommended:

There is no Solar Elevation value over which Verification Results are significantly better than below it.



EFFECT OF SOLAR ELEVATION ON CORRELATION

EFFECT OF SOLAR ELEVATION ON BIAS









Conclusions

PGE09 Validation Parameters compared to

Eumetsat HRV MET8 Wind Statistics show:

- A similar Quality at High levels.
- A bit worse Quality at Mid & Low levels
- \rightarrow Effect of Verification geographical area, very affected by orography.

(Orography is proofed to influence significantly Validation parameters).

- Hints to improve Validation parameters:
 - Higher QI Threshold (= 75, 80)
 - Spatial test value = 3
 - Minimum Speed Threshold (= 2, 4 m/s)
 - Maximum Speed Threshold at low & mid levels (= 40 m/s)



Future Developments

- Better handling of Land Influence:
 - → Introduction of Topographic Flag, related to detection of:
 - Land tracers.
 - Tracers blocked through Orography.
 - Orographic waves.
 - \rightarrow Effect of this parameter on verification.
- Study to reduce the dependence of PGE09 Algorithm on Numerical Model Data, including:
 → Utilization of CTTH Product for Tracer Level Assignment.
- Study to expand wind calculation to nighttime through IR Channels.

