ECMWF Report on ERS-2 RA for June 2001

Title: Report on ERS-2 Radar Altimeter wave height and wind speed data.

By: Saleh Abdalla

Date: 9 July 2001

Overview:

Based on the data received during the full month, on average, 16315 observations arrived at ECMWF every 6 hours of which 79.4% passed the quality control. The data coverage, which was fairly excellent, can be seen in Figure 1. There was no data for first 3 '6-hour' time slots on June 1. Data reception rate was significantly reduced at 06:00 UTC on 16 and at 12:00 UTC on 27 June. Note that we are talking about the raw data which have arrived at ECMWF before they were processed.

Backscatter:

ESR-2 $<\sigma_0>$ = 11.06 dB (with a main peak at 11.1 dB and a major secondary peak at 10.6 dB)

Wind Speed Comparison with ECMWF wind speeds (bias):

ERS-2 global: 0.040 m/s

ERS-2 northern hemisphere: -0.635 m/s

ERS-2 tropics: 0.015 m/s

ERS-2 southern hemisphere: 0.449 m/s

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

ECMWF Report on ERS-2 RA for June 2001

Wind Speed Comparison with buoy wind speeds (bias):

ERS-2 global: -0.999 m/s

ERS-2 northern hemisphere: -1.014 m/s

ERS-2 tropics: -0.924 m/s

Wave Height Comparison with ECMWF wave heights (bias):

ERS-2 global: -0.024 m (lowest waves measured: 0.6m)

ERS-2 northern hemisphere: 0.012 m

ERS-2 tropics: -0.055 m

ERS-2 southern hemisphere: -0.023 m

Wave Height Comparison with buoy wave heights (bias):

ERS-2 global: 0.04 m

ERS-2 northern hemisphere: 0.06 m

ERS-2 tropics: -0.12 m

Remarks:

- The quality of Altimeter data is as good as they used to be.

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

Comparison Method:

The Altimeter wave height and wind speed data, as received by ECMWF from ESA through GTS, are the so-called fast delivery products. At ECMWF these data are subject to a quality control method, the details of which are described by Janssen et al. (1989) and Bauer et al. (1992). Consequently, superobservations are formed by averaging 30 consecutive data in order to match the spatial scales of the operational WAM model. Therefore, the collocation statistics are based on the comparison between these superobservations and operational wavemodel products.

In addition, since also wave observations from buoys are received through the GTS, the Altimeter products are also compared against buoy observations. Again, in order to have matching scales, the buoy observations are averaged over a six hour time window. Apart from this, also a height correction is applied to the wind speed observations, since not all buoys observe the winds at the standard height of 10 m. A default observation height of 5 m is assumed, and when available the actual observation height is used. In order to interpolate from the observation height to the standard height a logarithmic wind profile with a roughness length as given by the Charnock relation is assumed, where the Charnock parameter is given the constant value of 0.018.

Figure captions:

Figure 1: Time series of data reception for ERS-2 Altimeter data for June 2001.

Figure 2: Distribution of the ERS-2 Altimeter Backscatter after QC for June 2001.

Figure 3: Distribution of the ERS-2 Altimeter wind speeds after QC for June 2001.

Figure 4: Distribution of the ERS-2 Altimeter wind speeds after along track averaging for June 2001.

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

Figure 5: Global distribution of ECMWF ocean surface wind speeds for June 2001.
Figure 6: Comparison of ECMWF wind speed results with ERS-2 Altimeter wind speed data for June 2001 (global).
Figure 7: Comparison of ECMWF wind speed results with ERS-2 Altimeter wind speed data for June 2001 (northern hemisphere)
Figure 8: Comparison of ECMWF wind speed results with ERS-2 Altimeter wind speed data for June 2001 (tropics)
Figure 9: Comparison of ECMWF wind speed results with ERS-2 Altimeter wind speed data for June 2001 (southern hemisphere)
Figure 10: Comparison of buoy wind speed observations with ERS-2 Altimeter wind speed data for June 2001 (global).
Figure 11: Comparison of buoy wind speed observations with ERS-2 Altimeter wind speed data for June 2001 (northern hemisphere).
Figure 12: Comparison of buoy wind speed observations with ERS-2 Altimeter wind speed data for June 2001 (tropics).
Figure 13: ERS-2 Altimeter wind speeds: Timeseries of bias (ERS-2 - model) and scatter index (SI).
Figure 14: Distribution of the ERS-2 Altimeter wave heights after QC for June 2001.
Figure 15: Distribution of the ERS-2 Altimeter wave heights after along track averaging for June 2001.
Figure 16: Global distribution of ECMWF wave heights for June 2001.
Figure 17: Comparison of ECMWF wave height results with ERS-2 Altimeter wave height data for June 2001 (global).
Figure 18: Comparison of ECMWF wave height results with ERS-2 Altimeter wave height data for June 2001 (northern hemisphere)
Figure 19: Comparison of ECMWF wave height results with ERS-2 Altimeter wave height data for June 2001 (tropics)
Figure 20: Comparison of ECMWF wave height results with ERS-2 Altimeter wave height data for June 2001 (southern hemisphere)
Figure 21: Comparison of buoy wave height observations with ERS-2 Altimeter wave height data for June 2001 (global).
Figure 22: Comparison of buoy wave height observations with ERS-2 Altimeter wave height data for June 2001 (northern hemisphere).
Figure 23: Comparison of buoy wave height observations with ERS-2 Altimeter wave height data for June 2001 (tropics).
Figure 24: ERS-2 Altimeter wave heights: Timeseries of bias (ERS-2 - model) and scatter index (SI) for June 2001.
Figure 25: ERS-2 Altimeter wave heights: Timeseries of bias (ERS-2 - model) and scatter index (SI) from December 1996 to June 2001
Figure 26: ERS-2 Altimeter wind speeds: Timeseries of bias (ERS-2 - model) and scatter index (SI) from December 1996 to June 2001

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

ECMWF Report on ERS-2 RA for June 2001

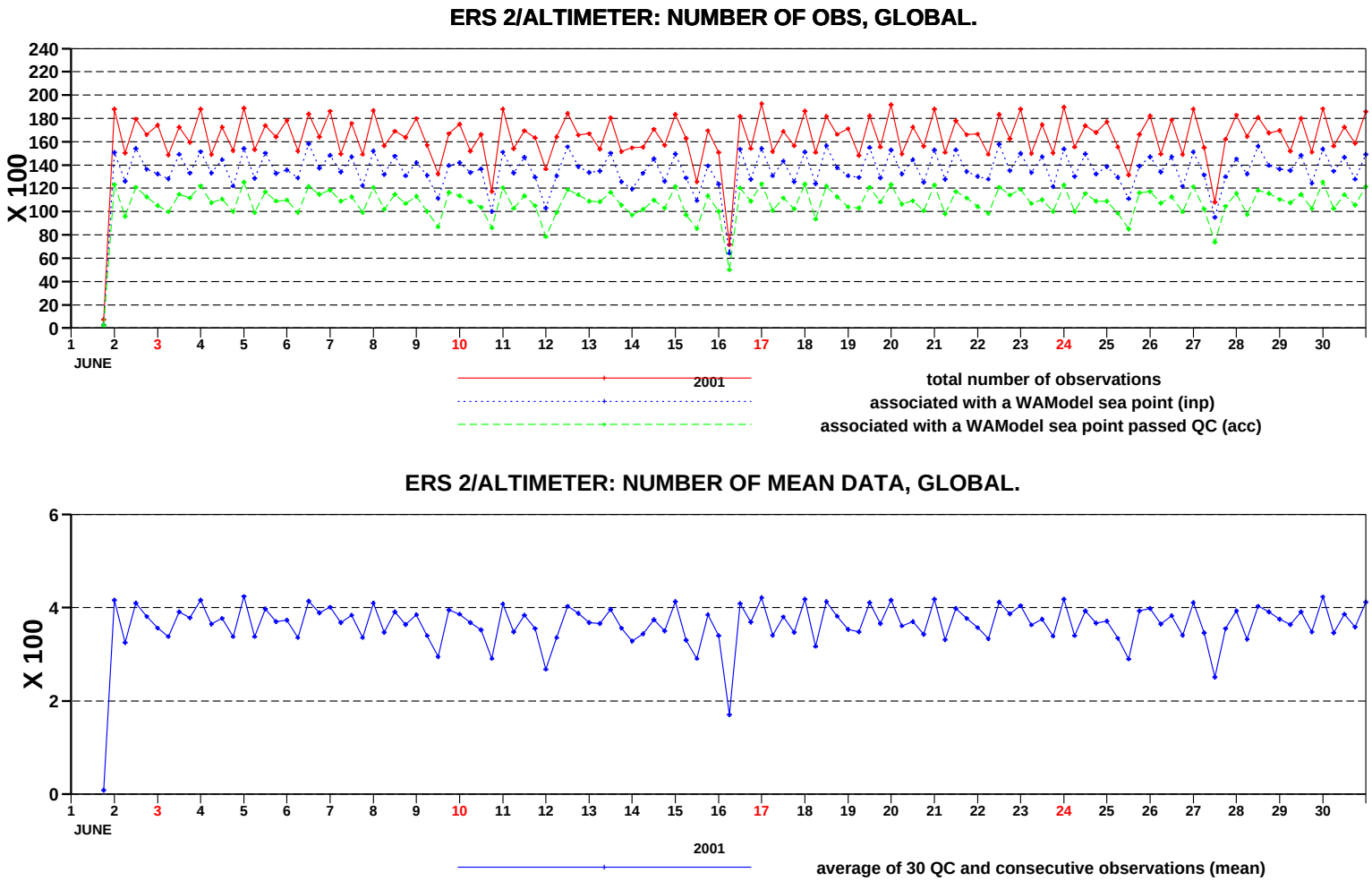


Figure 1: Time series of data reception for ERS-2 Altimeter data for June 2001

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

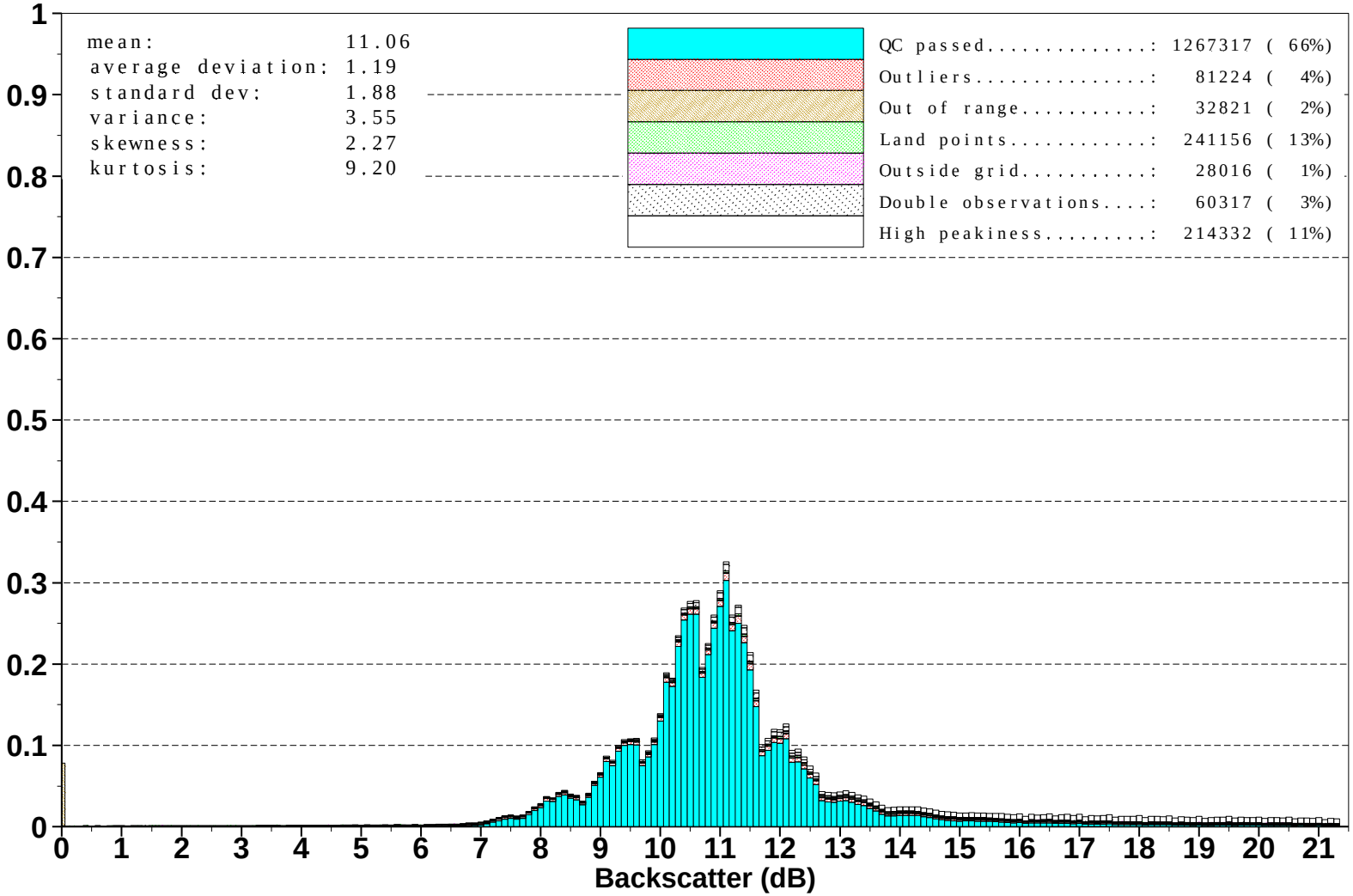


Figure 2: Distribution of the ERS-2 Altimeter backscatter after QC for June 2001

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

ECMWF Report on ERS-2 RA for June 2001

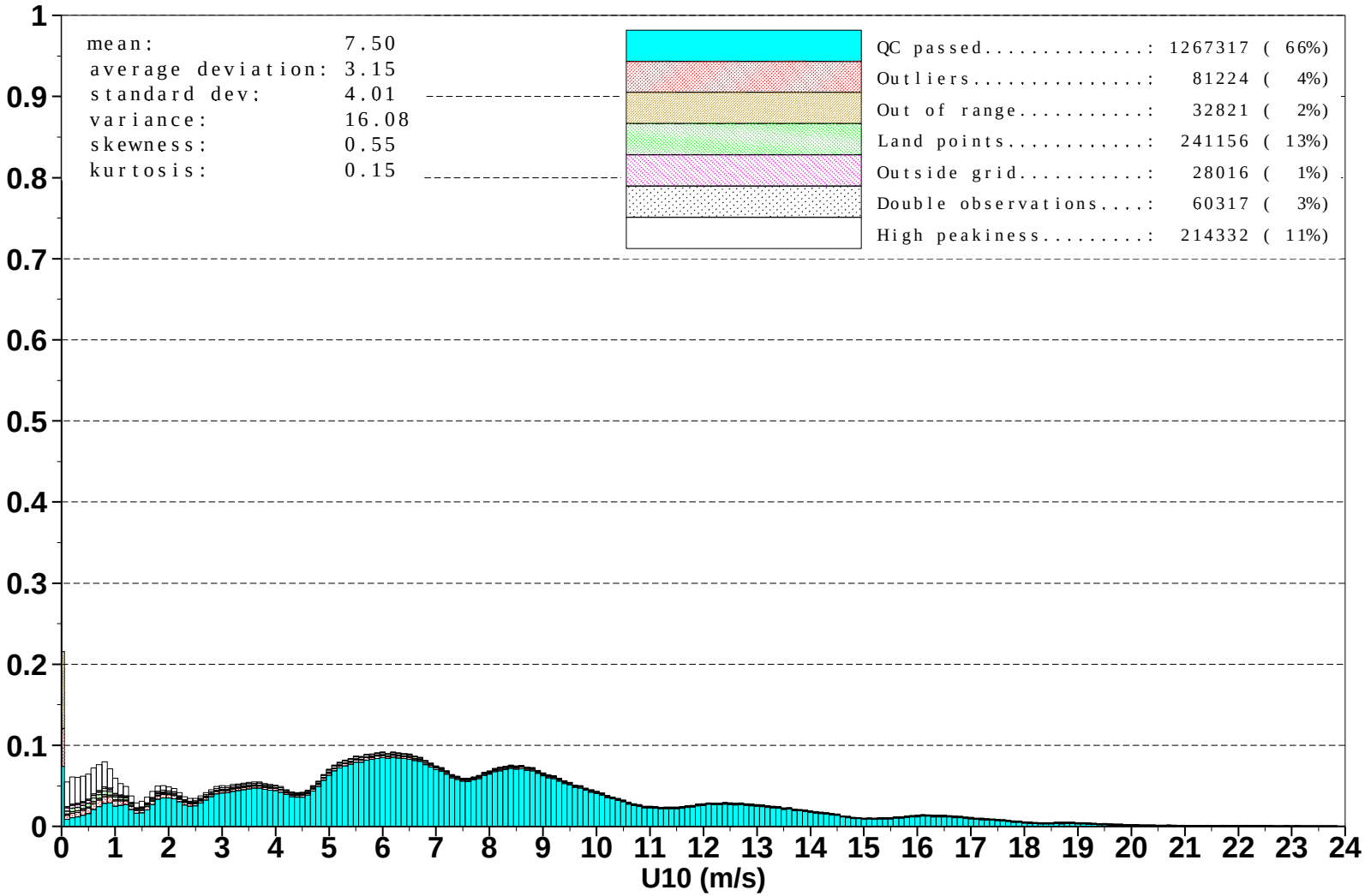


Figure 3: Distribution of the ERS-2 Altimeter wind speeds after QC for June 2001

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

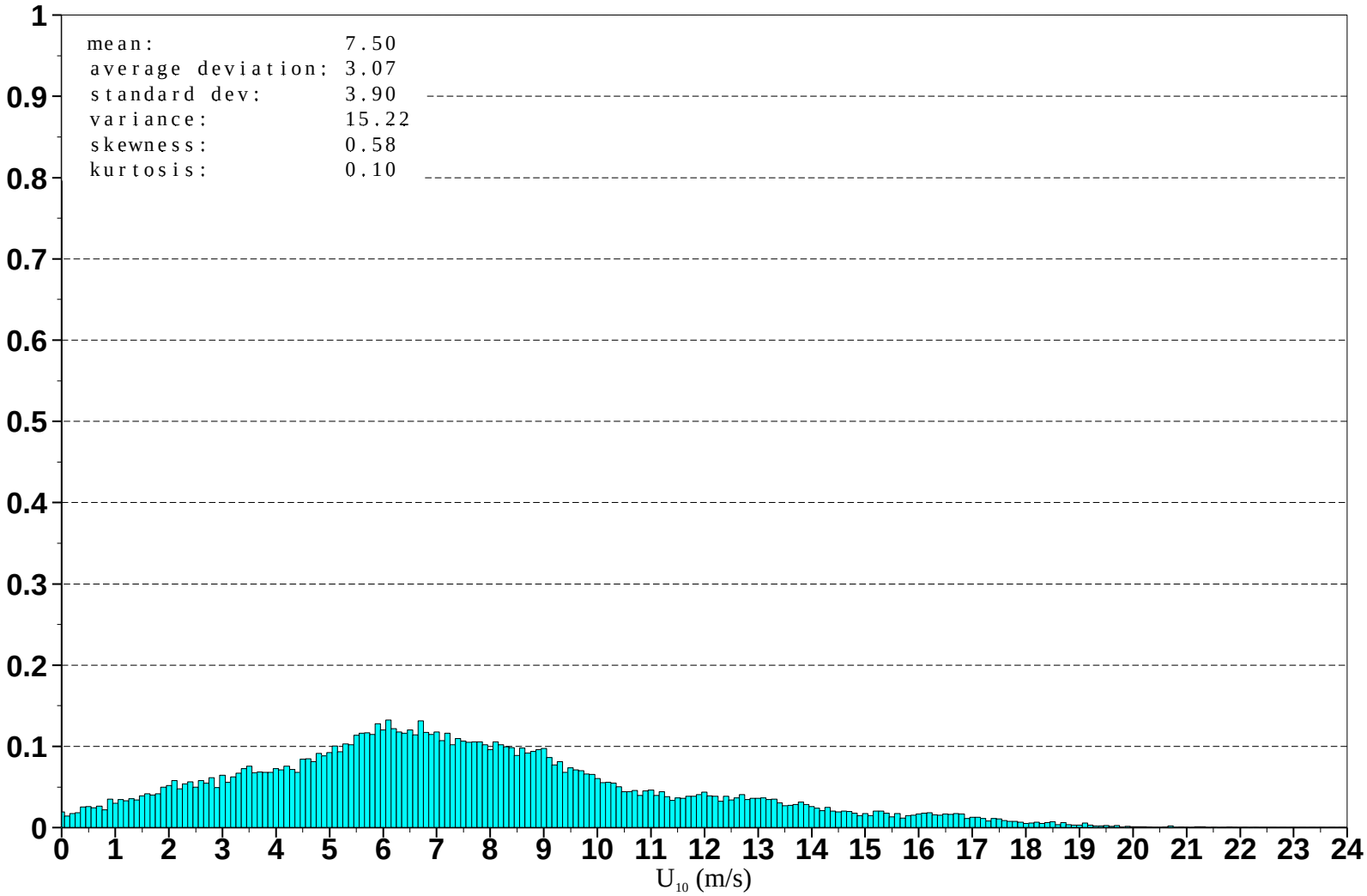


Figure 4: Distribution of ERS-2 Altimeter wind speeds after along track averaging for June 2001

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

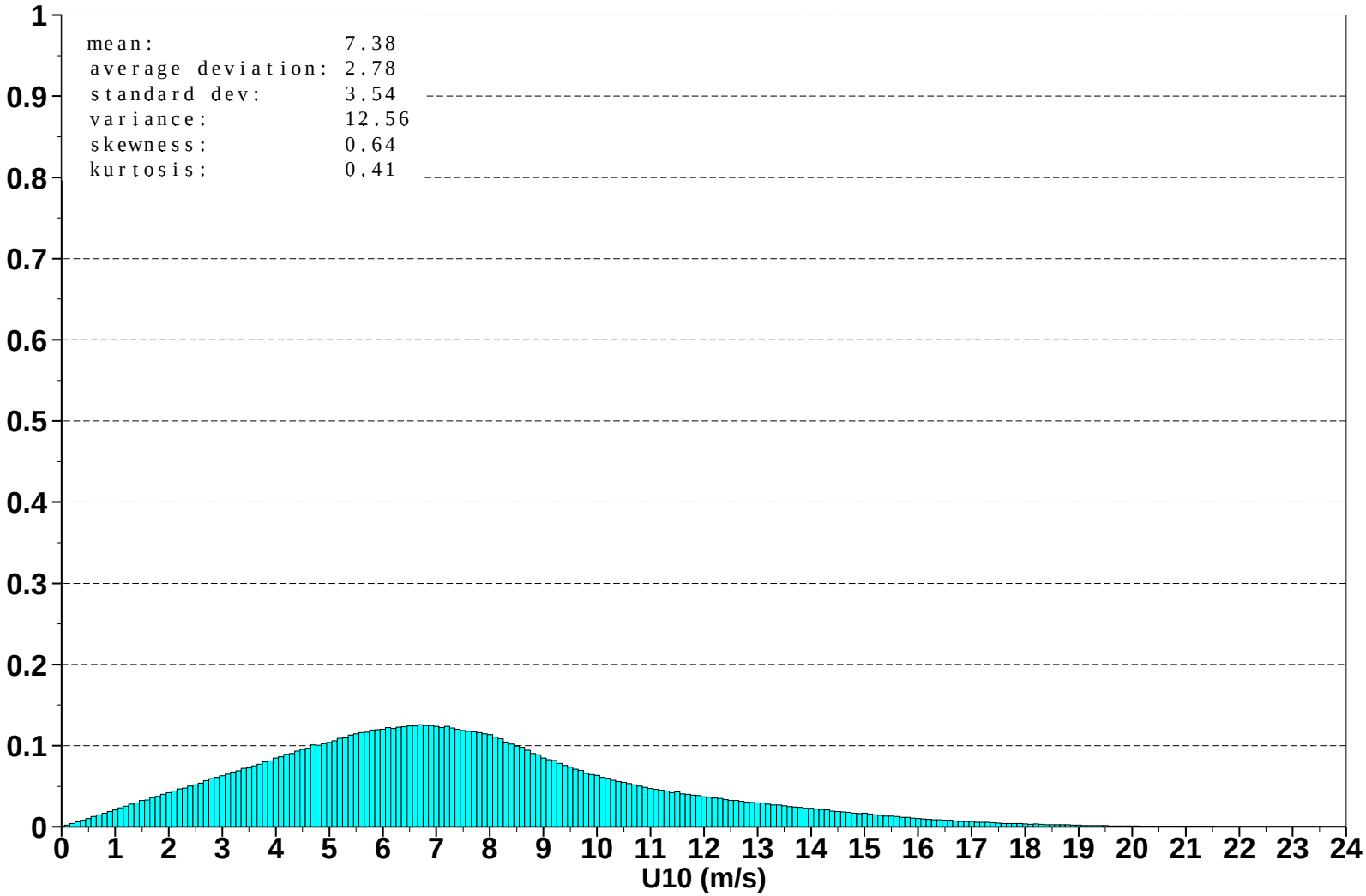
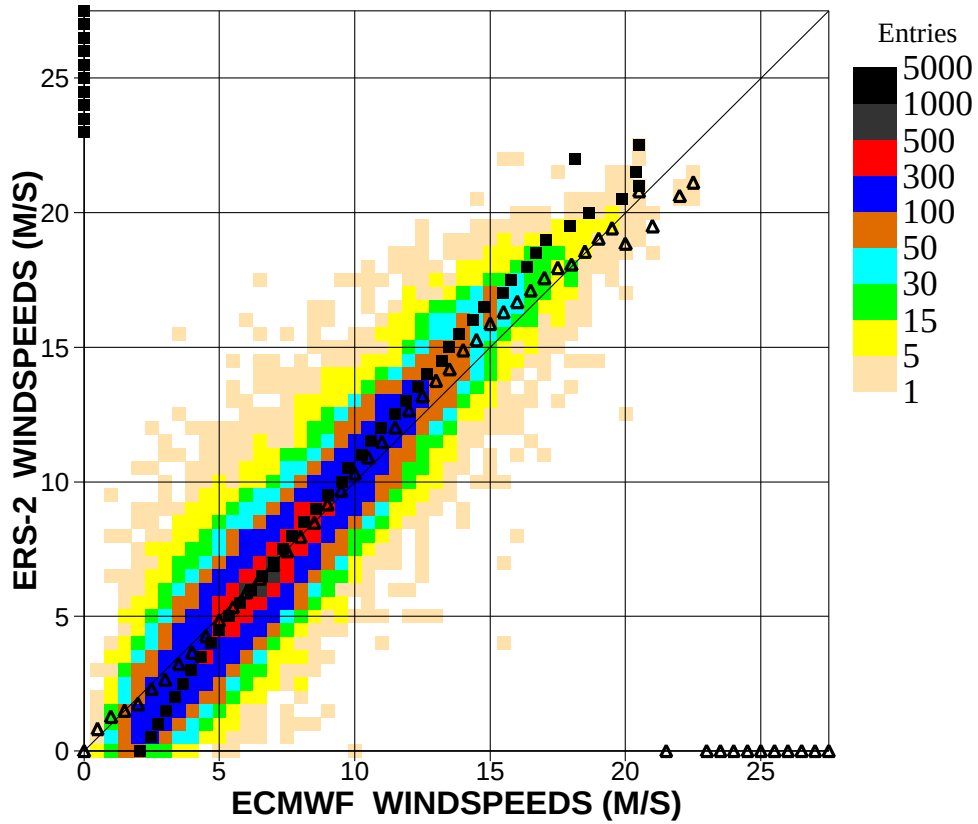


Figure 5: Global distribution of ECMWF ocean surface wind speeds for June 2001

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

ECMWF Report on ERS-2 RA for June 2001



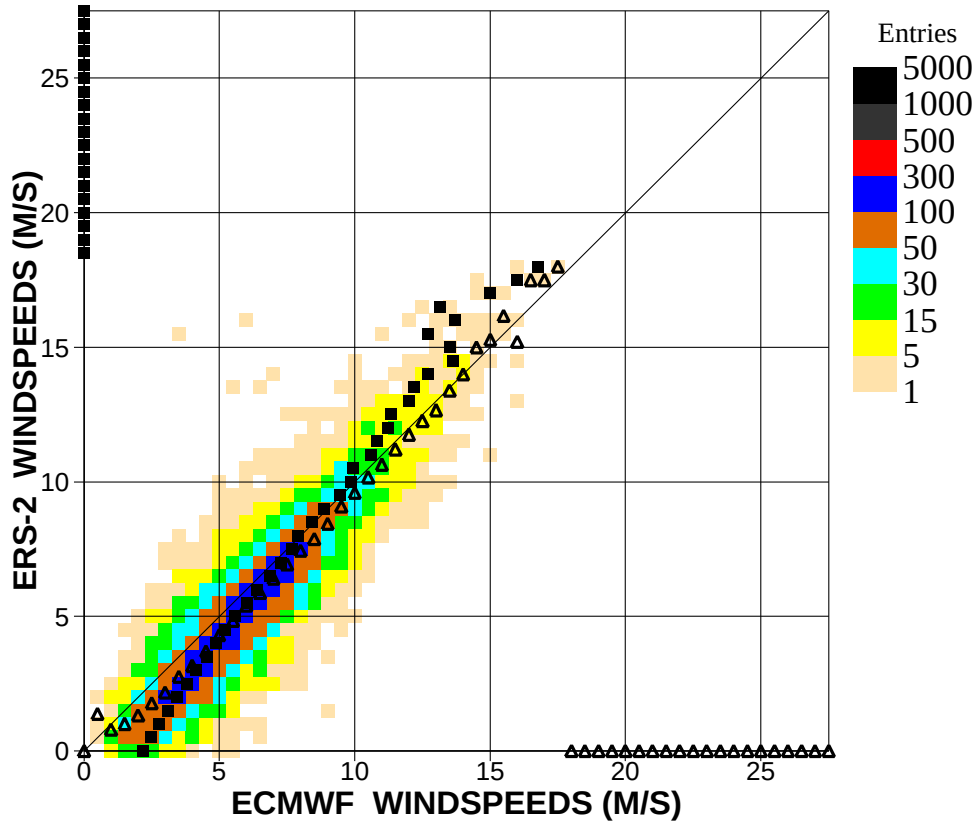
STATISTICS

ENTRIES	42727
MEAN ECMWF	7.4638
MEAN ERS-2	7.5039
BIAS (ERS-2 - ECMWF)	0.0400
STANDARD DEVIATION	1.4688
SCATTER INDEX	0.1968
CORRELATION	0.9294
SYMMETRIC SLOPE	1.0344(0.0021)
REGR. COEFFICIENT	1.0862(0.0021)
REGR. CONSTANT	-0.6033(0.0171)

Figure 6. Comparison of ECMWF wind speed results with ERS2 Altimeter wind speed data for June 2001 (global)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

ECMWF Report on ERS-2 RA for June 2001



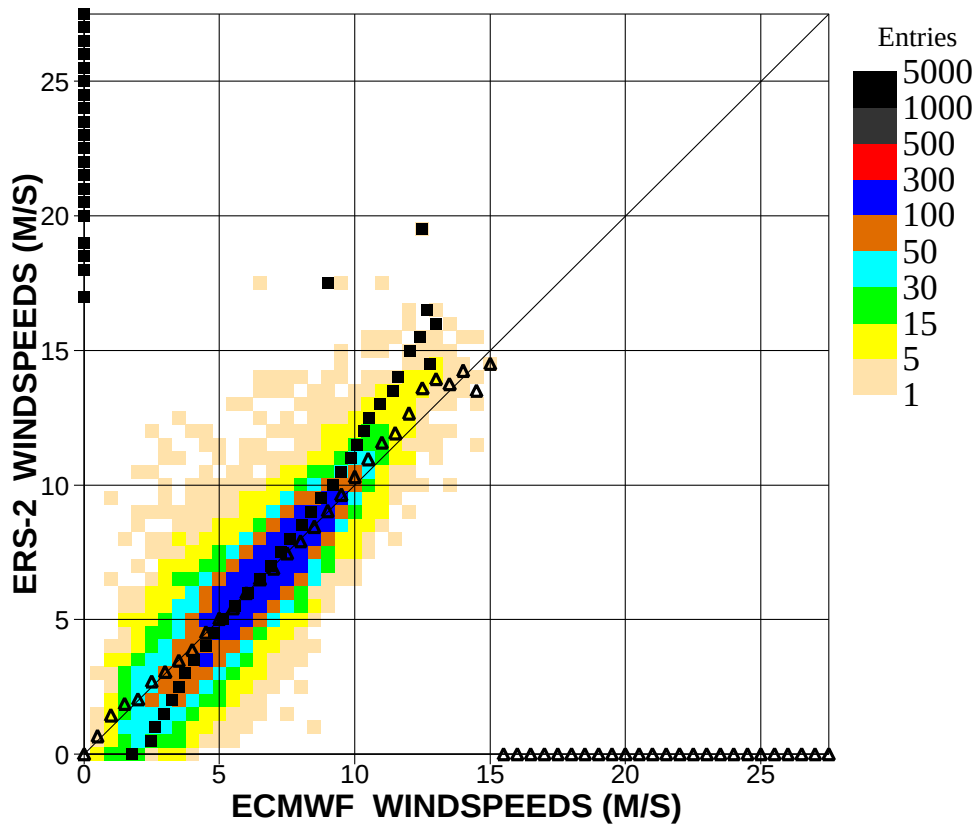
STATISTICS

ENTRIES	10780
MEAN ECMWF	5.9857
MEAN ERS-2	5.3510
BIAS (ERS-2 - ECMWF)	-0.6347
STANDARD DEVIATION	1.2788
SCATTER INDEX	0.2136
CORRELATION	0.8997
SYMMETRIC SLOPE	0.9393(0.0051)
REGR. COEFFICIENT	1.0481(0.0049)
REGR. CONSTANT	-0.9224(0.0318)

Figure 7. Comparison of ECMWF wind speed results with ERS2 Altimeter wind speed data for June 2001 (n.hem.)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

ECMWF Report on ERS-2 RA for June 2001



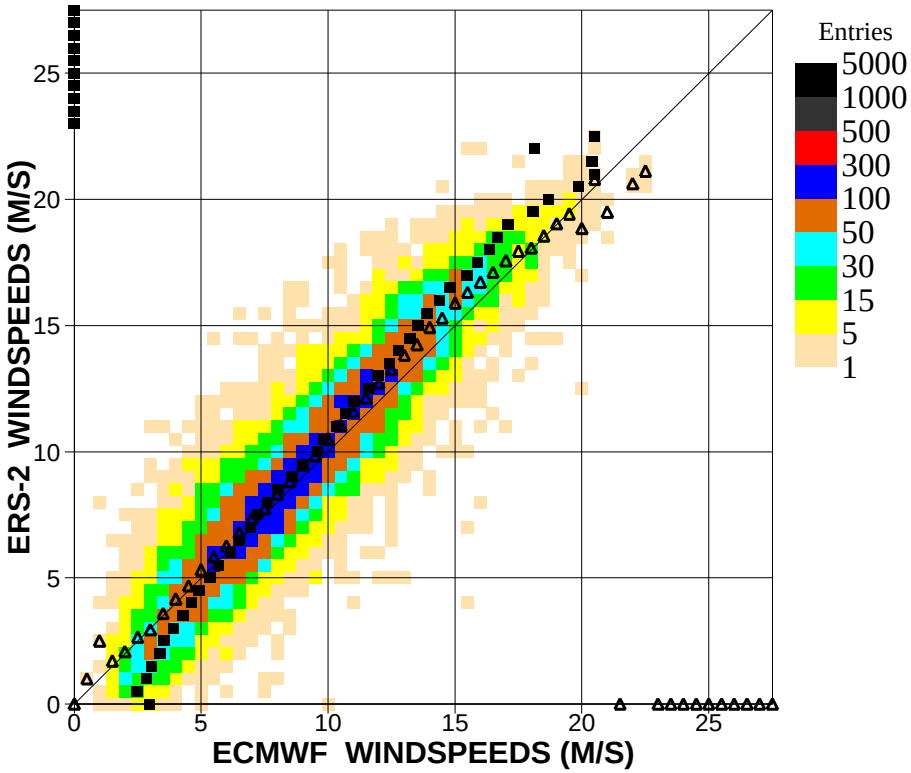
STATISTICS

ENTRIES	13807
MEAN ECMWF	6.3637
MEAN ERS-2	6.3788
BIAS (ERS-2 - ECMWF)	0.0150
STANDARD DEVIATION	1.3055
SCATTER INDEX	0.2051
CORRELATION	0.8704
SYMMETRIC SLOPE	1.0227(0.0049)
REGR. COEFFICIENT	1.0198(0.0049)
REGR. CONSTANT	-0.1110(0.0332)

Figure 8. Comparison of ECMWF wind speed results with ERS2 Altimeter wind speed data for June 2001 (tropics)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

ECMWF Report on ERS-2 RA for June 2001

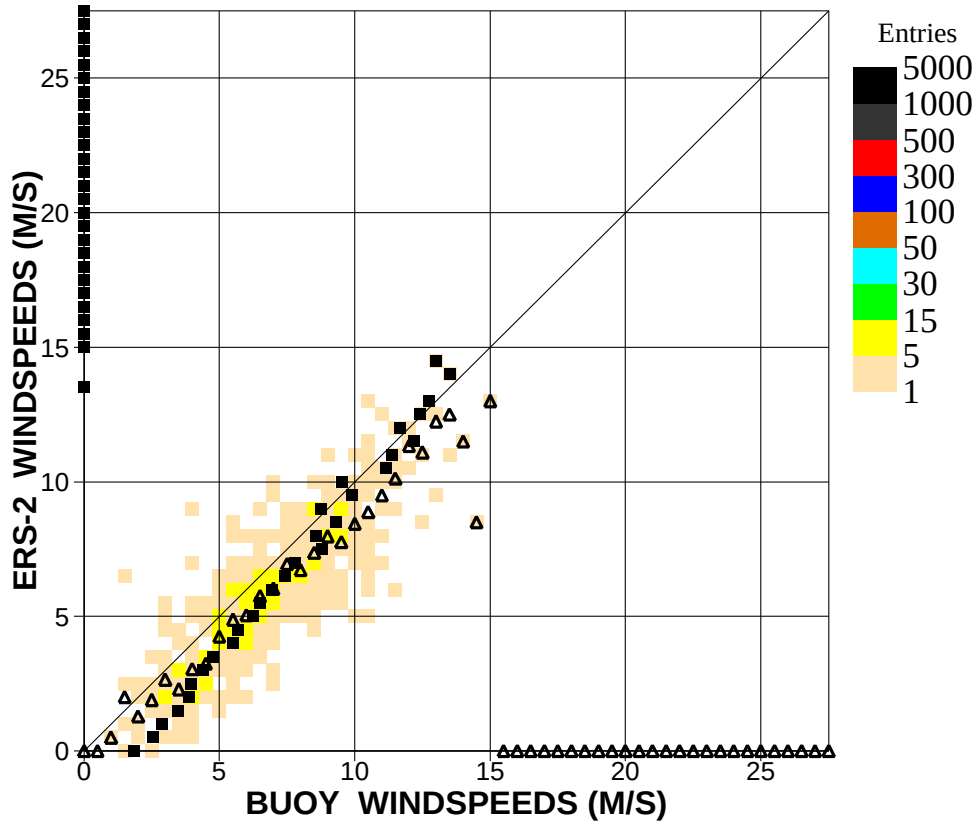


STATISTICS

ENTRIES	18464
MEAN ECMWF	9.1342
MEAN ERS-2	9.5835
BIAS (ERS-2 - ECMWF)	0.4493
STANDARD DEVIATION	1.5343
SCATTER INDEX	0.1680
CORRELATION	0.9301
SYMMETRIC SLOPE	1.0609(0.0031)
REGR. COEFFICIENT	1.0516(0.0031)
REGR. CONSTANT	-0.0217(0.0301)

Figure 9. Comparison of ECMWF wind speed results with ERS2 Altimeter wind speed data for June 2001 (s.hem.)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

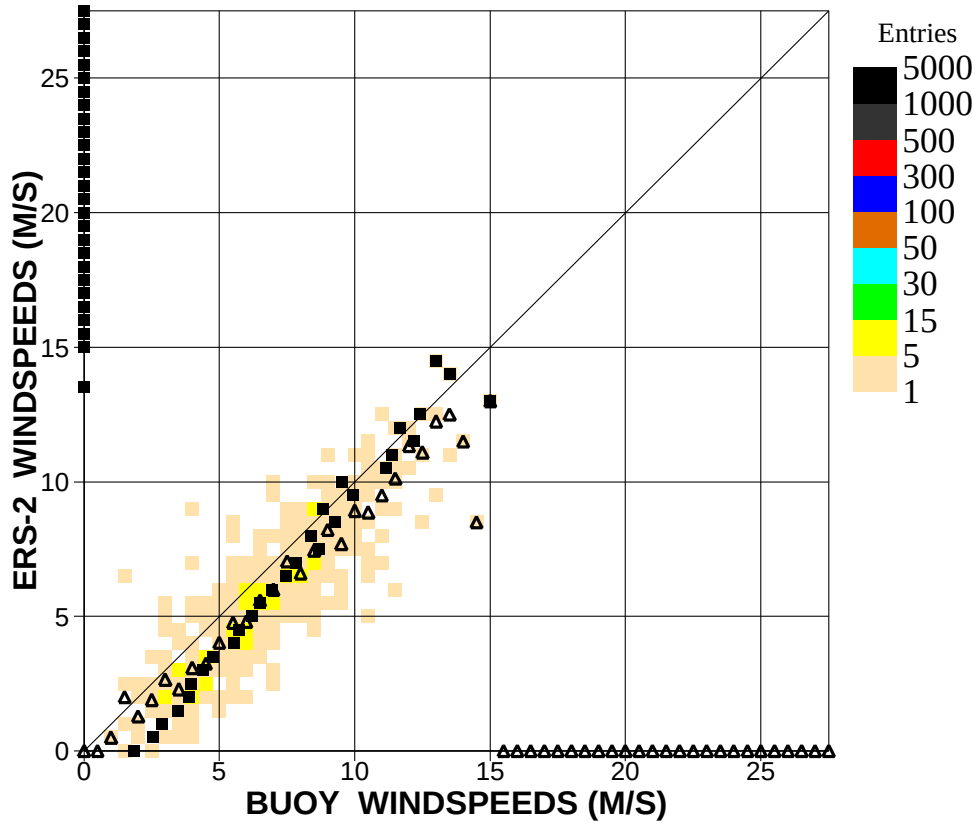


STATISTICS

ENTRIES	501	
MEAN BUOY	6.8565	
MEAN ERS-2	5.8575	
BIAS (ERS-2 - BUOY)	-0.9990	
STANDARD DEVIATION	1.4370	
SCATTER INDEX	0.2096	
CORRELATION	0.8544	
SYMMETRIC SLOPE	0.8816	(0.0248)
REGR. COEFFICIENT	0.9009	(0.0245)
REGR. CONSTANT	-0.3193	(0.1797)

Figure 10. Comparison of buoy wind speed observations with ERS2 Altimeter wind speed data for June 2001 (global)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int



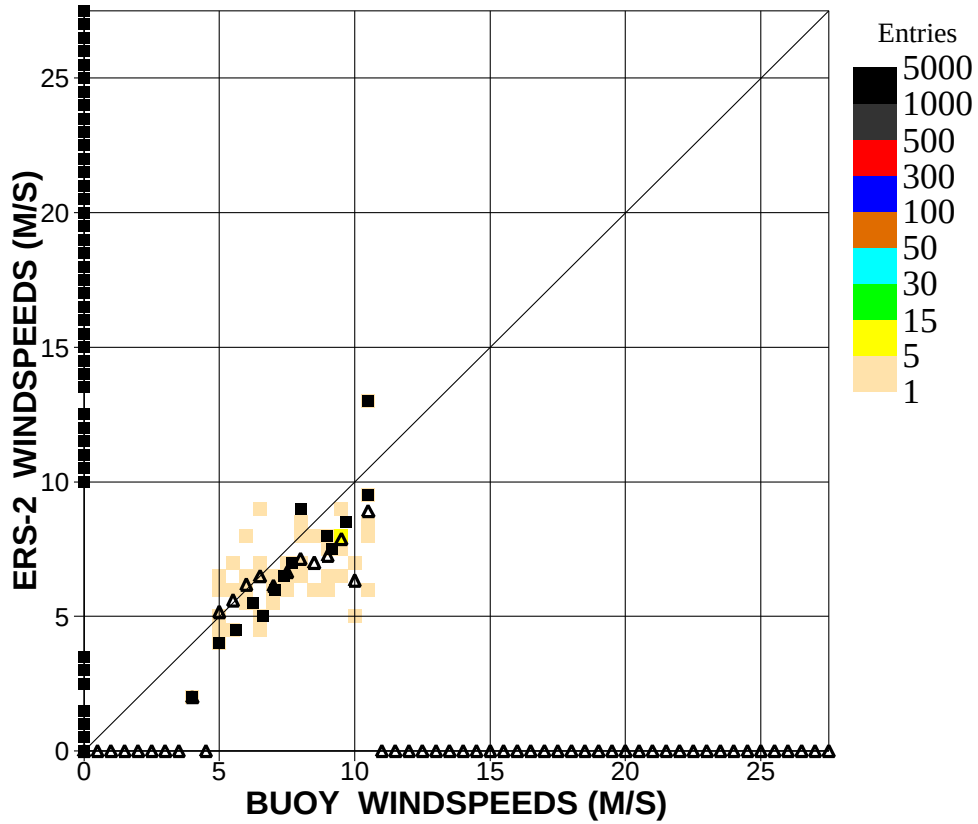
STATISTICS

ENTRIES	424	
MEAN BUOY	6.7175	
MEAN ERS-2	5.7040	
BIAS (ERS-2 - BUOY)	-1.0135	
STANDARD DEVIATION	1.4562	
SCATTER INDEX	0.2168	
CORRELATION	0.8643	
SYMMETRIC SLOPE	0.8820	(0.0264)
REGR. COEFFICIENT	0.9201	(0.0261)
REGR. CONSTANT	-0.4769	(0.1886)

Figure 11. Comparison of buoy wind speed observations with ERS2 Altimeter wind speed data for June 2001 (n.hem.)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

ECMWF Report on ERS-2 RA for June 2001



STATISTICS

ENTRIES	74	
MEAN BUOY	7.6072	
MEAN ERS-2	6.6838	
BIAS (ERS-2 - BUOY)	-0.9235	
STANDARD DEVIATION	1.3248	
SCATTER INDEX	0.1742	
CORRELATION	0.6609	
SYMMETRIC SLOPE	0.8778	(0.0844)
REGR. COEFFICIENT	0.5691	(0.0762)
REGR. CONSTANT	2.3543	(0.5936)

Figure 12. Comparison of buoy wind speed observations with ERS2 Altimeter wind speed data for June 2001 (hawaii)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

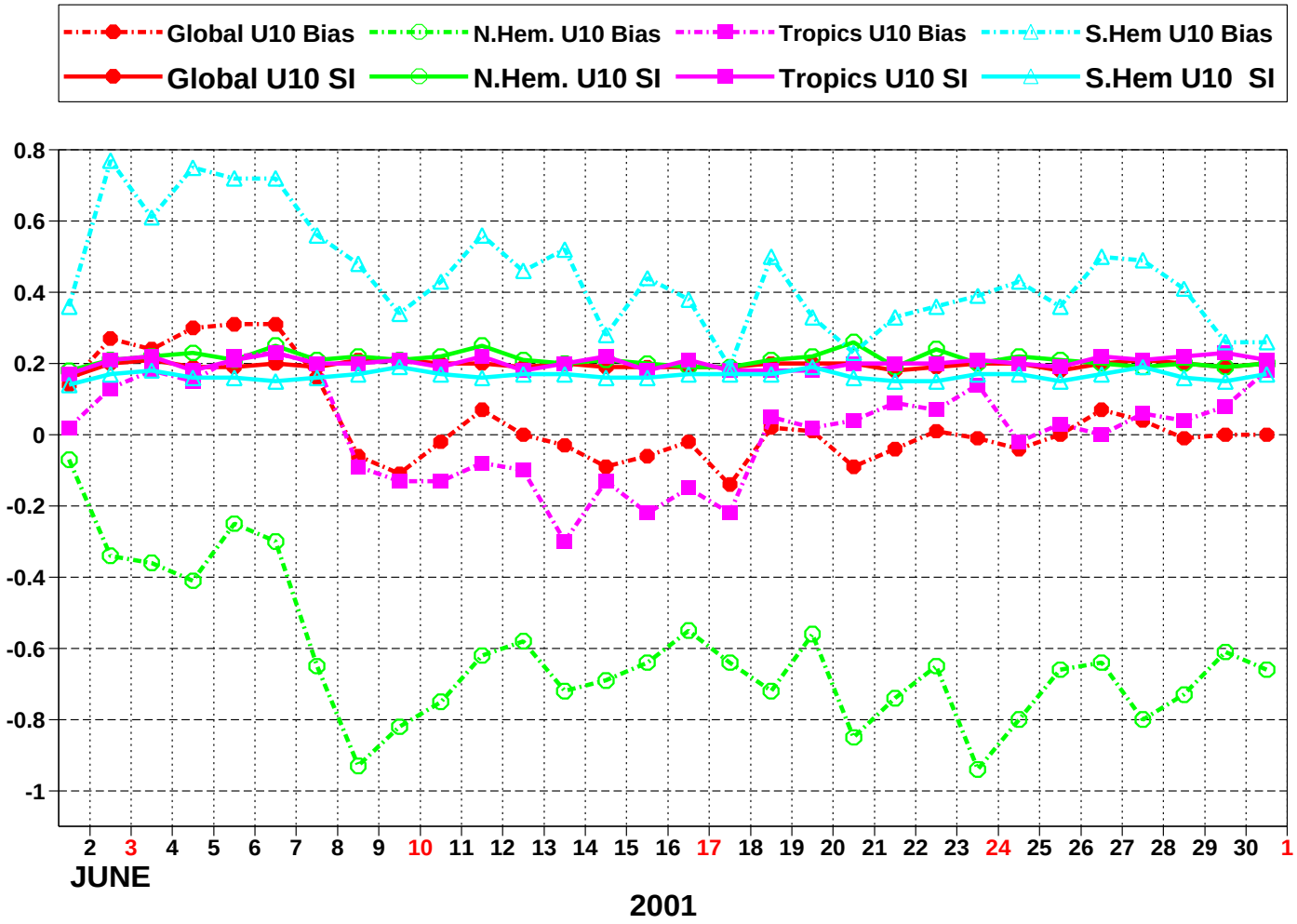


Figure 13: ERS-2 Altimeter wind speeds: Timeseries of bias (ERS-2 - model) and scatter index (SI)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

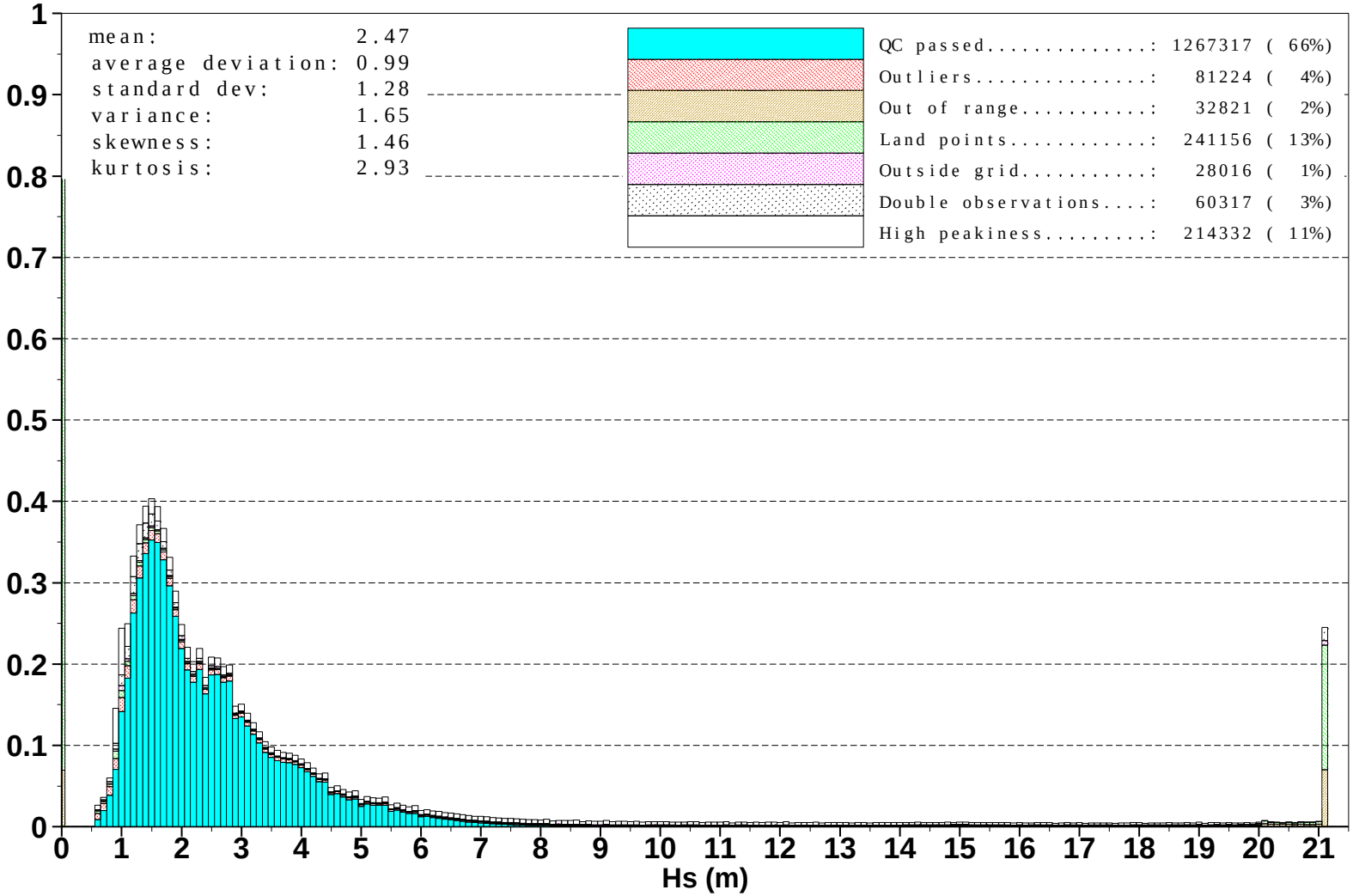


Figure 14: Distribution of the ERS-2 Altimeter wave heights after QC for June 2001

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

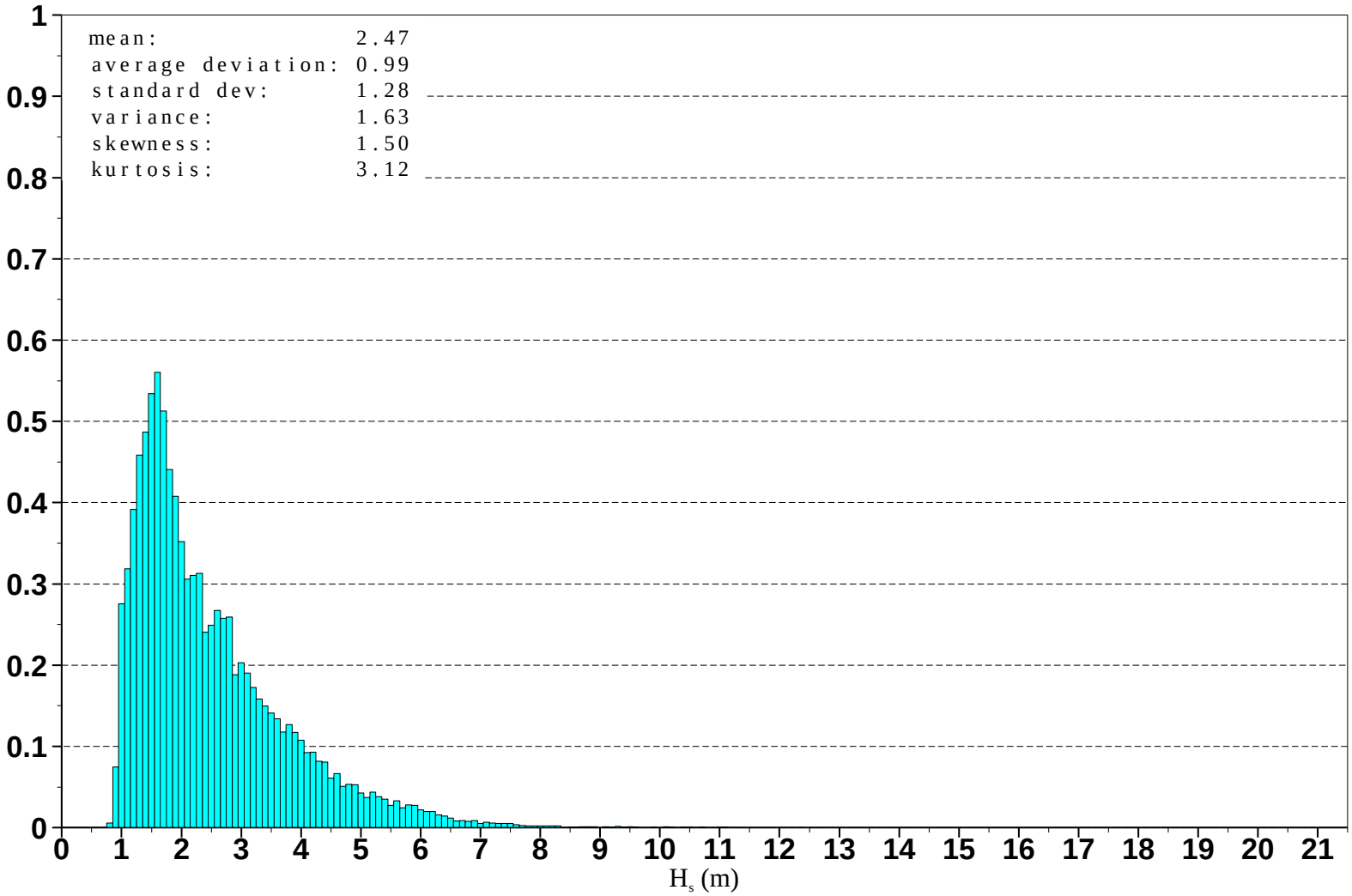


Figure 15: Distribution of ERS-2 Altimeter wave heights after along track averaging for June 2001

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

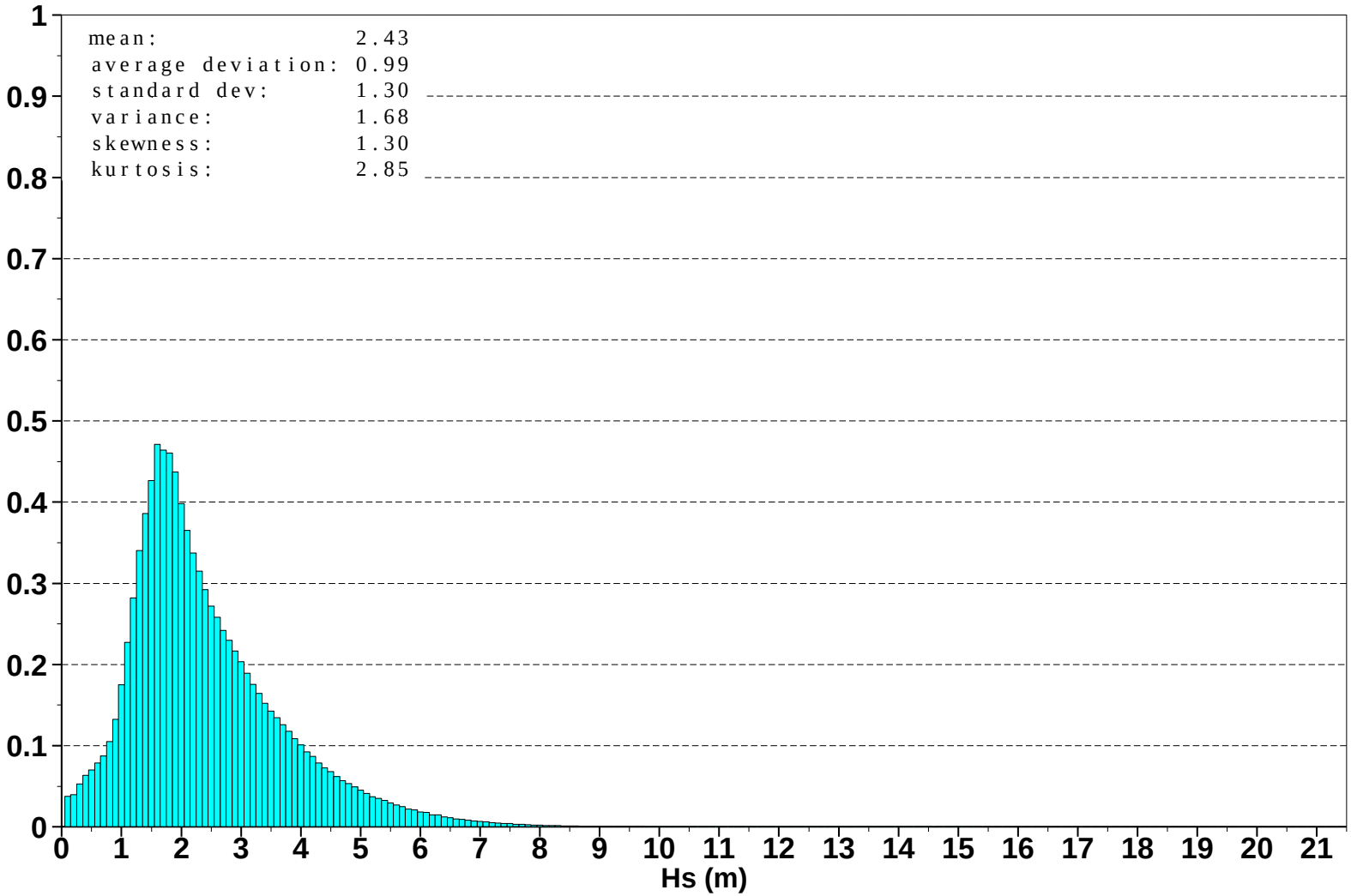
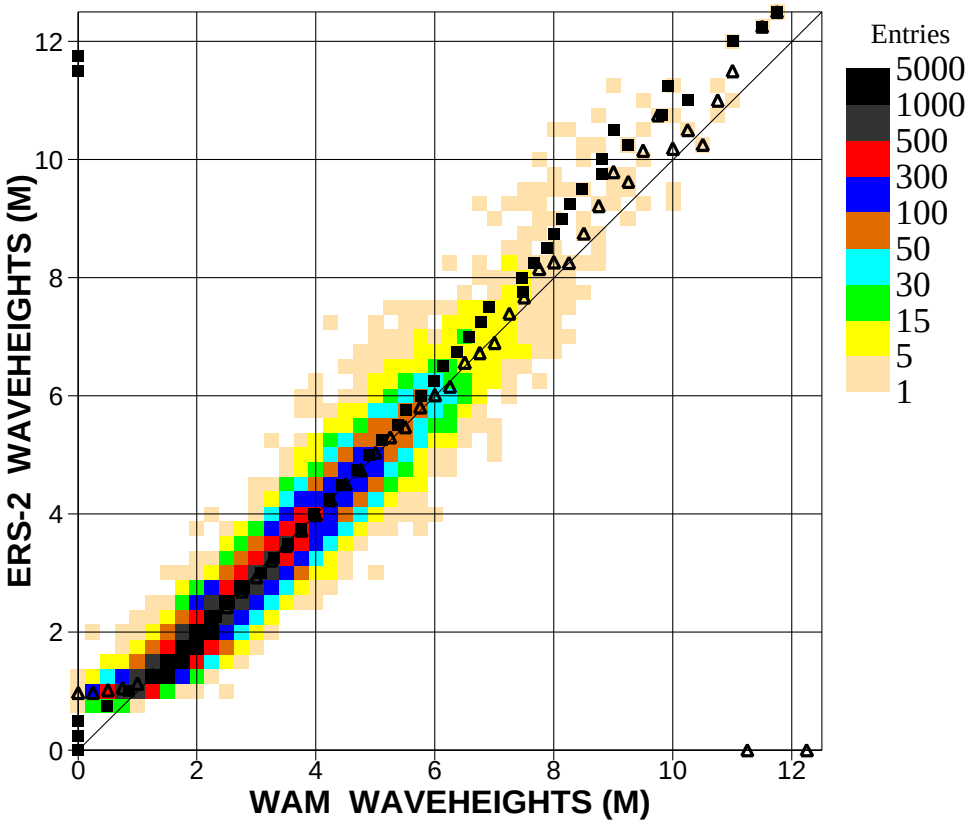


Figure 16: Global distribution of ECMWF wave heights for June 2001

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

ECMWF Report on ERS-2 RA for June 2001

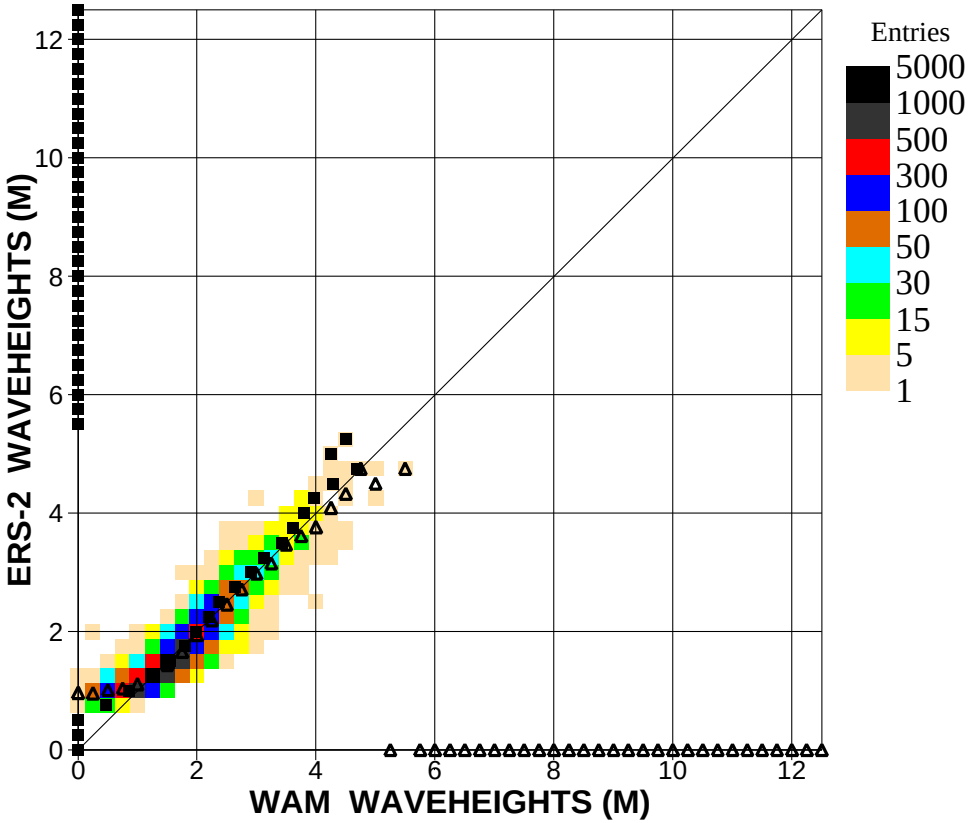


STATISTICS

ENTRIES	42727
MEAN WAM	2.4988
MEAN ERS-2	2.4745
BIAS (ERS-2 - WAM)	-0.0243
STANDARD DEVIATION	0.2897
SCATTER INDEX	0.1159
CORRELATION	0.9740
SYMMETRIC SLOPE	0.9957(0.0011)
REGR. COEFFICIENT	0.9907(0.0011)
REGR. CONSTANT	-0.0010(0.0031)

Figure 17. Comparison of ECMWF wave height results with ERS2 Altimeter wave height data for June 2001 (global)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

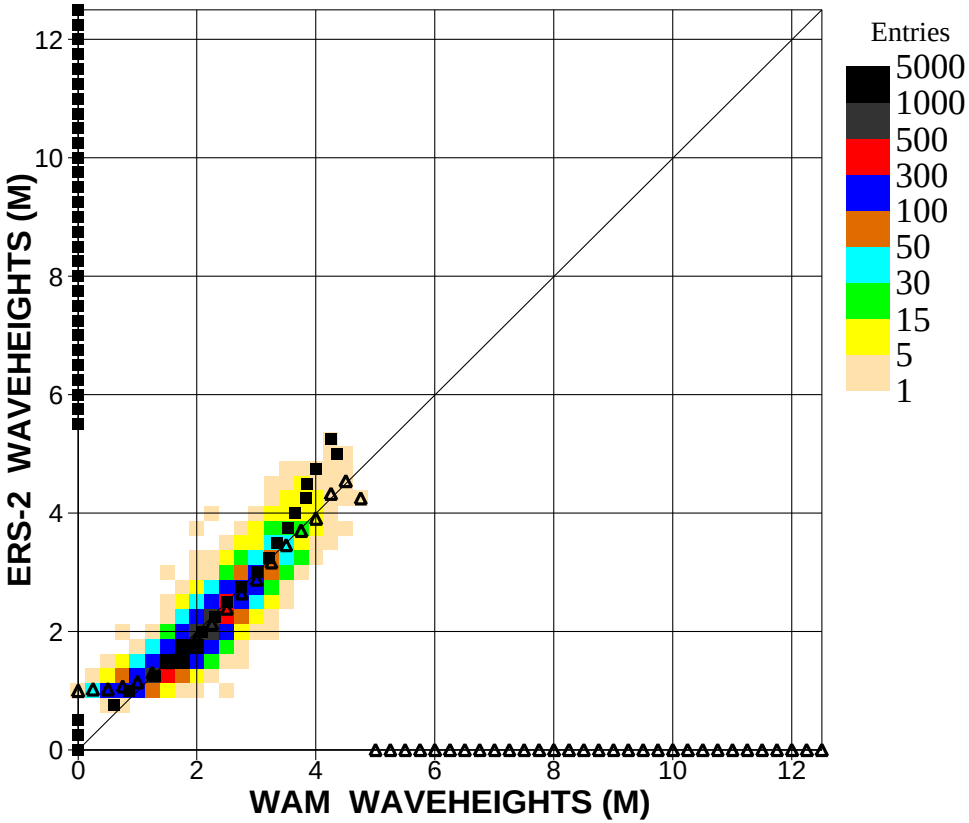


STATISTICS

ENTRIES	10780
MEAN WAM	1.5423
MEAN ERS-2	1.5547
BIAS (ERS-2 - WAM)	0.0124
STANDARD DEVIATION	0.2285
SCATTER INDEX	0.1482
CORRELATION	0.9217
SYMMETRIC SLOPE	0.9967(0.0037)
REGR. COEFFICIENT	0.8433(0.0034)
REGR. CONSTANT	0.2540(0.0056)

Figure 18. Comparison of ECMWF wave height results with ERS2 Altimeter wave height data for June 2001 (n.hem.)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

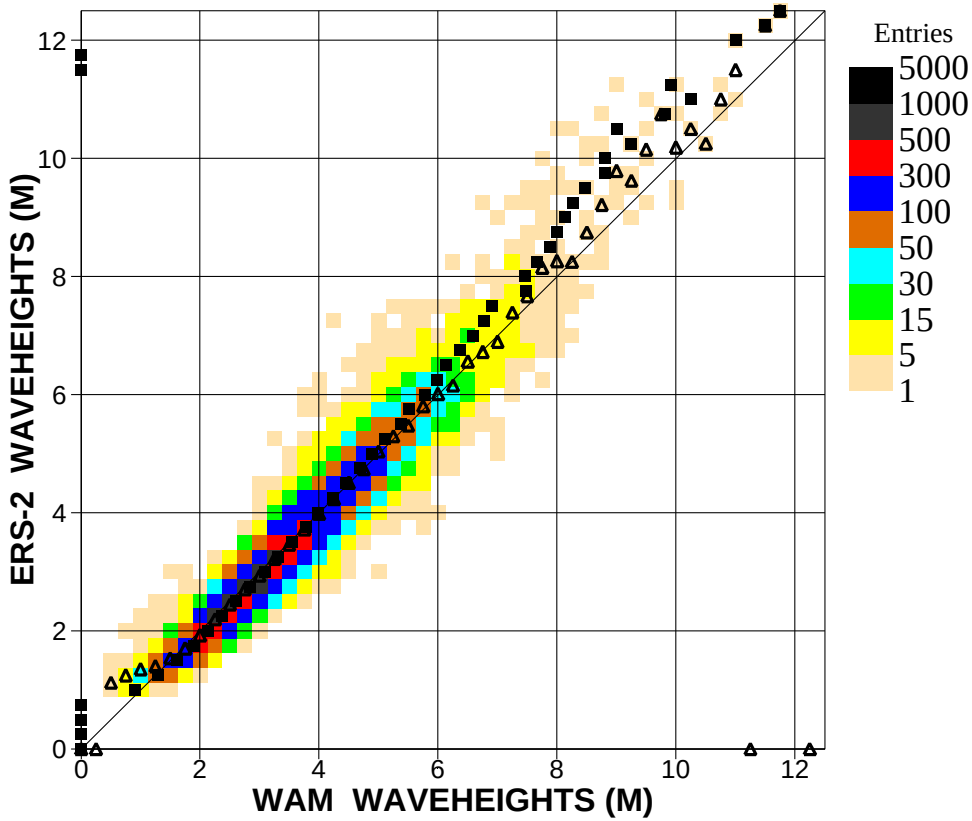


STATISTICS

ENTRIES	13807
MEAN WAM	1.9611
MEAN ERS-2	1.9060
BIAS (ERS-2 - WAM)	-0.0551
STANDARD DEVIATION	0.2295
SCATTER INDEX	0.1170
CORRELATION	0.9229
SYMMETRIC SLOPE	0.9713(0.0032)
REGR. COEFFICIENT	0.8899(0.0032)
REGR. CONSTANT	0.1607(0.0065)

Figure 19. Comparison of ECMWF wave height results with ERS2 Altimeter wave height data for June 2001 (tropics)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

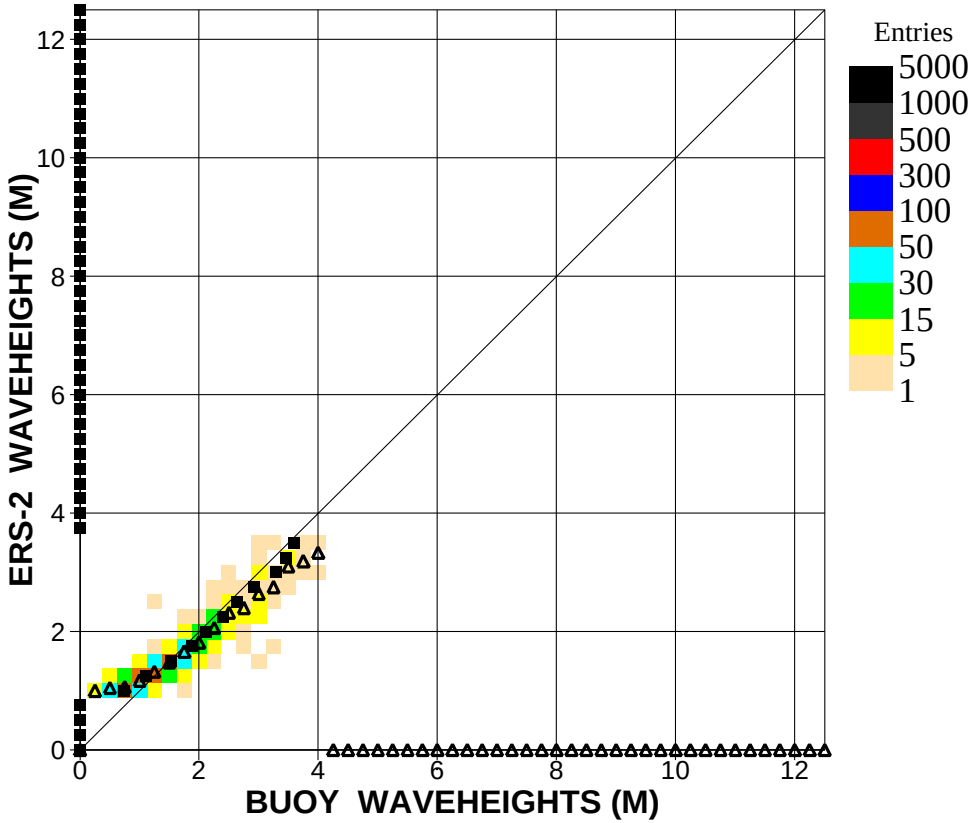


STATISTICS

ENTRIES	18464
MEAN WAM	3.4509
MEAN ERS-2	3.4277
BIAS (ERS-2 - WAM)	-0.0231
STANDARD DEVIATION	0.3518
SCATTER INDEX	0.1019
CORRELATION	0.9639
SYMMETRIC SLOPE	1.0011(0.0021)
REGR. COEFFICIENT	1.0214(0.0021)
REGR. CONSTANT	-0.0971(0.0076)

Figure 20. Comparison of ECMWF wave height results with ERS2 Altimeter wave height data for June 2001 (s.hem.)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

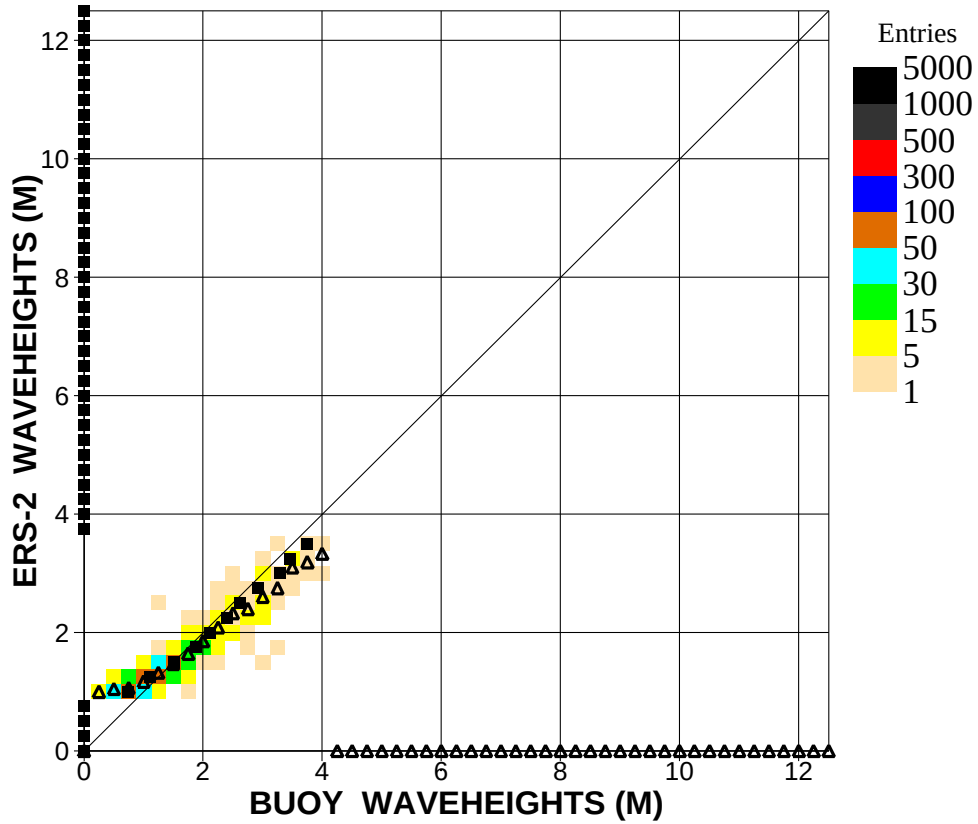


STATISTICS

ENTRIES	712	
MEAN BUOY	1.5085	
MEAN ERS-2	1.5517	
BIAS (ERS-2 - BUOY)	0.0432	
STANDARD DEVIATION	0.3015	
SCATTER INDEX	0.1998	
CORRELATION	0.9319	
SYMMETRIC SLOPE	0.9795	(0.0154)
REGR. COEFFICIENT	0.6826	(0.0100)
REGR. CONSTANT	0.5220	(0.0167)

Figure 21. Comparison of buoy wave height observations with ERS2 Altimeter wave height data for June 2001 (global)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

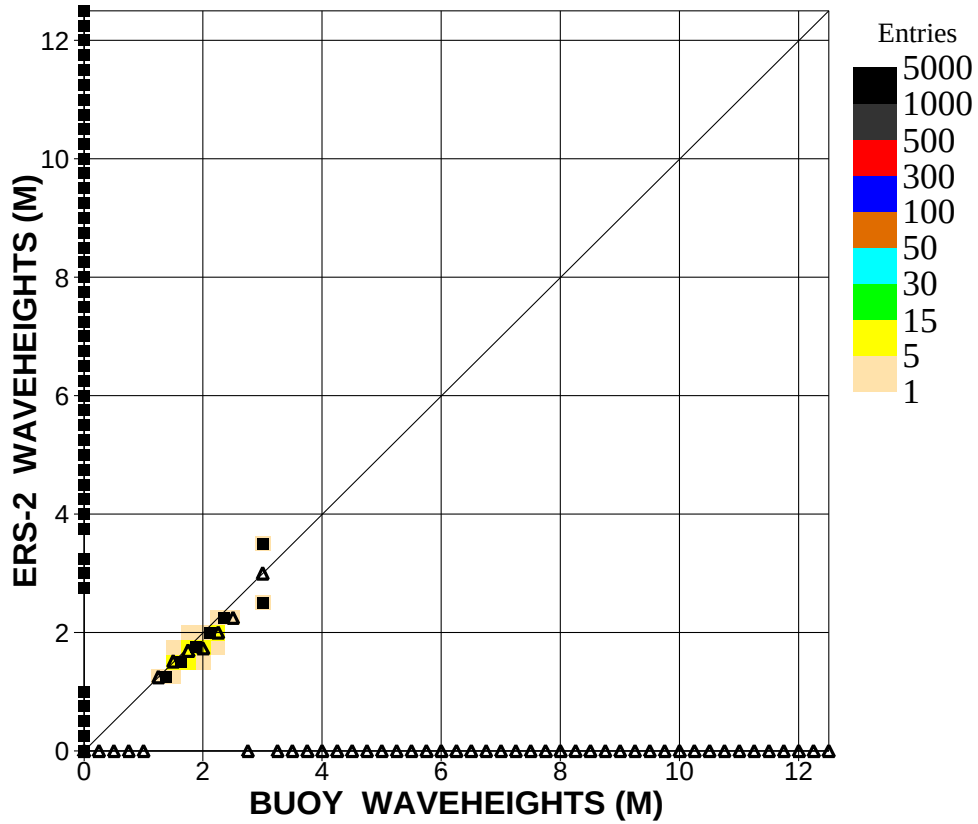


STATISTICS

ENTRIES	635	
MEAN BUOY	1.4644	
MEAN ERS-2	1.5266	
BIAS (ERS-2 - BUOY)	0.0622	
STANDARD DEVIATION	0.3077	
SCATTER INDEX	0.2101	
CORRELATION	0.9344	
SYMMETRIC SLOPE	0.9860	(0.0165)
REGR. COEFFICIENT	0.6840	(0.0104)
REGR. CONSTANT	0.5249	(0.0171)

Figure 22. Comparison of buoy wave height observations with ERS2 Altimeter wave height data for June 2001 (n.hem.)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int



STATISTICS

ENTRIES	74	
MEAN BUOY	1.8805	
MEAN ERS-2	1.7616	
BIAS (ERS-2 - BUOY)	-0.1189	
STANDARD DEVIATION	0.1815	
SCATTER INDEX	0.0965	
CORRELATION	0.8412	
SYMMETRIC SLOPE	0.9366	(0.0621)
REGR. COEFFICIENT	0.7840	(0.0594)
REGR. CONSTANT	0.2873	(0.1134)

Figure 23. Comparison of buoy wave height observations with ERS2 Altimeter wave height data for June 2001 (hawaii)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

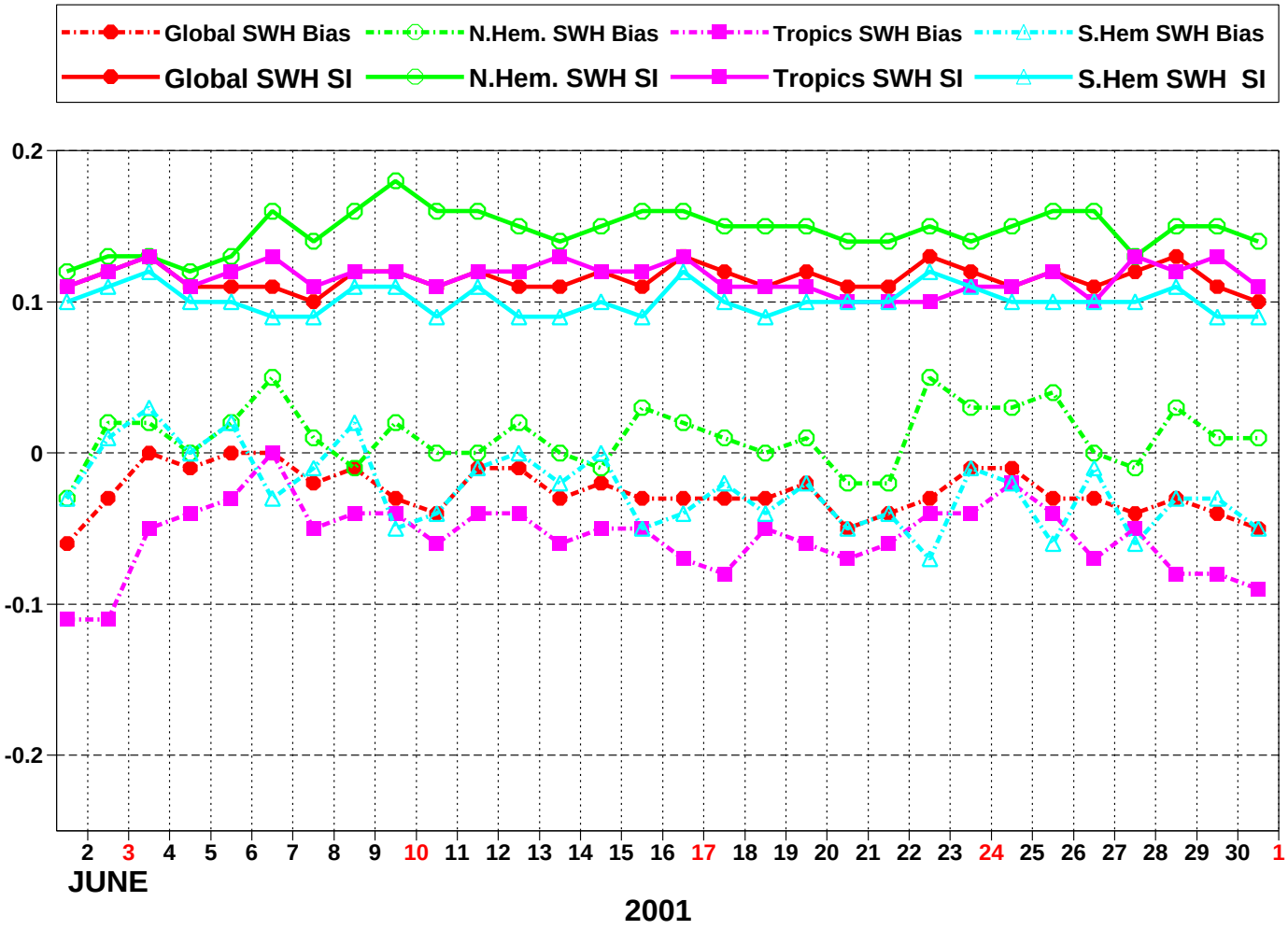


Figure 24: ERS-2 Altimeter wave heights: Timeseries of bias (ERS-2 - model) and scatter index (SI)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

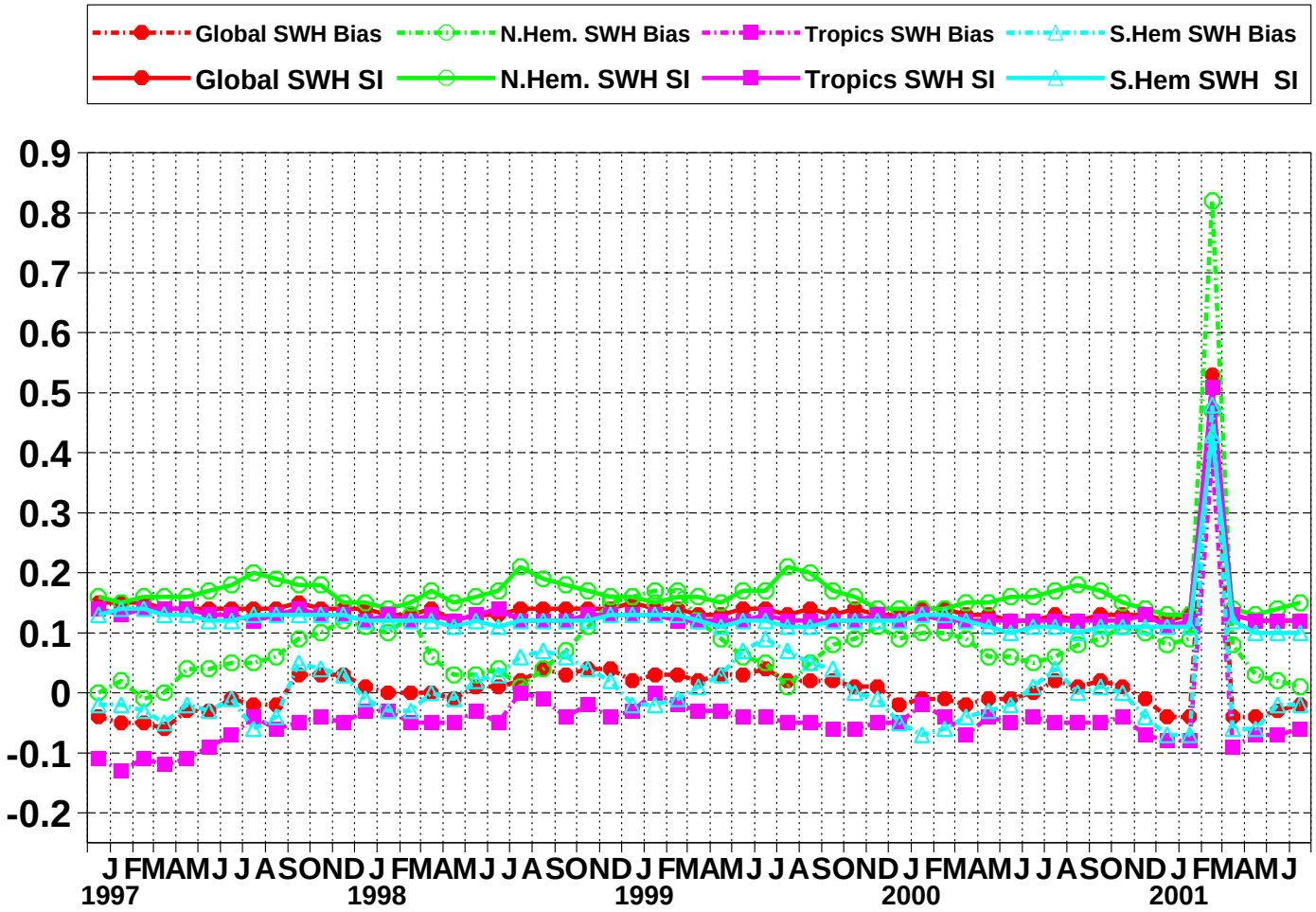


Figure 25: ERS-2 Altimeter wave heights: Timeseries of bias (ERS-2 - model) and scatter index (SI)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int

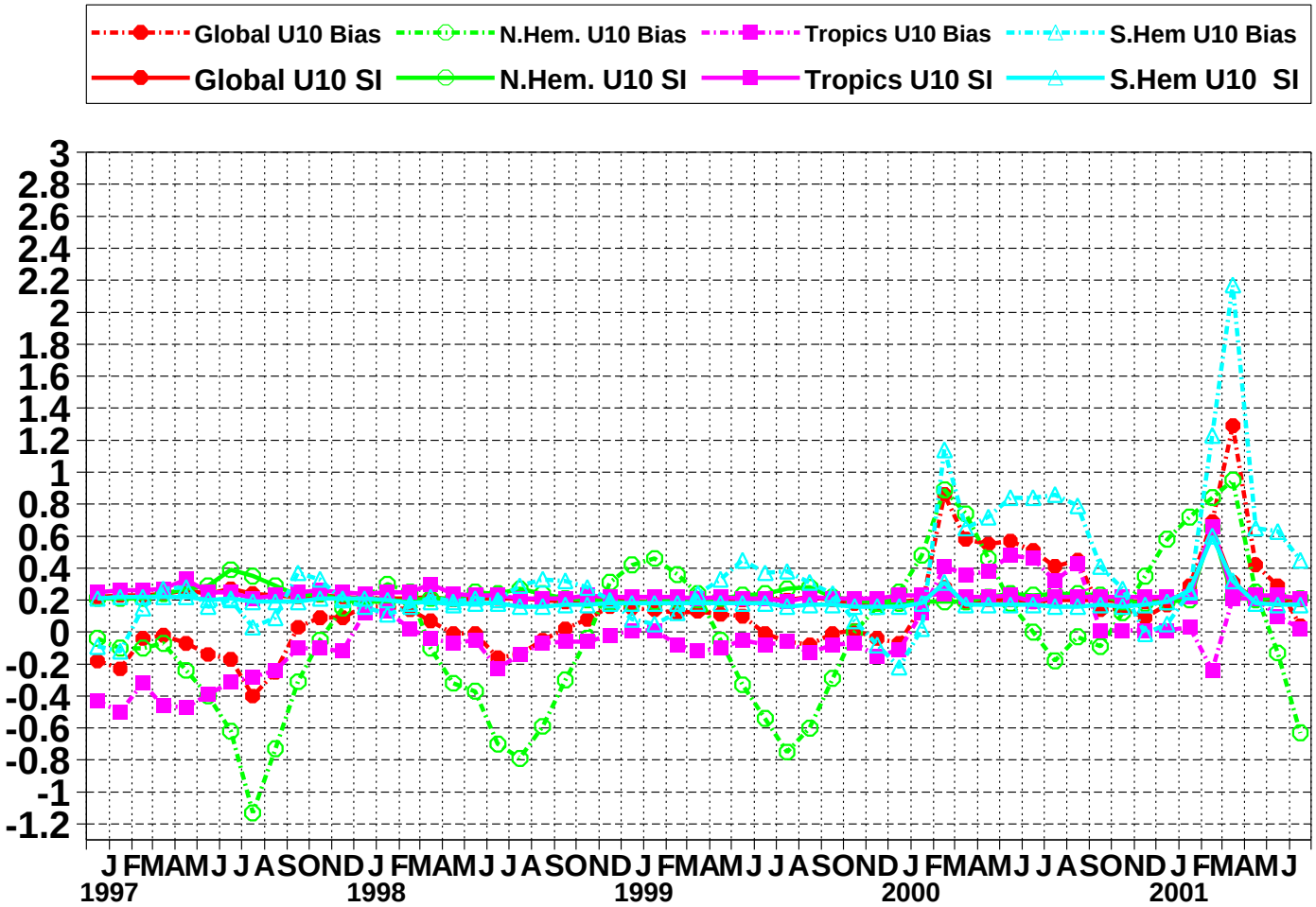


Figure 26: ERS-2 Altimeter wind speeds: Timeseries of bias (ERS-2 - model) and scatter index (SI)

Saleh Abdalla
European Centre for Medium Range Weather Forecasts
Shinfield Park, Reading, Berkshire RG2 9AX, England
Telephone: U.K. (0118) 949 9703, International (+44 118) 949 9703
Telex 984 7908 ECMWF G, Telefax (0118) 986 9450, e-mail: abdalla@ecmwf.int