

■ ECMWF Report on ERS-2 RA for February 2002 ■

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

By: Saleh Abdalla

Date: 6 March 2002

Overview:

Based on the data received during the full month, on average, 15984 observations arrived at ECMWF every 6 hours of which 82.9% passed the quality control. The data coverage, which was rather good, can be seen in Figure 1. Data were missed during a period of about 6 hours (around 06:00 UTC) on the 3rd. of the month. Significant reduction of data occurred only at time slots centred at: 12: 00 on the 7th. and 00: 00 UTC on the 17th. of the month. Note that we are talking about the raw data which have arrived at ECMWF before they were processed. The wave data was as good as usual. Apart from the active impact of the DES Sun- Blinding phenomenon which affects the quality of the wind speeds in the Southern Hemisphere and an anomaly on the February 24 (see remarks below), the quality of the received wind data is as usual.

Backscatter:

ESR-2 $\langle \sigma_0 \rangle$ = 10.88 dB (with a main peak at 11.1 dB and a secondary peak at 10.6 dB)

Wind Speed Comparison with ECMWF wind speeds (bias):

ERS-2 global: 0.303 m/s

ERS-2 northern hemisphere: 0.368 m/s

ERS-2 tropics: -0.088 m/s

ERS-2 southern hemisphere: 0.520 m/s



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Wind Speed Comparison with buoy wind speeds (bias):

ERS-2 global: -0.088 m/s

ERS-2 northern hemisphere: 0.009 m/s

ERS-2 tropics: -0.594 m/s

Wave Height Comparison with ECMWF wave heights (bias):

ERS-2 global: -0.044 m (lowest waves measured: 0.6m)

ERS-2 northern hemisphere: 0.077 m

ERS-2 tropics: -0.070 m

ERS-2 southern hemisphere: -0.086 m

Wave Height Comparison with buoy wave heights (bias):

ERS-2 global: -0.18 m

ERS-2 northern hemisphere: -0.18 m

ERS-2 tropics: -0.27 m

Remarks:

- As has been pointed out in the previous reports, most of the outliers (RA values higher than model) in the scatter plot for the wind speeds in the Southern Hemisphere (Figure 9) can be attributed to the “DES Sun- Blinding” phenomenon



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which was active almost the whole month. This was verified with reference to the “ERS- 2 Performance Reports” web page available at <http://ersmonrp.esoc.esa.de/start.htm>.

- The few extreme outliers in the wind scatter plot of the Tropics (Figure 8) were due to apparent anomaly in the altimeter performance. Figure 27 show the time series of the RA wind speed along the ERS-2 track during the period in between 06:12 and 06:58 UTC on 24 February 2002. It can be clearly seen that the RA wind speed shot-up above 20 m/s at around 10°S before it dropped to zero around the equator then shooting-up again at around 20°N and finally went back to its normal status.
- The quality of Altimeter wave height data is as good as it used to be.

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.



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Figure captions:

- Figure 1: Time series of data reception for ERS-2 Altimeter data for February 2002.
- Figure 2: Distribution of the ERS-2 Altimeter Backscatter after QC for February 2002.
- Figure 3: Distribution of the ERS-2 Altimeter wind speeds after QC for February 2002.
- Figure 4: Distribution of the ERS-2 Altimeter wind speeds after along track averaging for February 2002.
- Figure 5: Global distribution of ECMWF ocean surface wind speeds for February 2002.
- Figure 6: Comparison of ECMWF wind speed results with ERS-2 Altimeter wind speed data for February 2002 (global).
- Figure 7: Comparison of ECMWF wind speed results with ERS-2 Altimeter wind speed data for February 2002 (northern hemisphere)
- Figure 8: Comparison of ECMWF wind speed results with ERS-2 Altimeter wind speed data for February 2002 (tropics)
- Figure 9: Comparison of ECMWF wind speed results with ERS-2 Altimeter wind speed data for February 2002 (southern hemisphere)
- Figure 10: Comparison of buoy wind speed observations with ERS-2 Altimeter wind speed data for February 2002 (global).
- Figure 11: Comparison of buoy wind speed observations with ERS-2 Altimeter wind speed data for February 2002 (northern hemisphere).
- Figure 12: Comparison of buoy wind speed observations with ERS-2 Altimeter wind speed data for February 2002 (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 February 2002.
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- Figure 20: Comparison of ECMWF wave height results with ERS-2 Altimeter wave height data for February 2002 (southern hemisphere)
- Figure 21: Comparison of buoy wave height observations with ERS-2 Altimeter wave height data for February 2002 (global).
- Figure 22: Comparison of buoy wave height observations with ERS-2 Altimeter wave height data for February 2002 (northern hemisphere).



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Figure 23: Comparison of buoy wave height observations with ERS-2 Altimeter wave height data for February 2002 (tropics).

Figure 24: ERS-2 Altimeter wave heights: Timeseries of bias (ERS-2 - model) and scatter index (SI) for February 2002.

Figure 25: ERS-2 Altimeter wave heights: Timeseries of bias (ERS-2 - model) and scatter index (SI) from December 1996 to February 2002

Figure 26: ERS-2 Altimeter wind speeds: Timeseries of bias (ERS-2 - model) and scatter index (SI) from December 1996 to February 2002

Figure 27: Timeseries of wind speed along ERS-2 track between 06:12 and 06:58 UTC on 24 February 2002.



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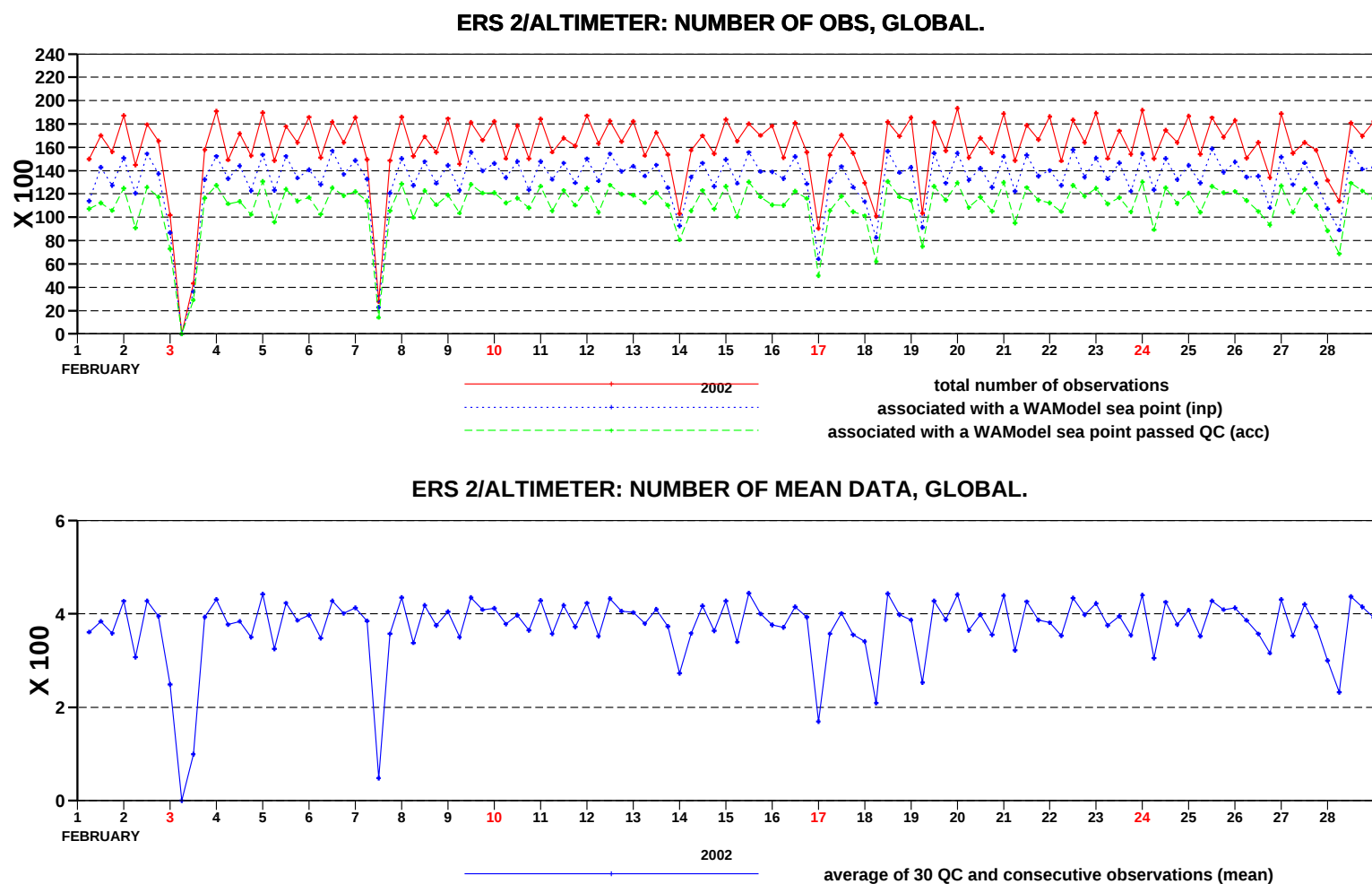


Figure 1: Time series of data reception for ERS-2 Altimeter data for February 2002

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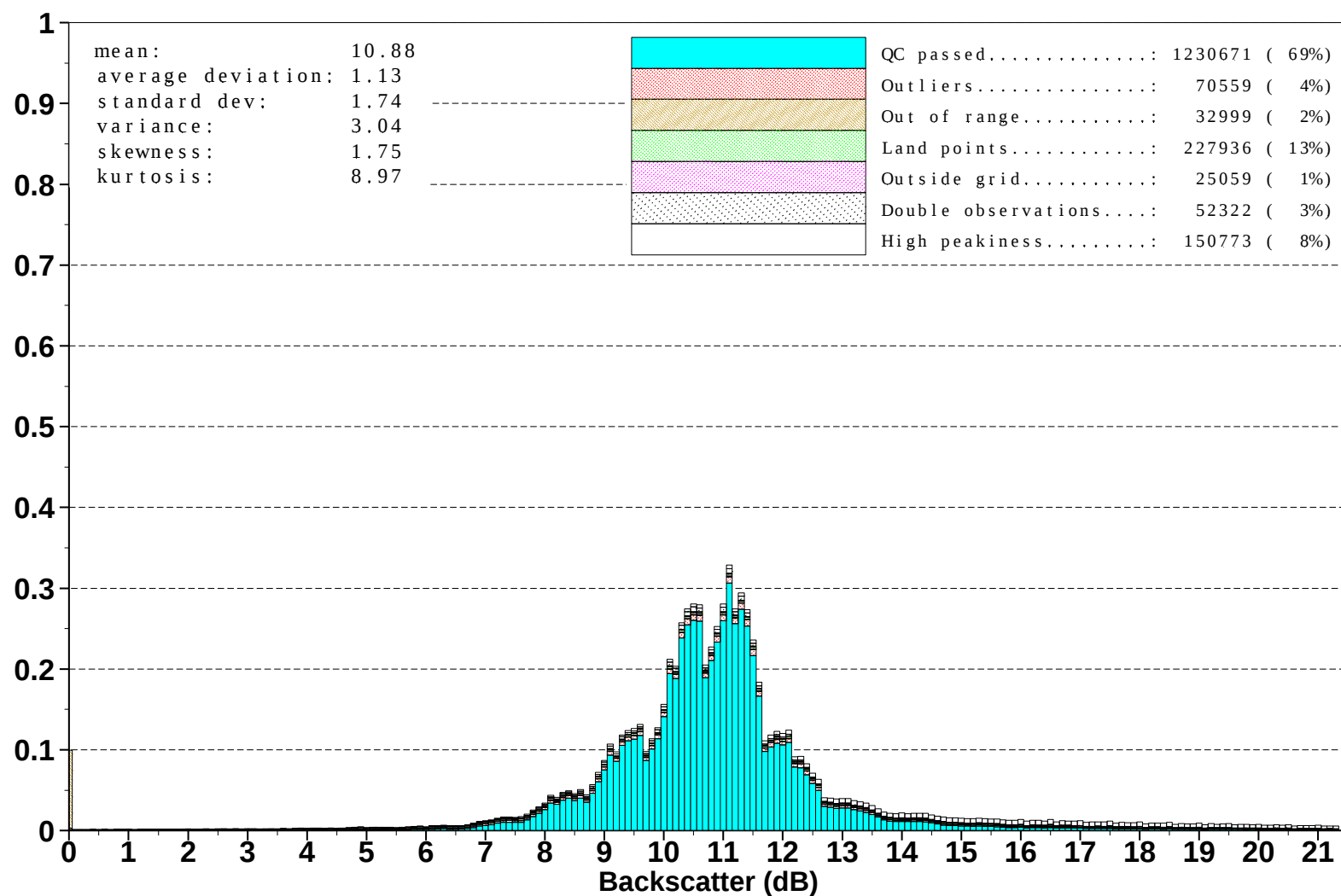


Figure 2: Distribution of the ERS-2 Altimeter backscatter after QC for February 2002



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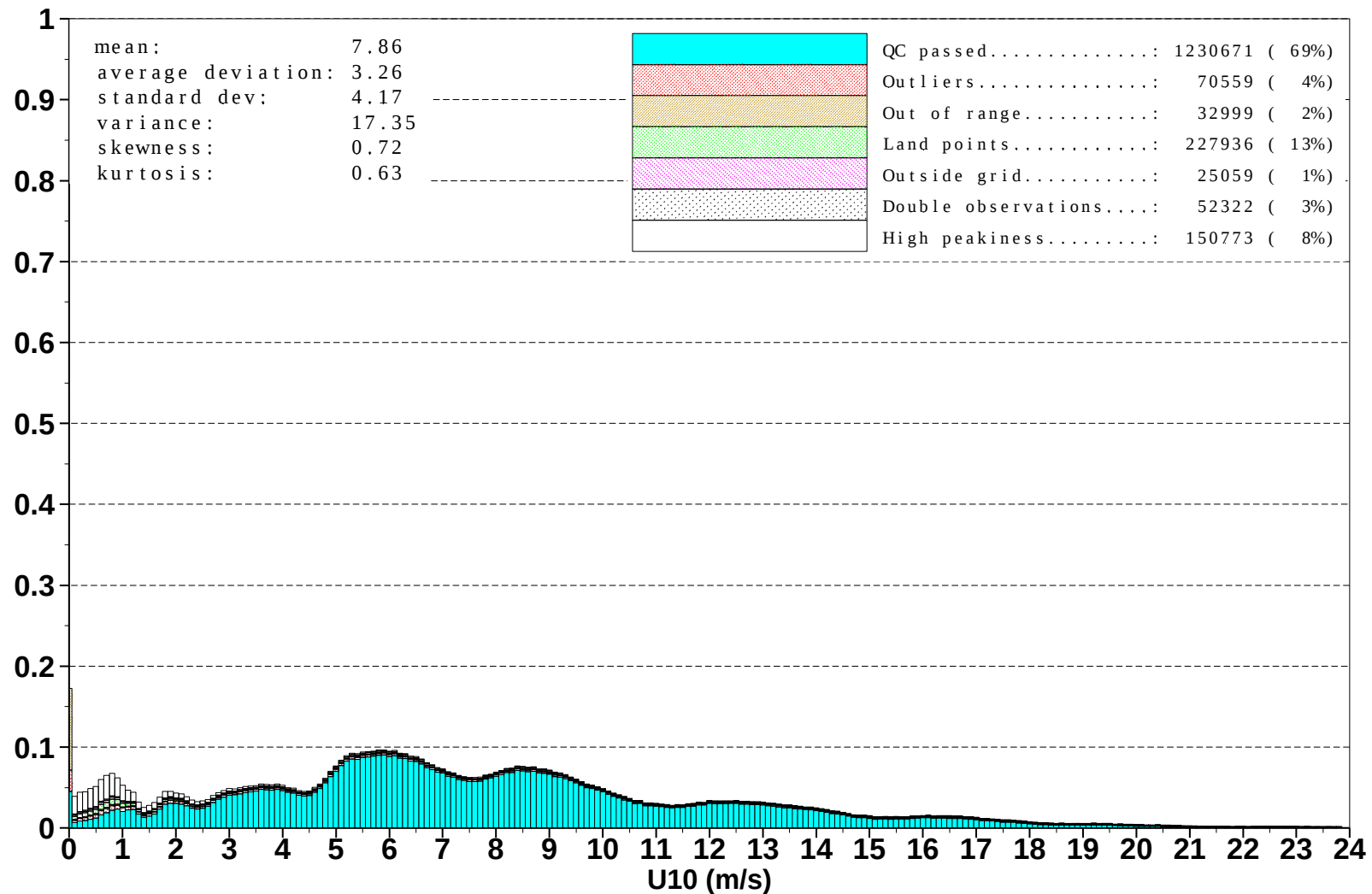


Figure 3: Distribution of the ERS-2 Altimeter wind speeds after QC for February 2002



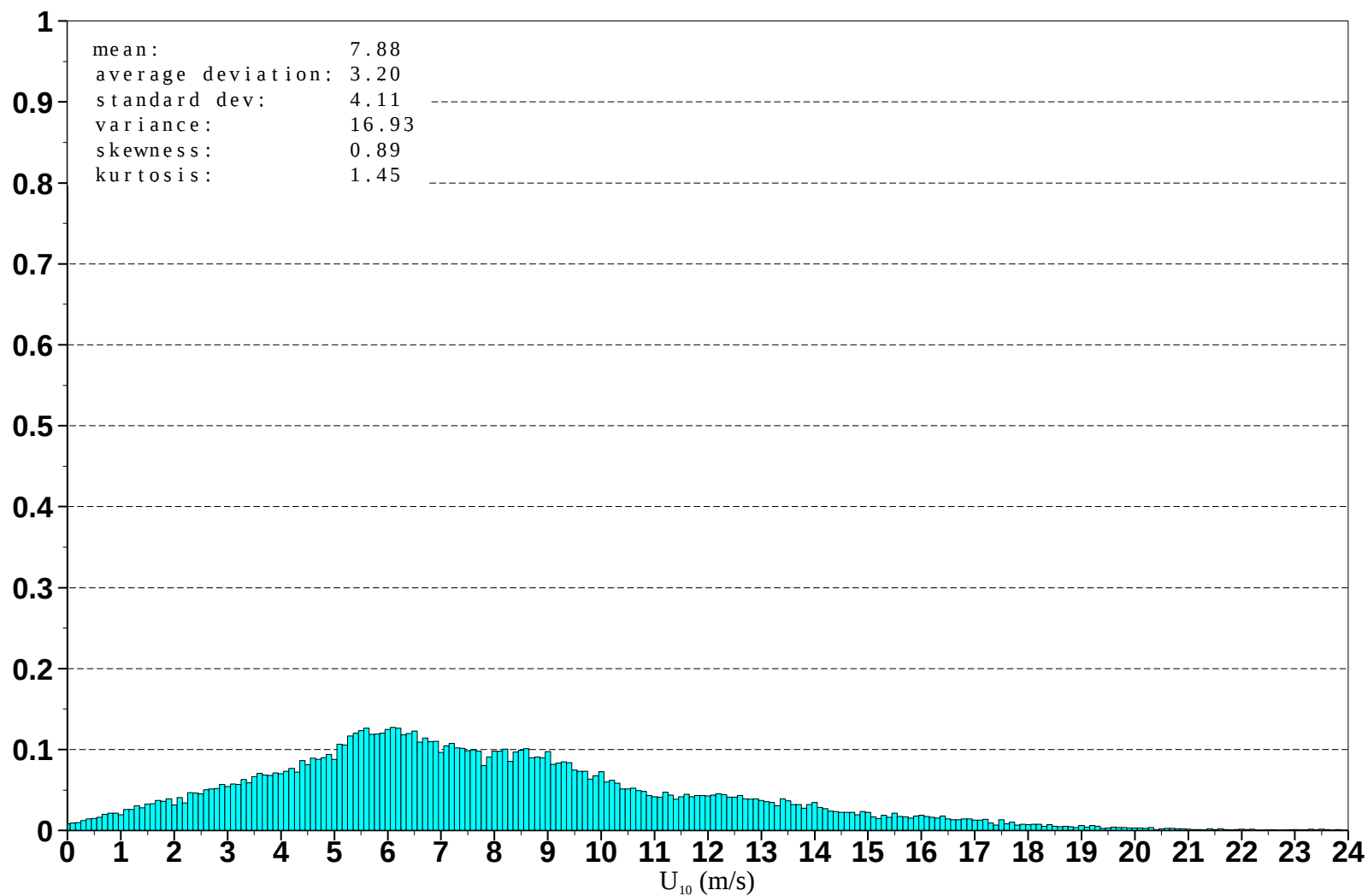
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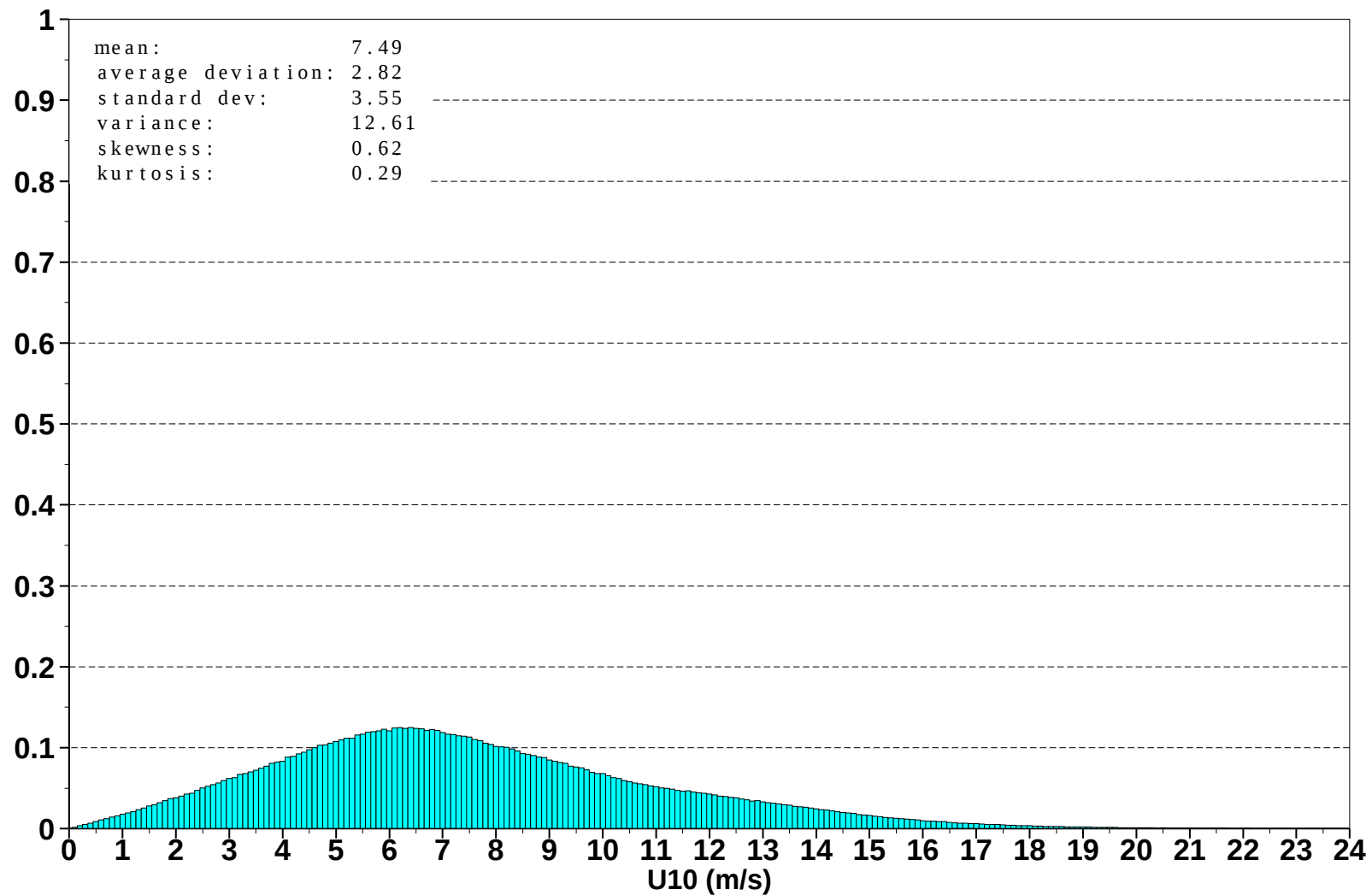


Figure 5: Global distribution of ECMWF ocean surface wind speeds for February 2002



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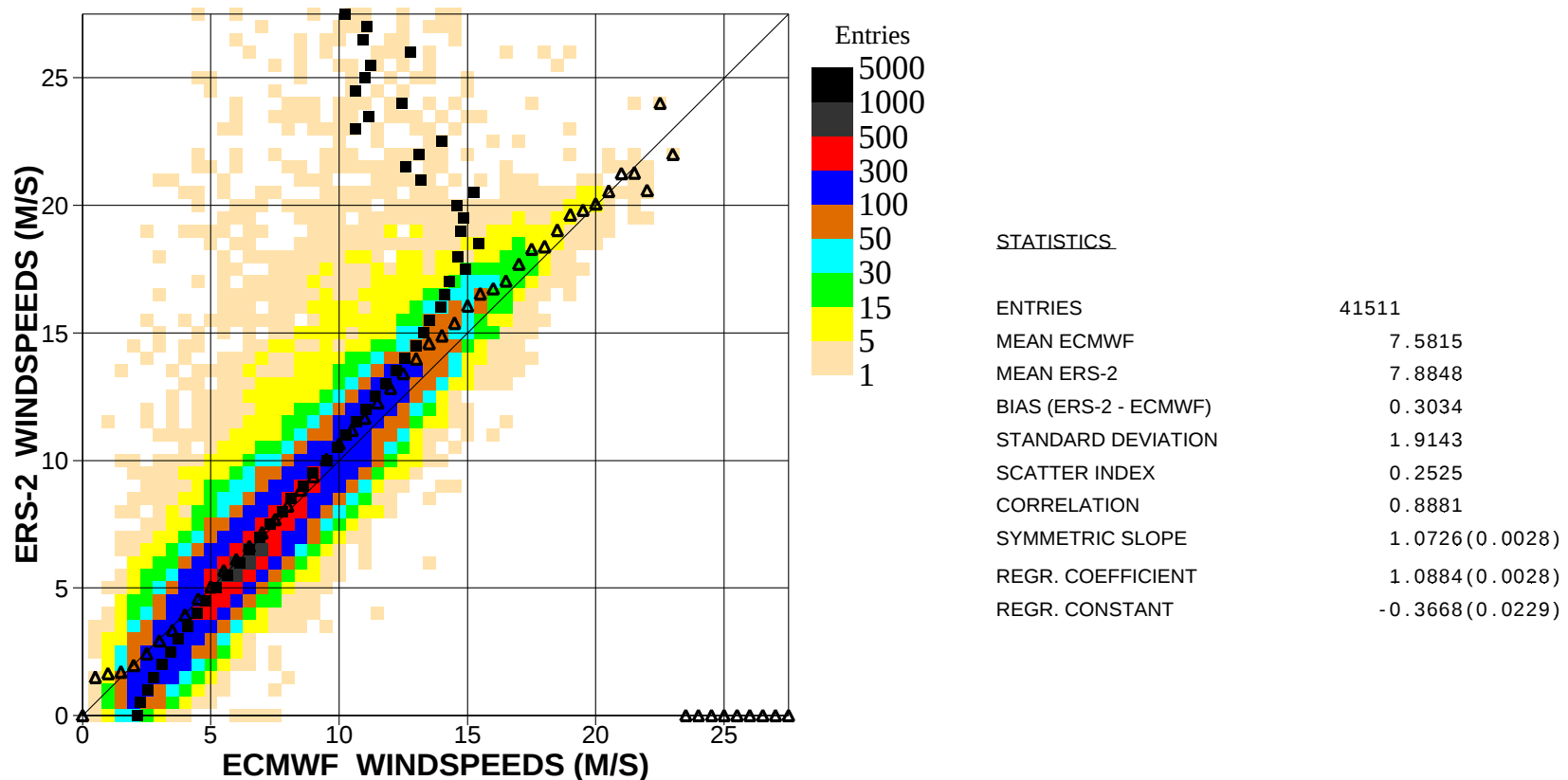


Figure 6. Comparison of ECMWF wind speed results with ERS2 Altimeter wind speed data for February 2002 (global)

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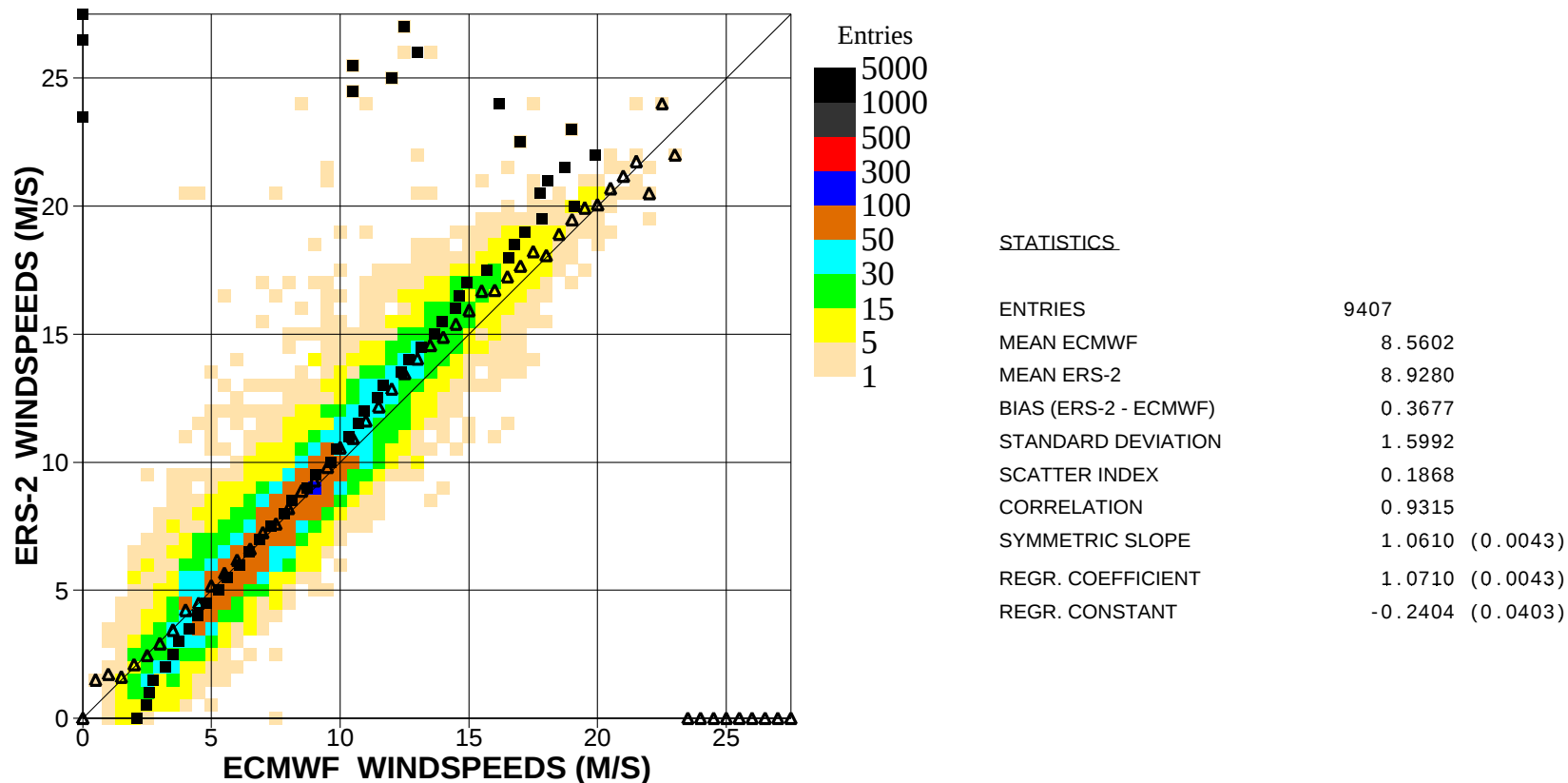


Figure 7. Comparison of ECMWF wind speed results with ERS2 Altimeter wind speed data for February 2002 (n.hem.)

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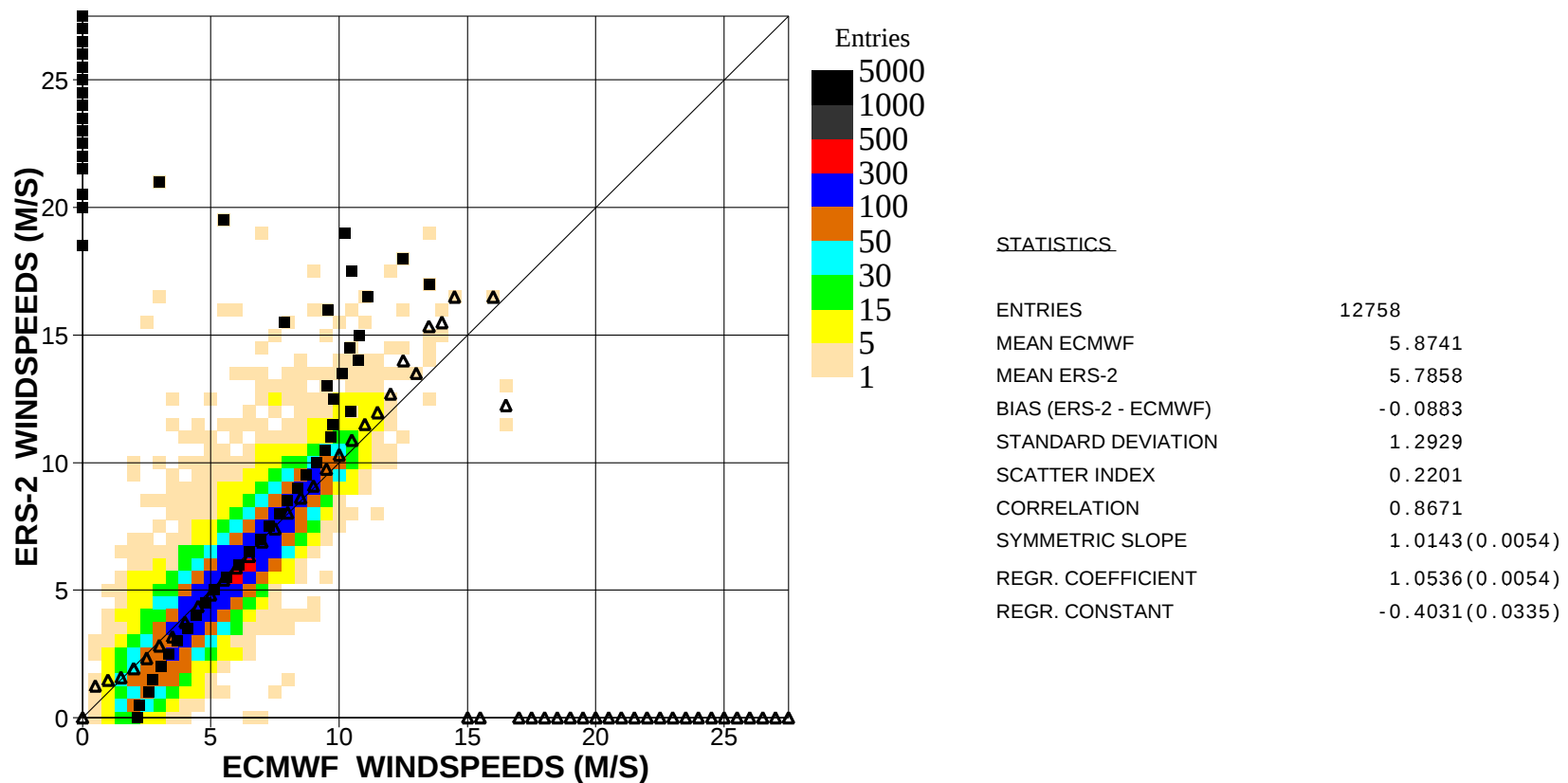


Figure 8. Comparison of ECMWF wind speed results with ERS2 Altimeter wind speed data for February 2002 (tropics)

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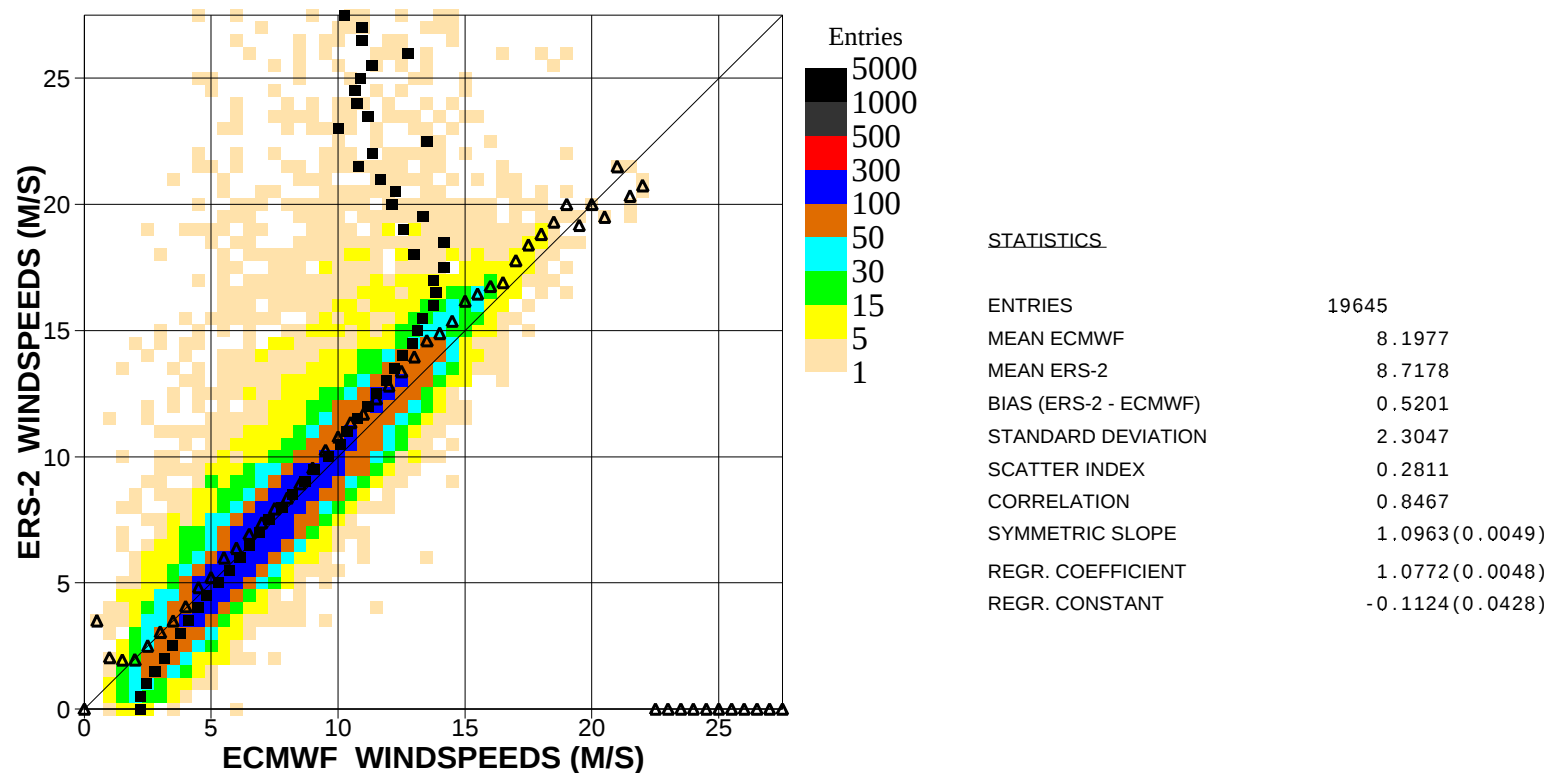


Figure 9. Comparison of ECMWF wind speed results with ERS2 Altimeter wind speed data for February 2002 (s.hem.)

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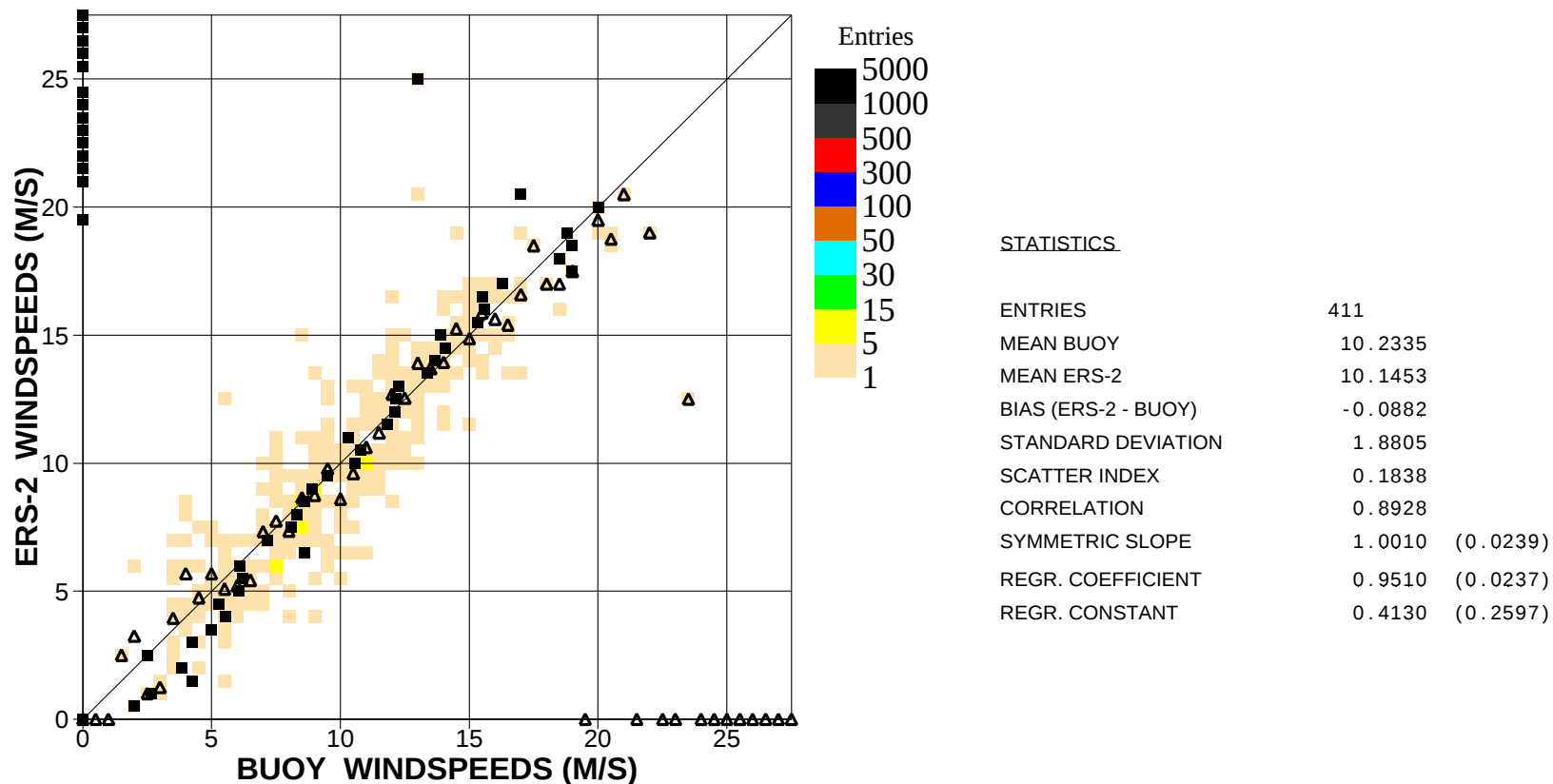


Figure 10. Comparison of buoy wind speed observations with ERS2 Altimeter wind speed data for February 2002 (global)

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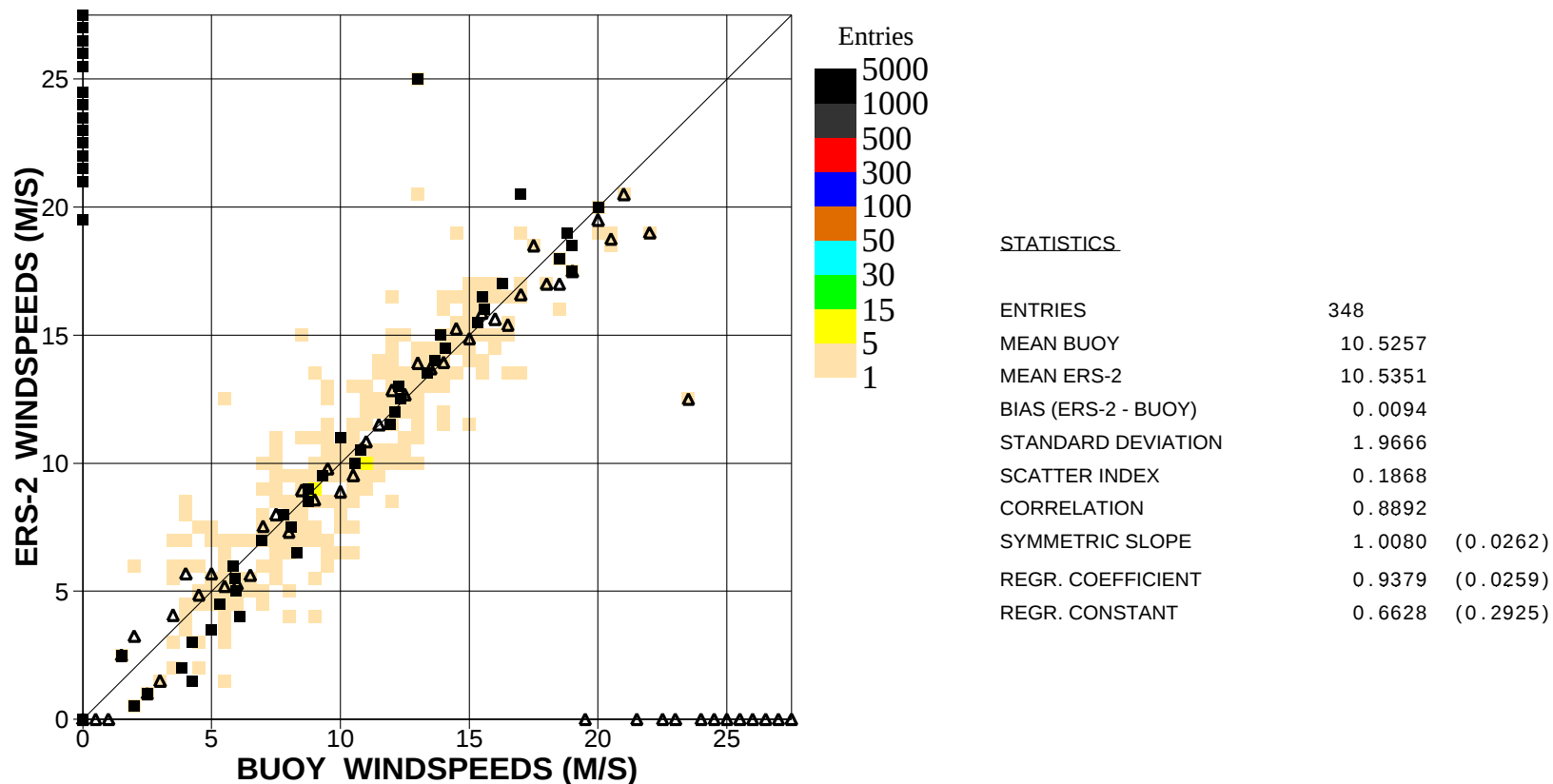


Figure 11. Comparison of buoy wind speed observations with ERS2 Altimeter wind speed data for February 2002 (n.hem.)

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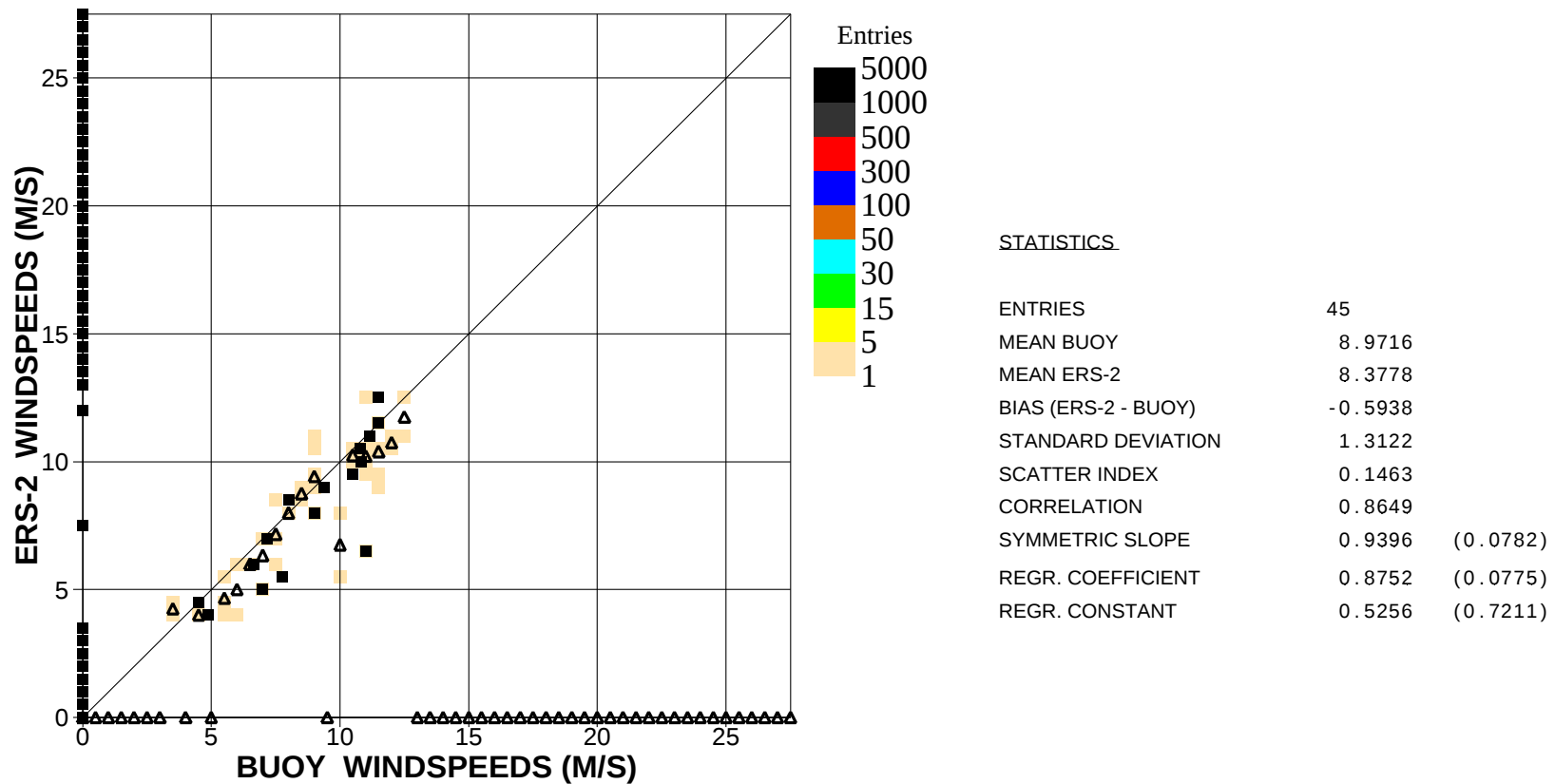


Figure 12. Comparison of buoy wind speed observations with ERS2 Altimeter wind speed data for February 2002 (hawaii)

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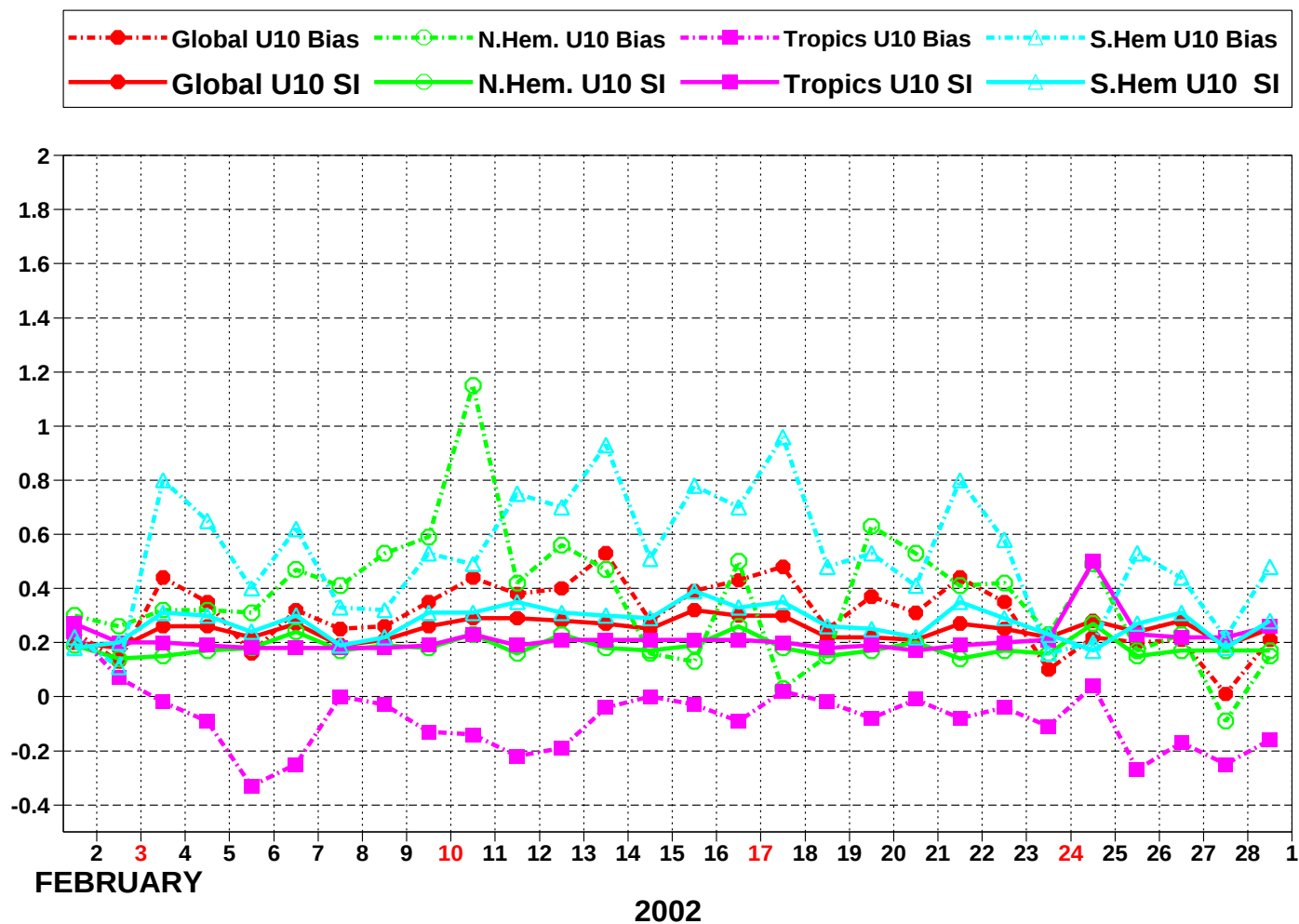


Figure 13: ERS-2 Altimeter wind speeds: Timeseries of bias (ERS-2 - model) and scatter index (SI)

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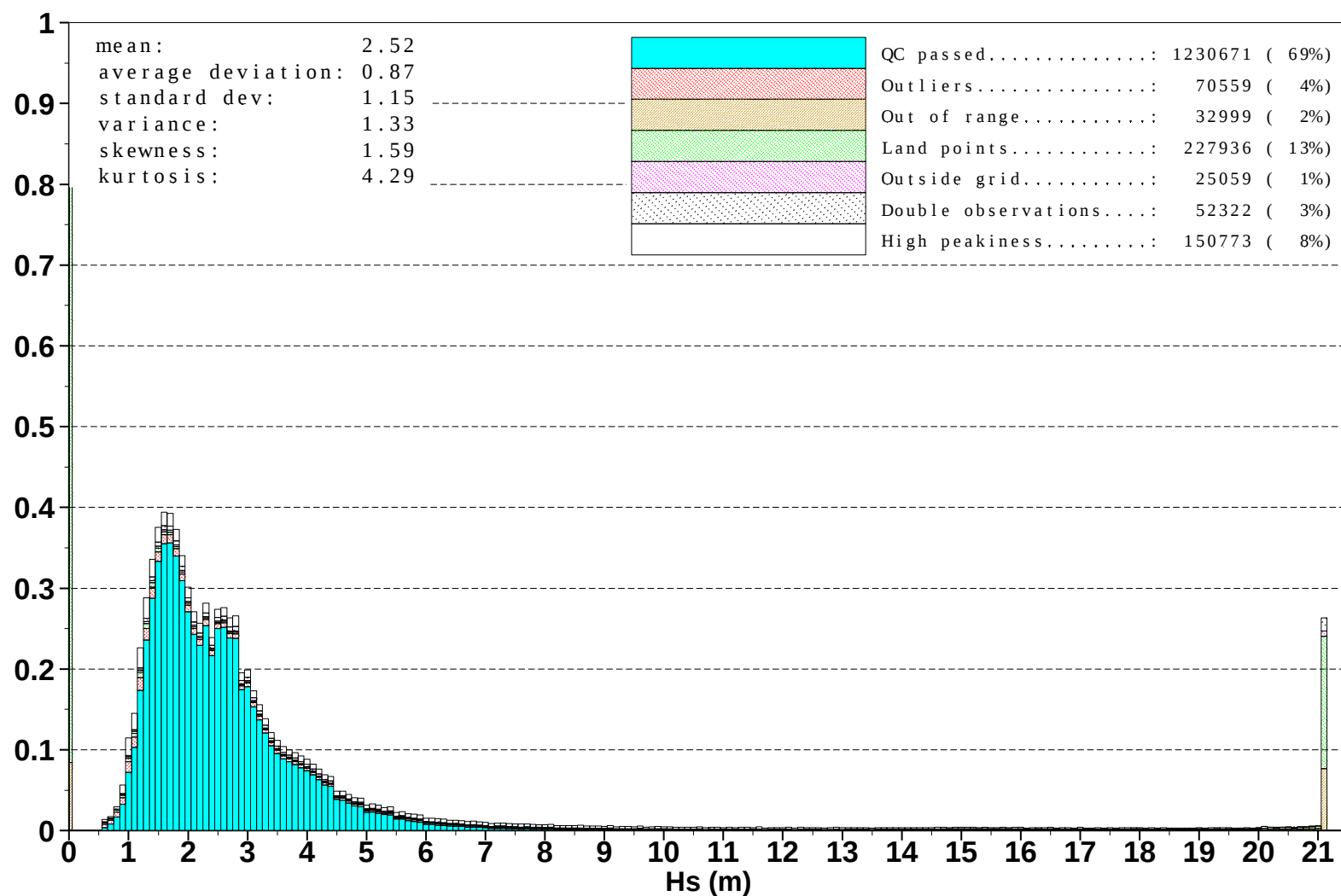
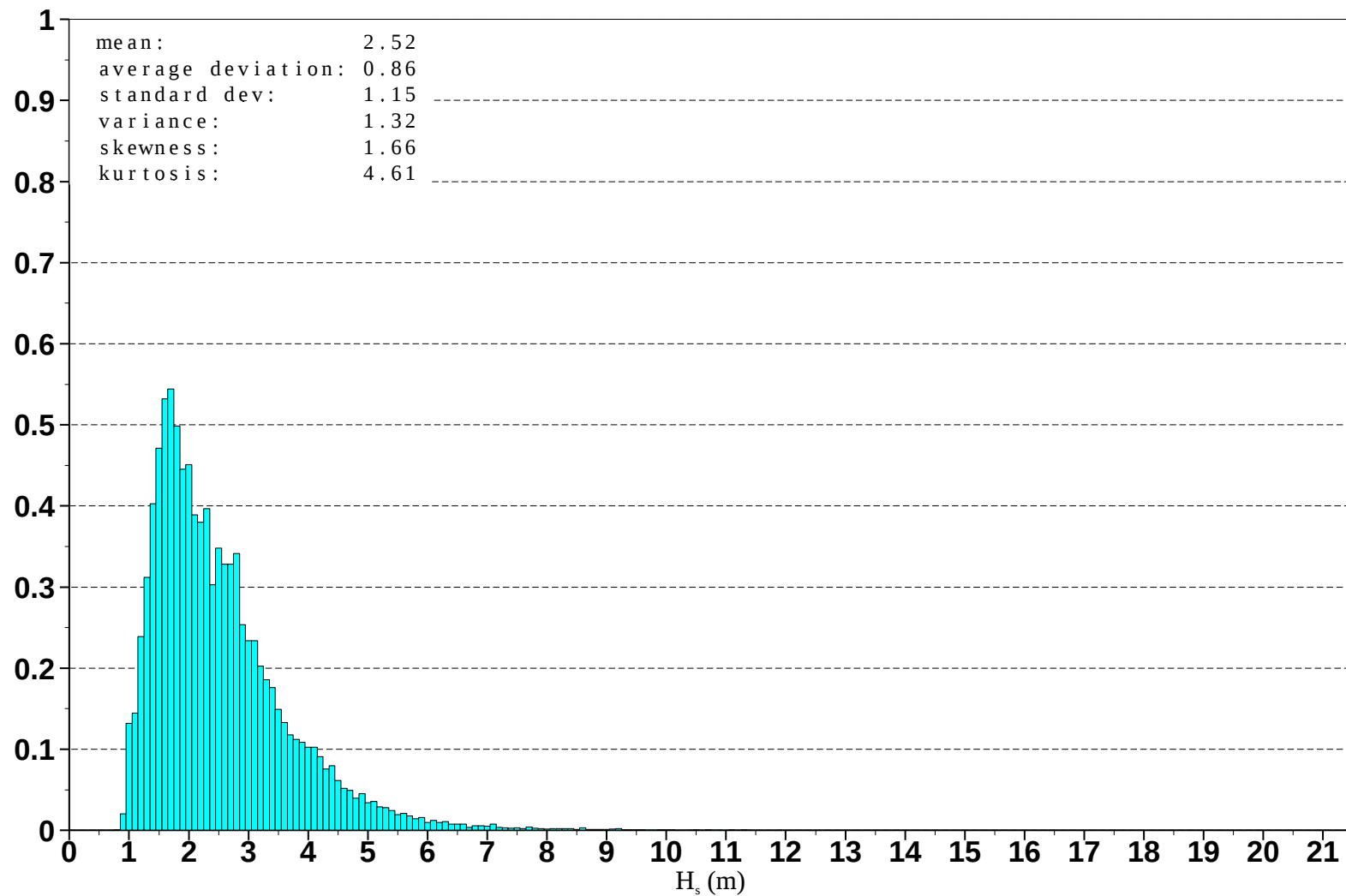


Figure 14: Distribution of the ERS-2 Altimeter wave heights after QC for February 2002



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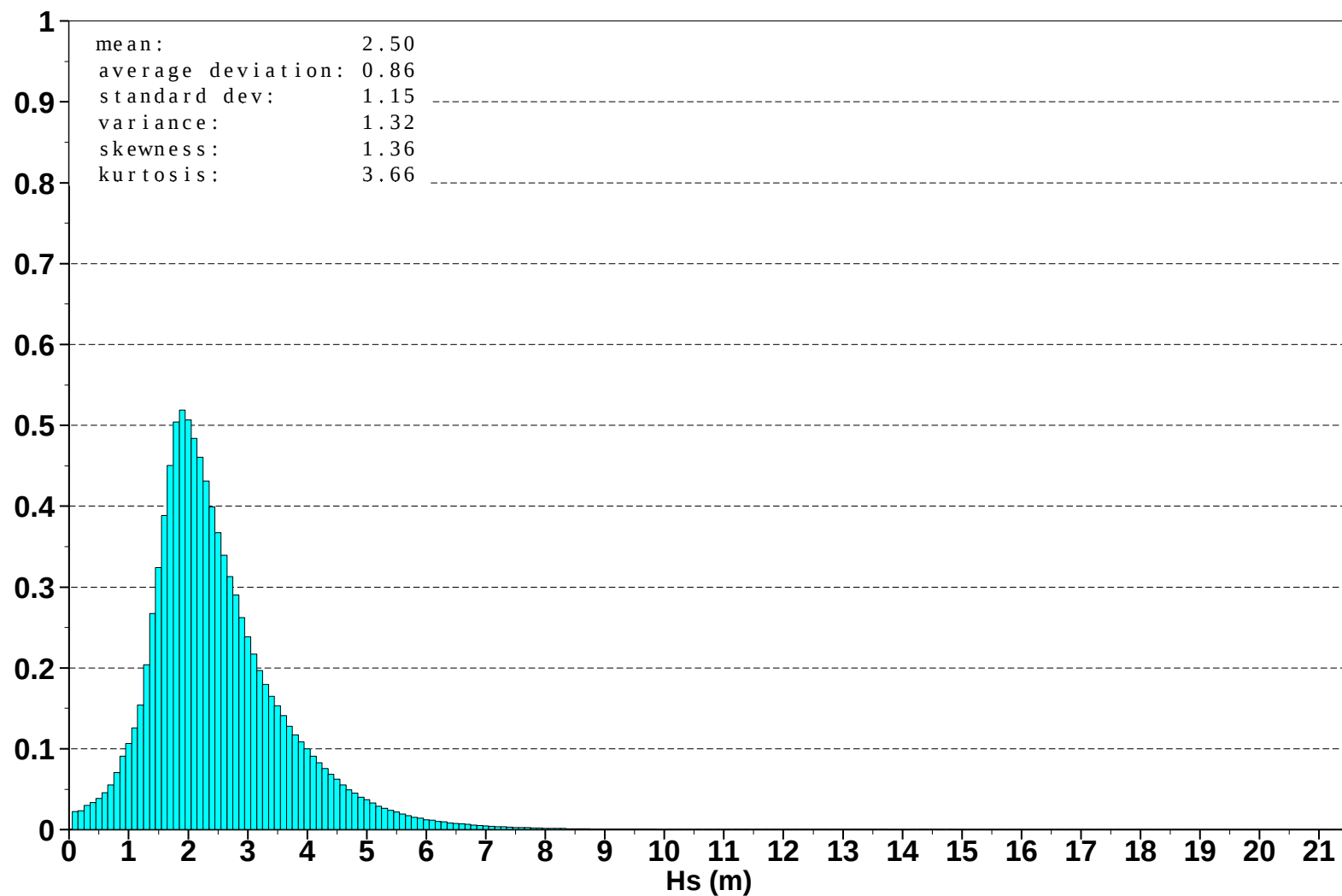


Figure 16: Global distribution of ECMWF wave heights for February 2002



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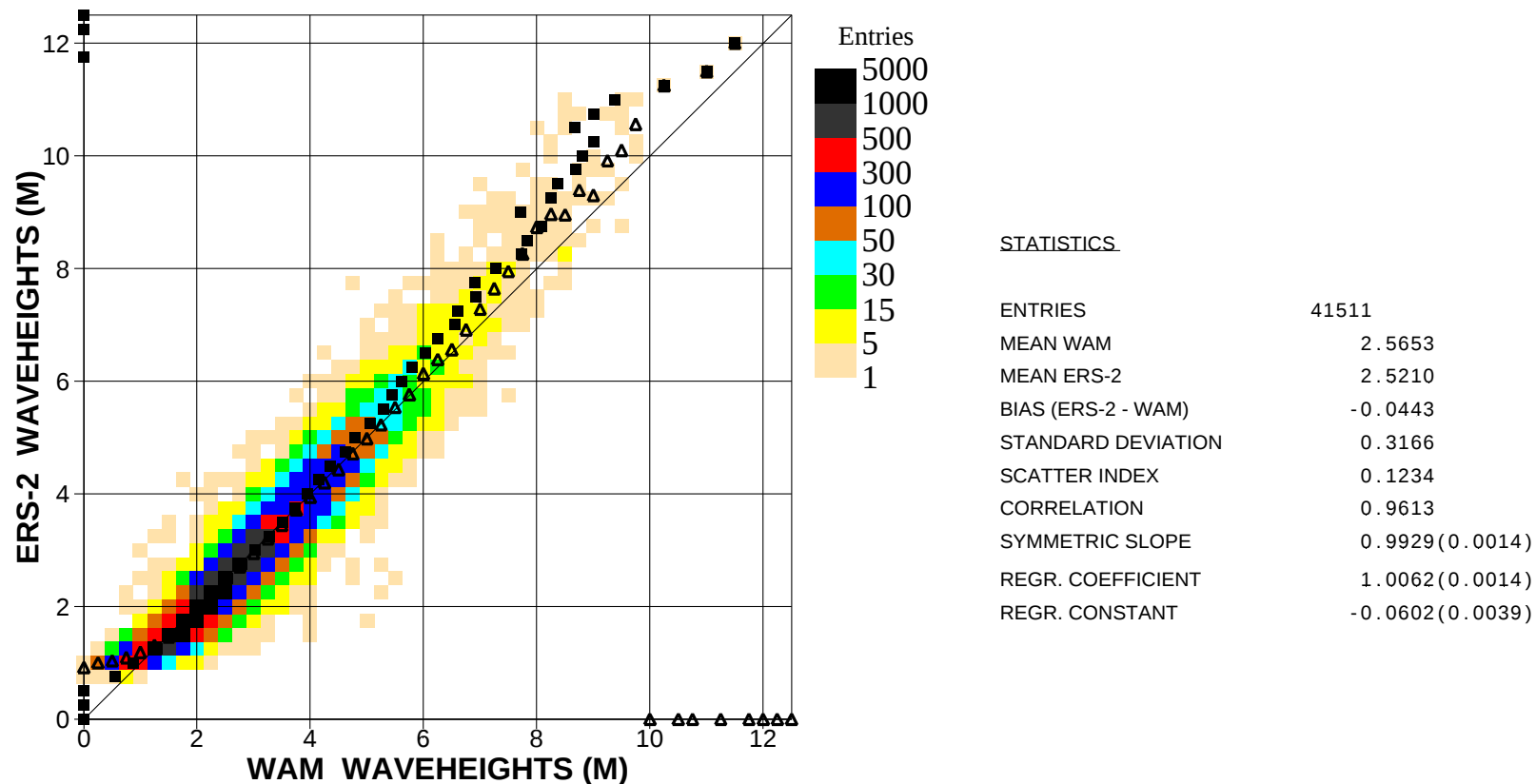


Figure 17. Comparison of ECMWF wave height results with ERS2 Altimeter wave height data for February 2002 (global)

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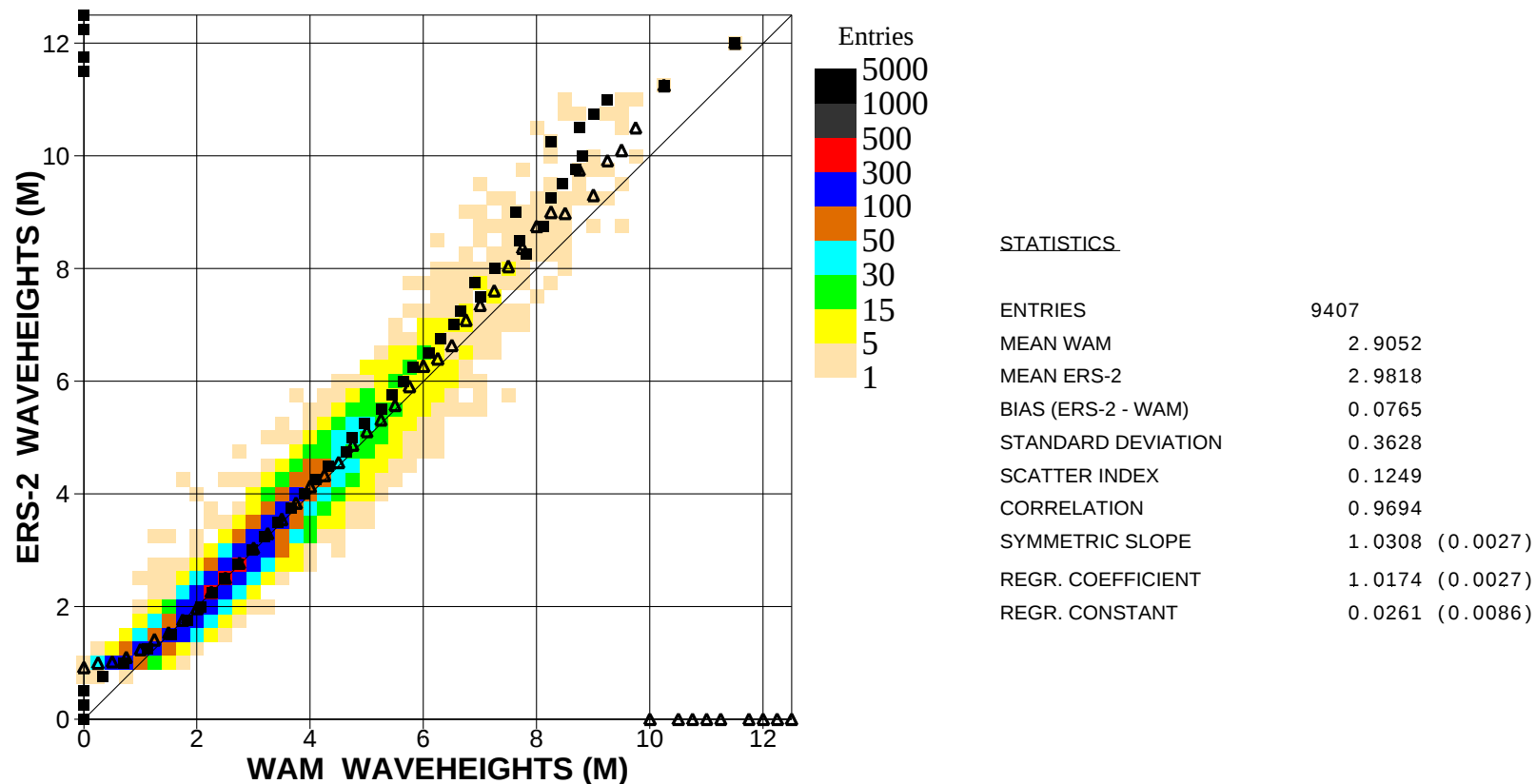


Figure 18. Comparison of ECMWF wave height results with ERS2 Altimeter wave height data for February 2002 (n.hem.)



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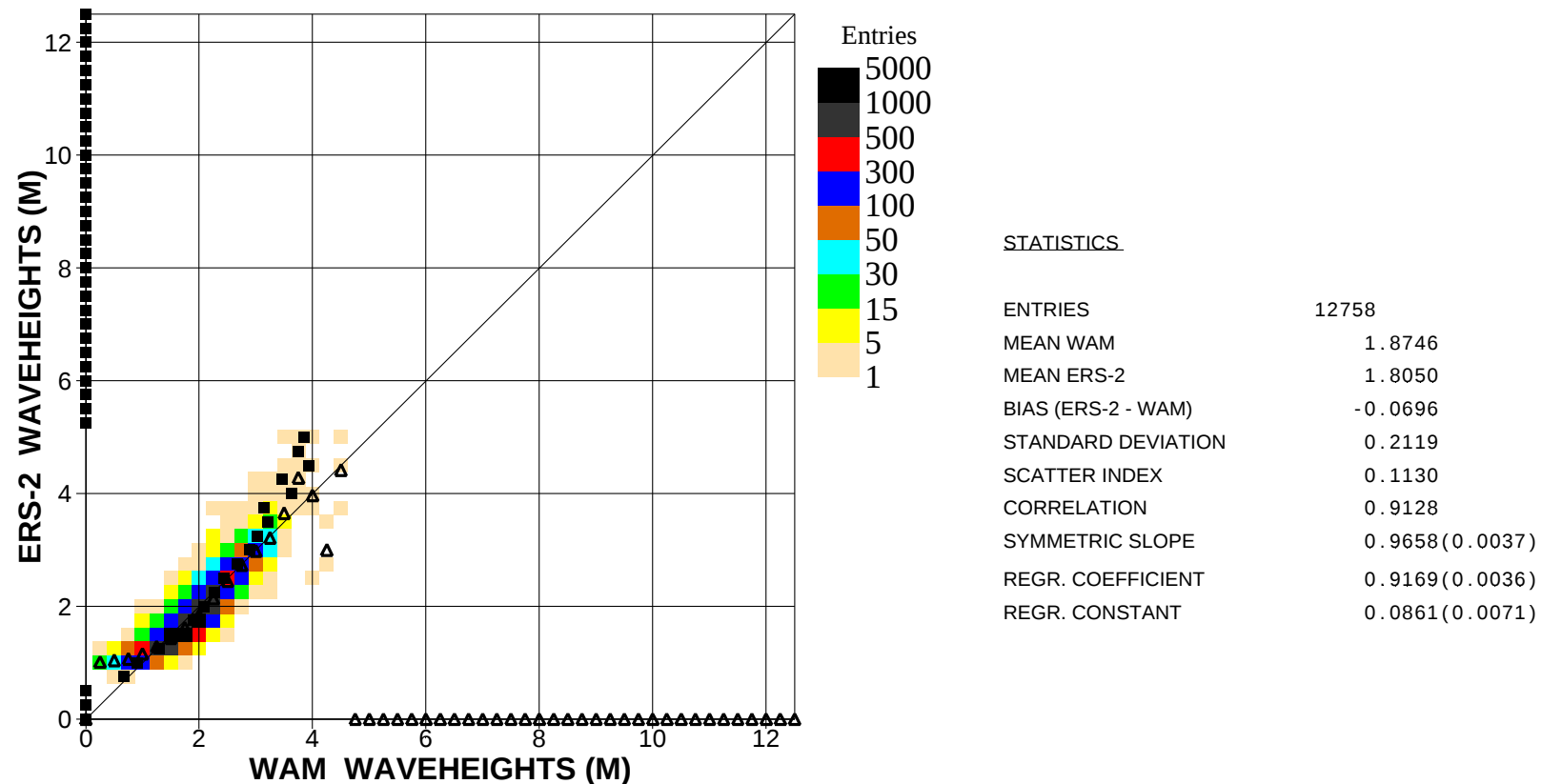


Figure 19. Comparison of ECMWF wave height results with ERS2 Altimeter wave height data for February 2002 (tropics)

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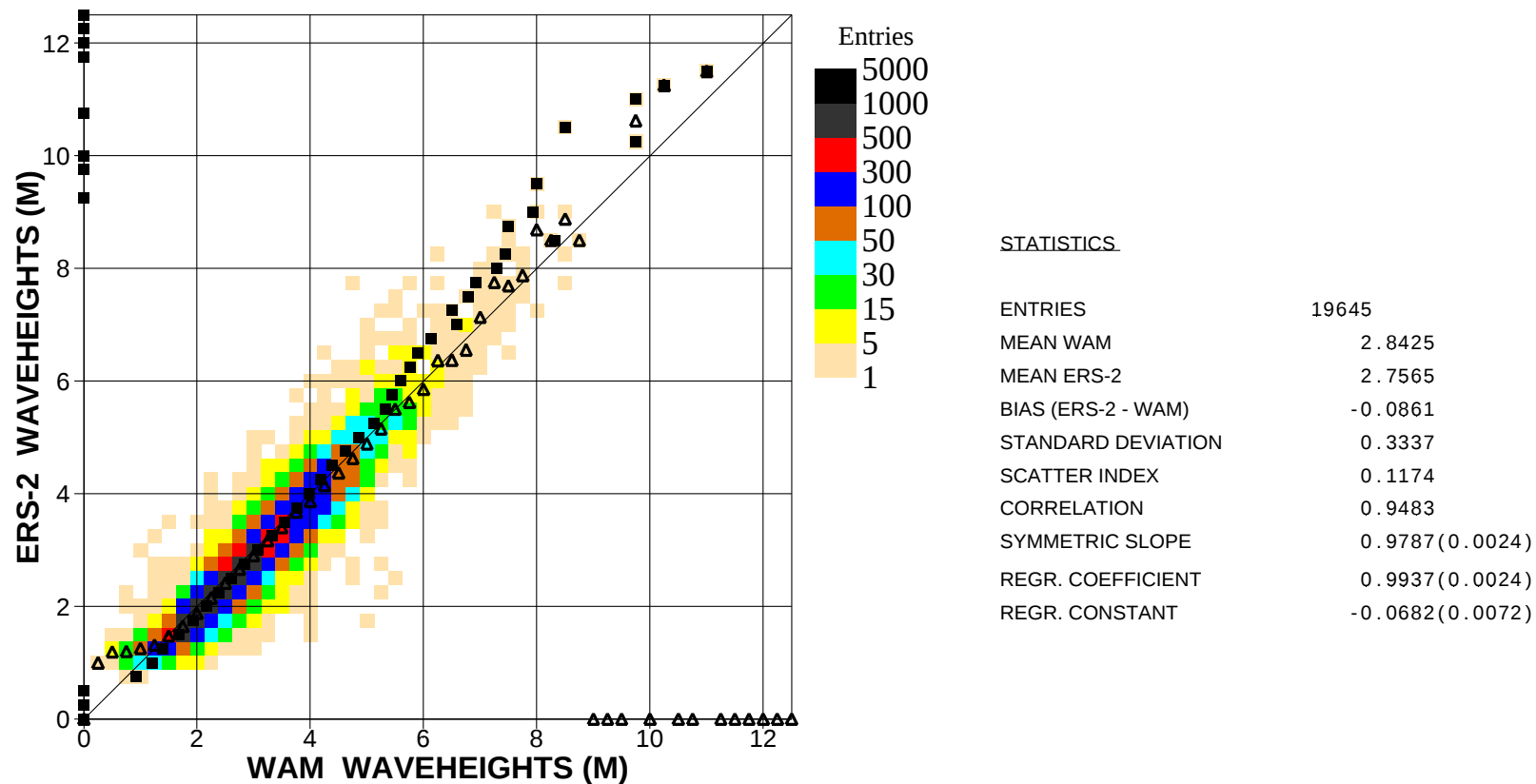


Figure 20. Comparison of ECMWF wave height results with ERS2 Altimeter wave height data for February 2002 (s.hem.)

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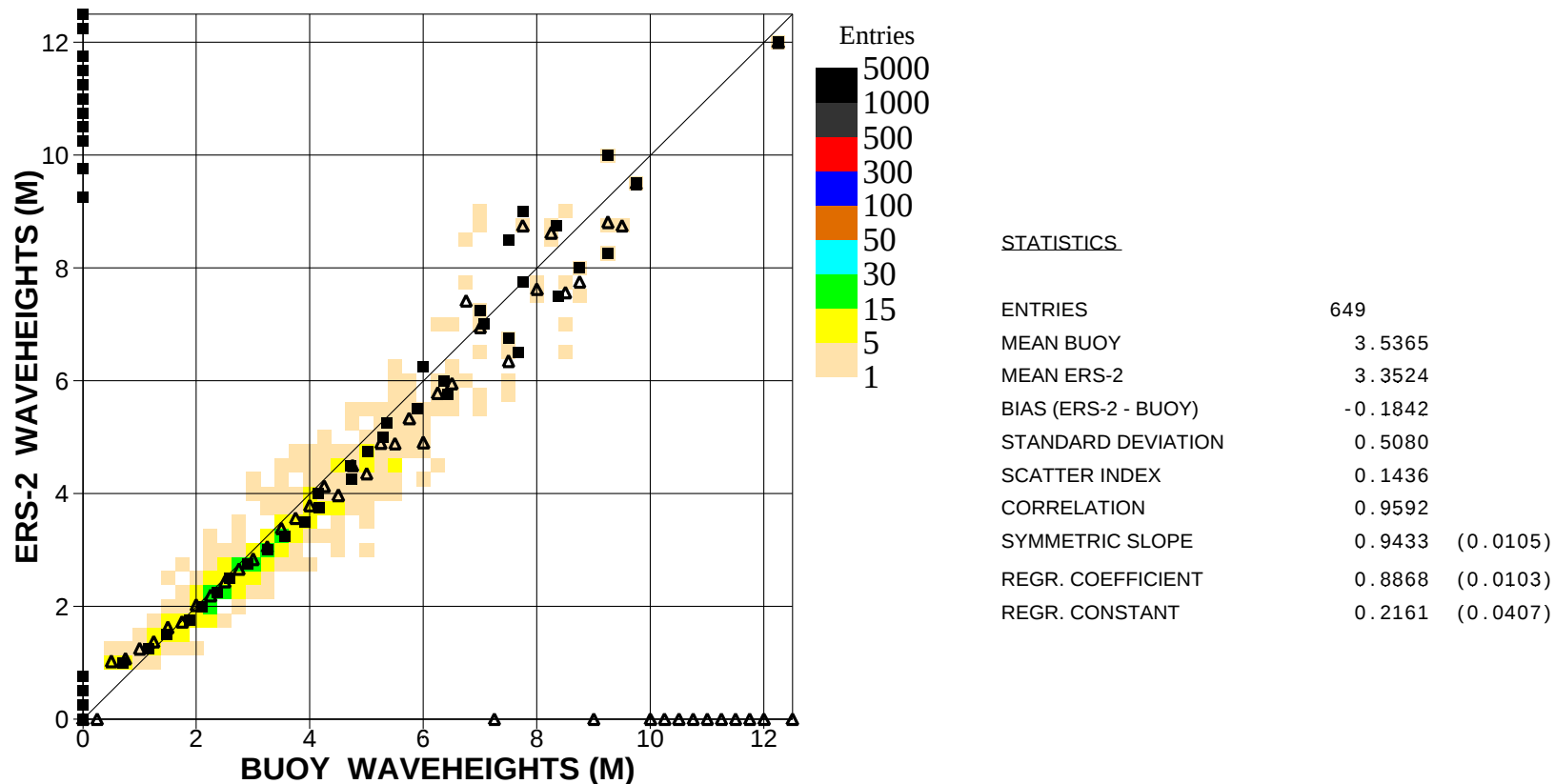


Figure 21. Comparison of buoy wave height observations with ERS2 Altimeter wave height data for February 2002 (global)

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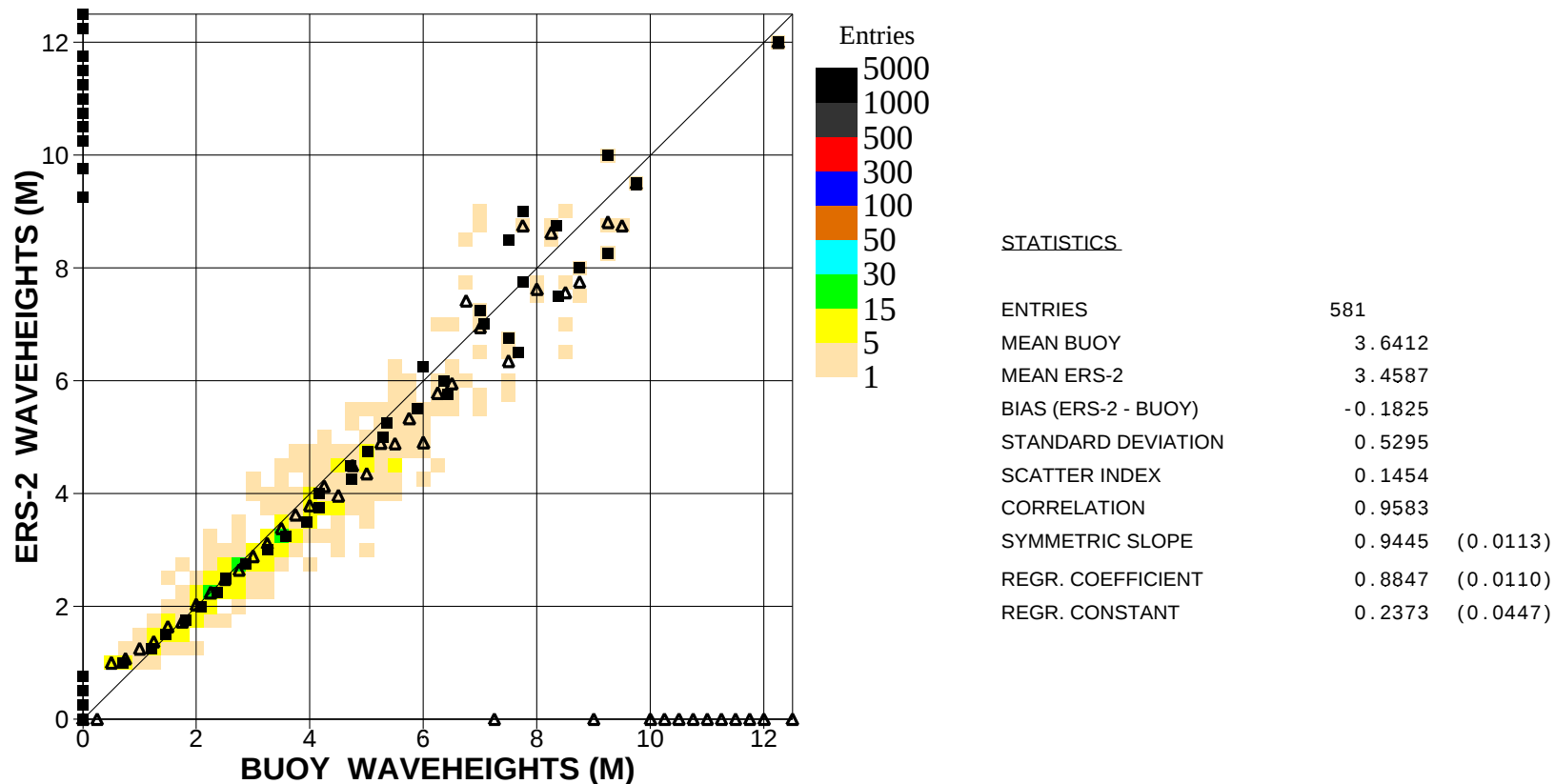


Figure 22. Comparison of buoy wave height observations with ERS2 Altimeter wave height data for February 2002 (n.hem.)

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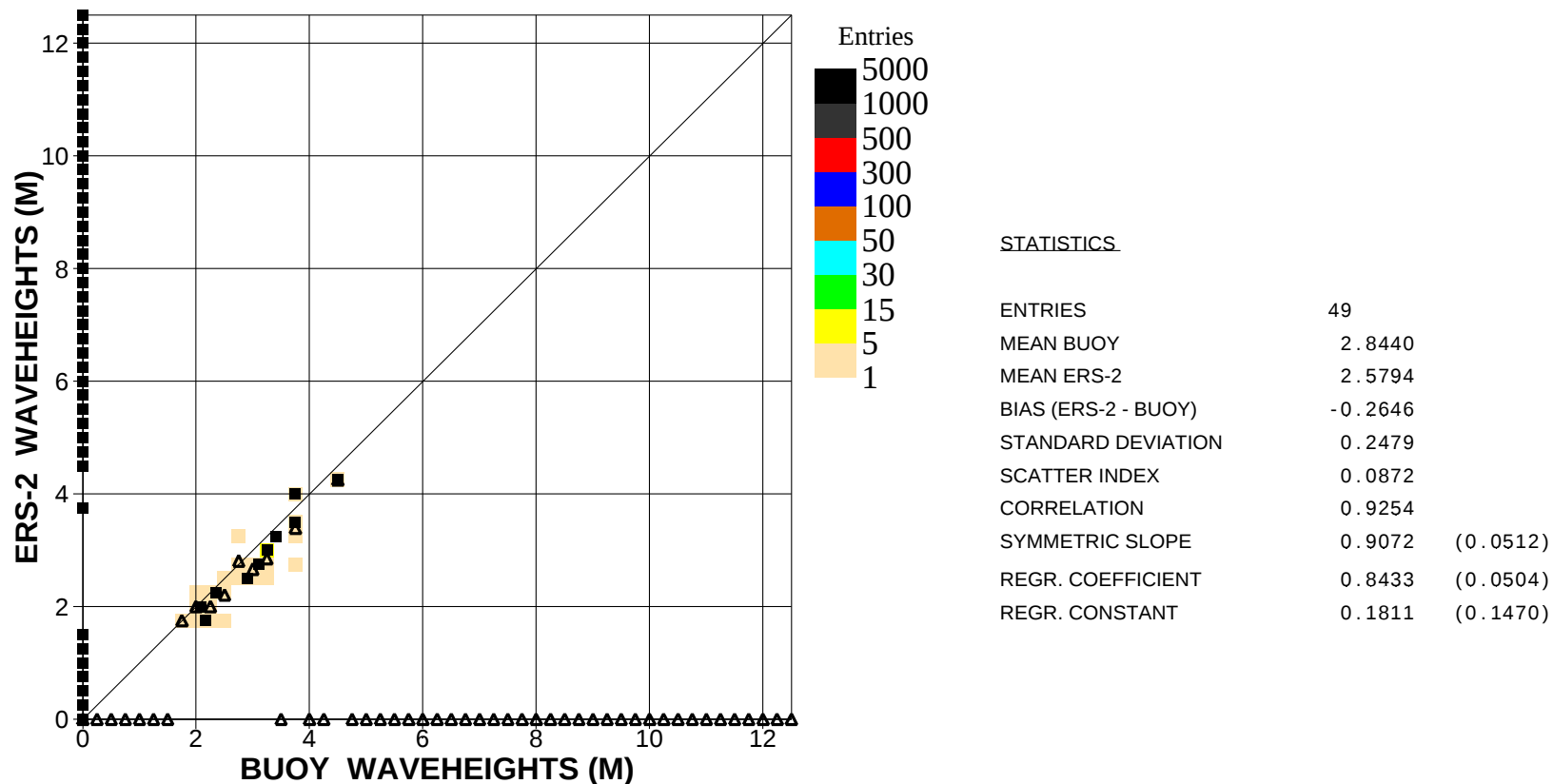


Figure 23. Comparison of buoy wave height observations with ERS2 Altimeter wave height data for February 2002 (hawaii)

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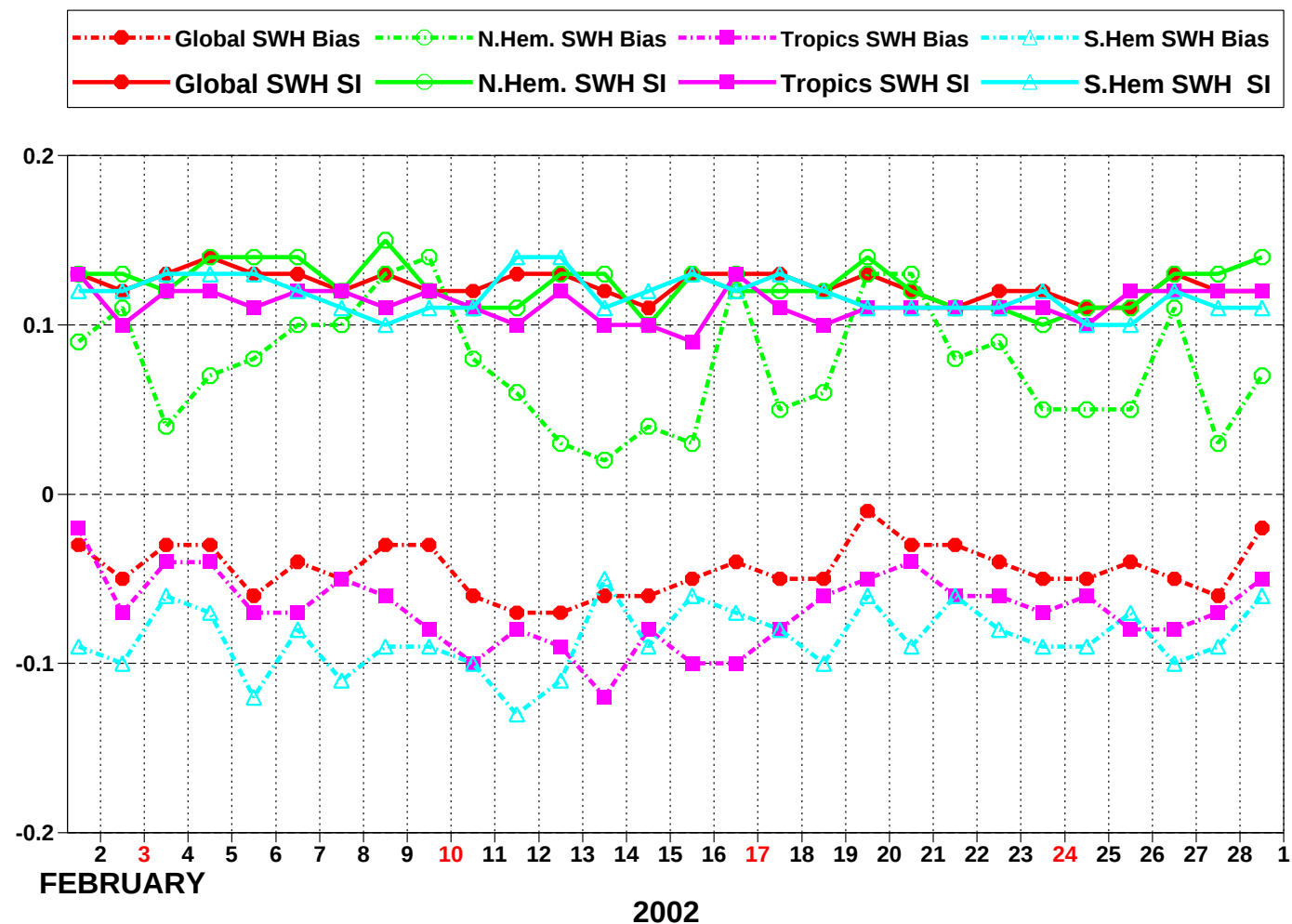


Figure 24: ERS-2 Altimeter wave heights: Timeseries of bias (ERS-2 - model) and scatter index (SI)



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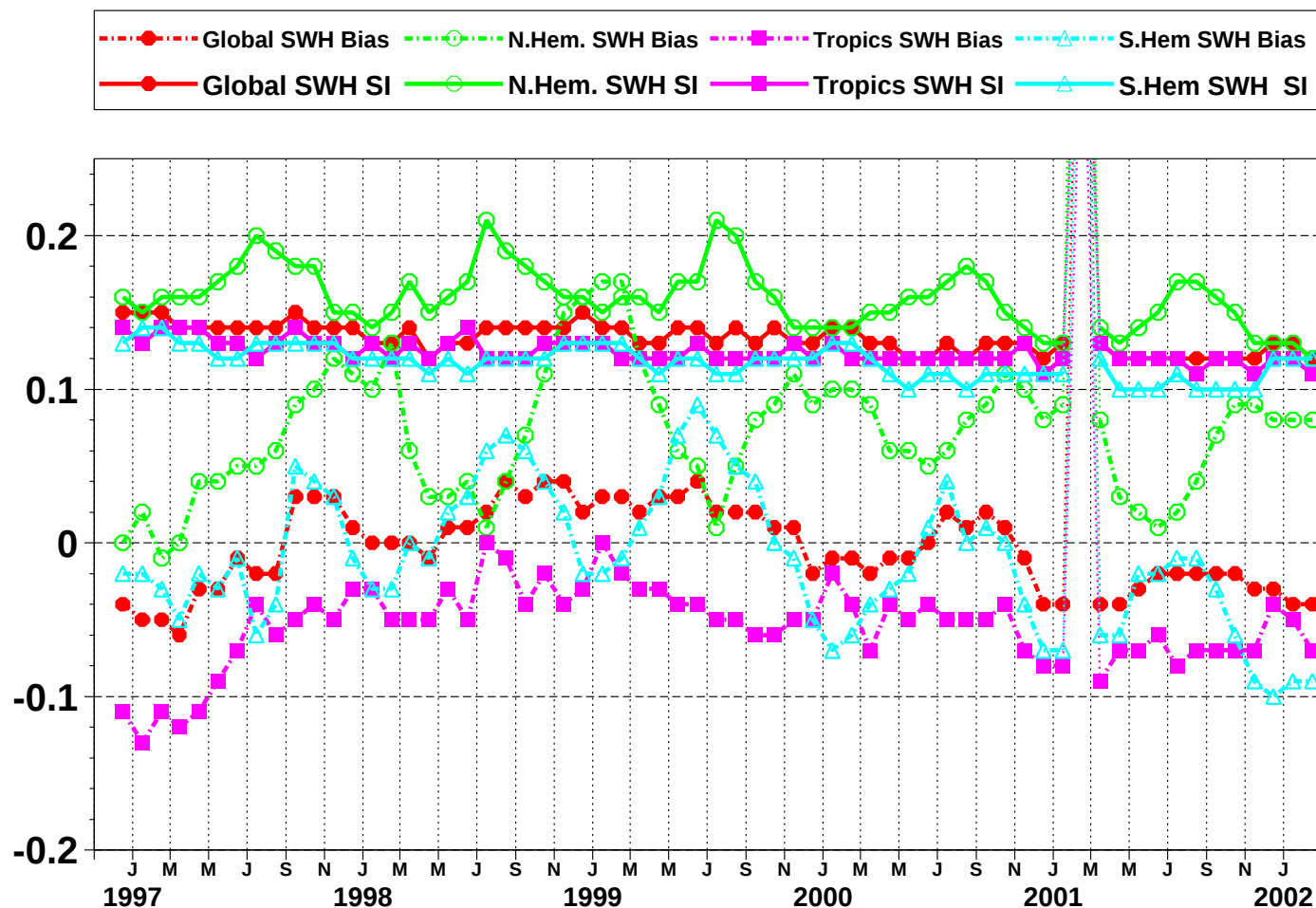


Figure 25: ERS-2 Altimeter wave heights: Timeseries of bias (ERS-2 - model) and scatter index (SI)

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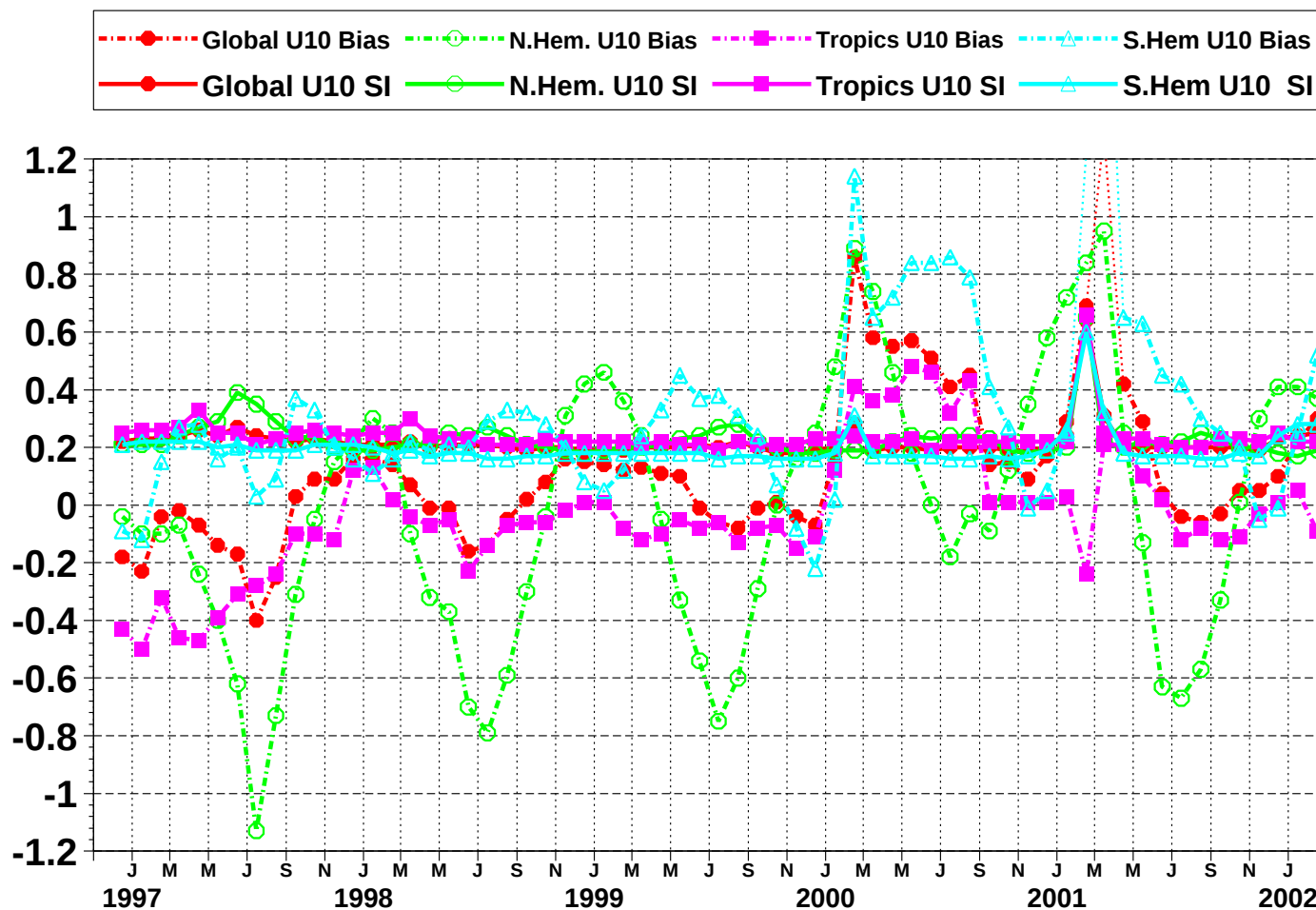


Figure 26: ERS-2 Altimeter wind speeds: Timeseries of bias (ERS-2 - model) and scatter index (SI)

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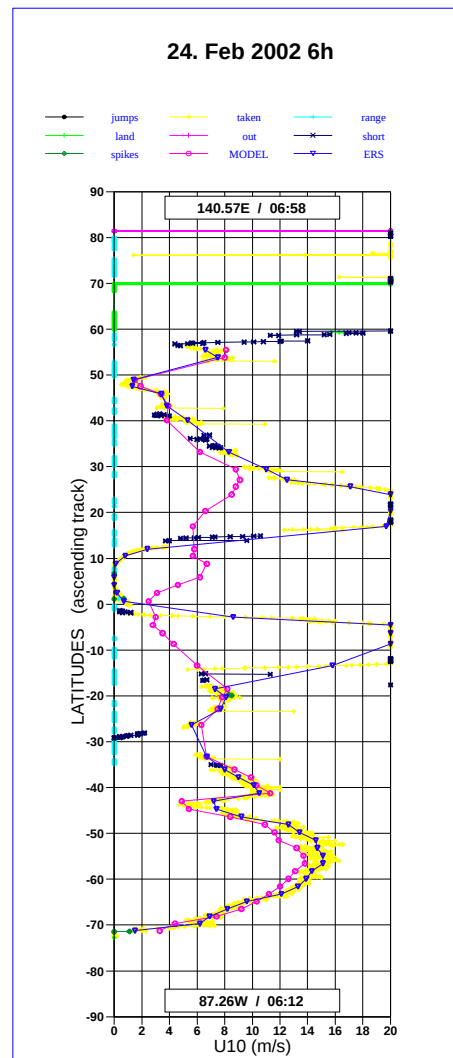


Figure 27: Timeseries of wind speed along ERS-2 track between 06:12 and 06:58 UTC on 24 February 2002

