

Jason-2 wind and wave products: monitoring, validation and assimilation

S. Abdalla, P.A.E.M. Janssen, J.R. Bidlot

European Centre for Medium-Range Weather Forecasts, Shinfield Park, RG2 9AX, Reading, UK



Ku-band significant wave height (SWH), altimeter surface wind speed and Microwave Radiometer water vapour content (TCWV) parameters from Jason-2 near-real-time OGDR-BUFR products (as received at ECMWF) during the last three months (August–October 2008) were verified against model and in-situ observations.

The agreement between SWH from Jason-2 and from the ECMWF wave model first-guess is very good with a relative standard deviation of the difference of about 10.2% as can be seen in Figure 1. This agreement is at least 5% better than that of Jason-1. It is also clear that Jason-2 and the model are nominally unbiased unlike Jason-1 which is biased high by at least 4%. The very same results emerge from the comparison against in-situ observations as can be seen in Figure 2.

The high quality of Jason-2 SWH product encourages the immediate use of the product in several assimilation experiments to assess its impact on the forecasting system. Data covering the period from 01 August to 21 September 2008 were used for this purpose. The model analysis and forecast fields were verified using available observations and the model own analysis. These preliminary results show good impact of the data as can be seen, for example in Figure 3. Therefore, the operational assimilation of Jason-2 SWH data is planned to take place soon by replacing the corresponding Jason-1 product if Jason-1 orbit is not shifted.

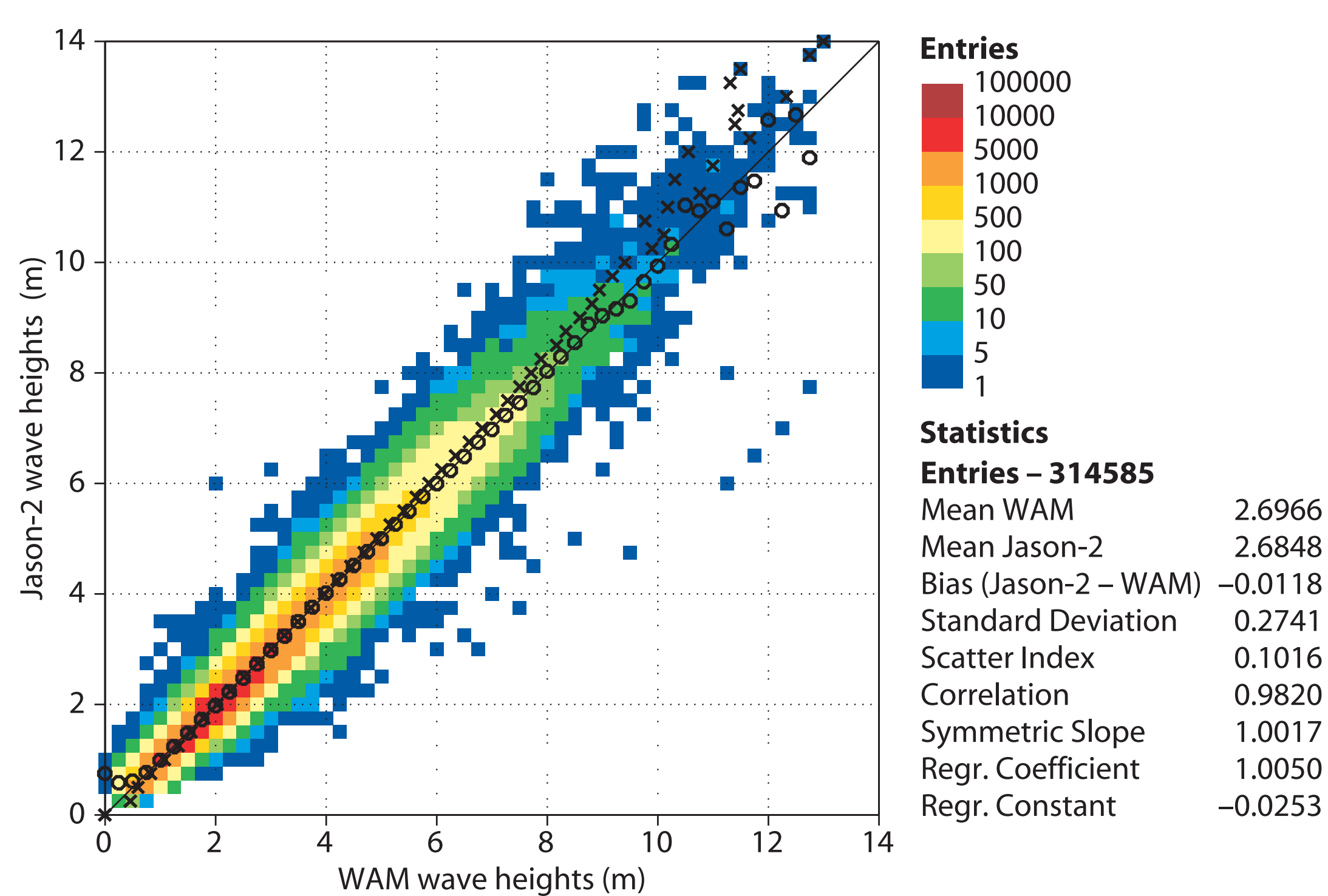


Figure 1 Global comparison between Jason-2 Ku-band and ECMWF wave model SWH values during the period from 1 August to 31 October 2008.

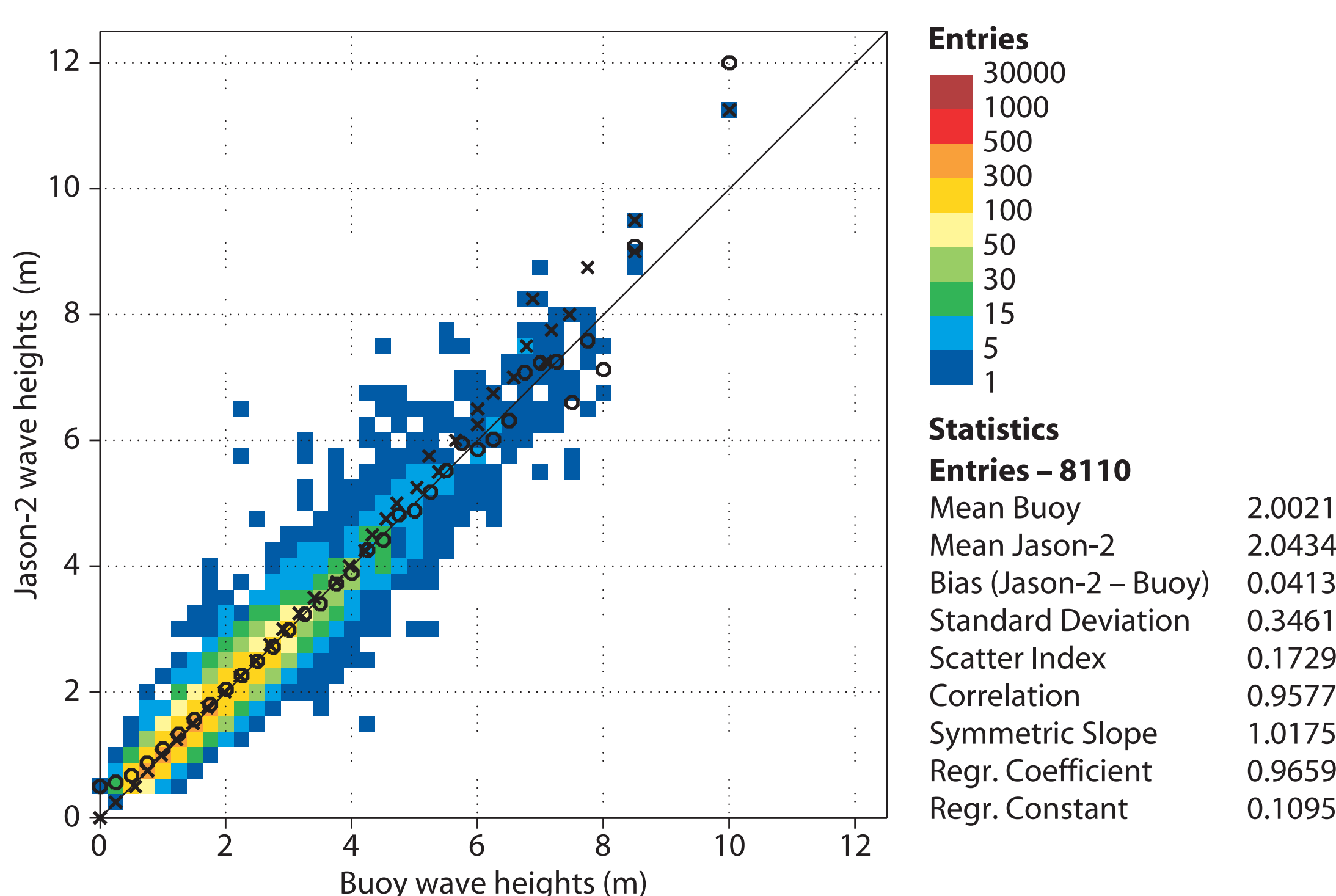


Figure 2 Global comparison between Jason-2 Ku-band and in-situ SWH values during the period from 1 August to 31 October 2008 (mainly in the Northern Hemisphere).

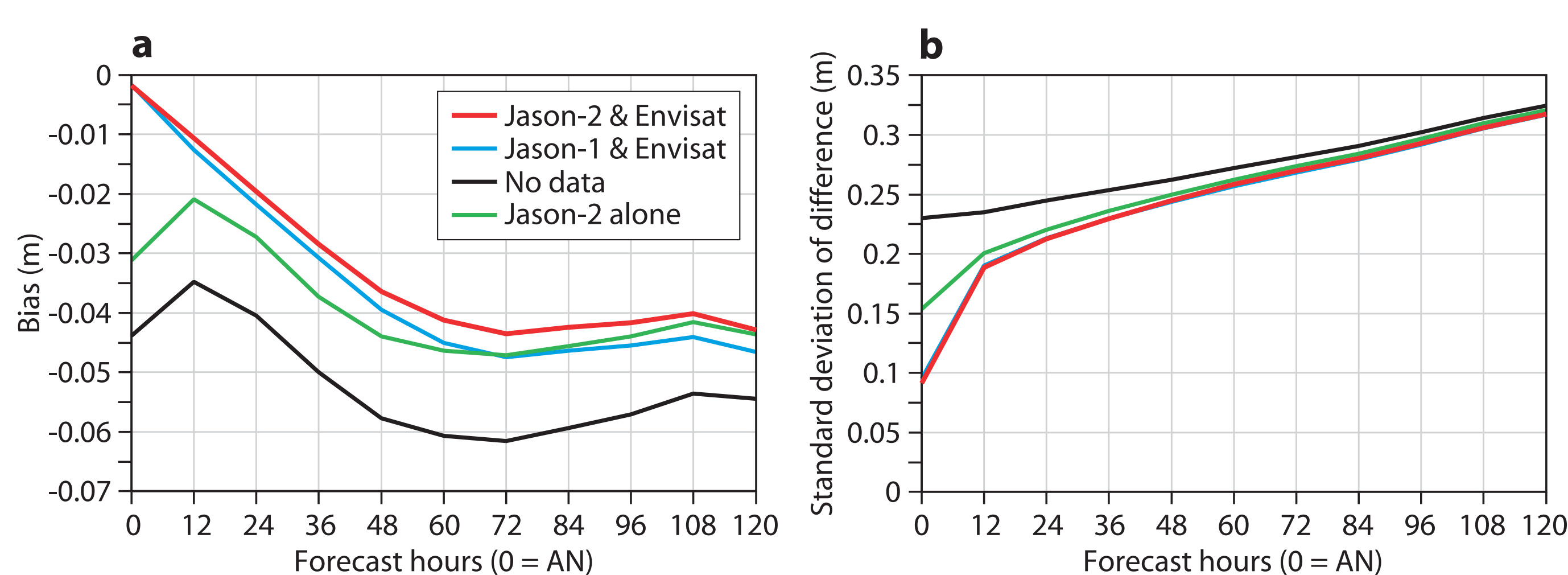


Figure 3 Impact of Jason-2 SWH assimilation on the SWH forecast errors in the tropics for the period from 1 August to 21 September 2008.

The altimeter surface wind speed product from Jason-2 agrees very well with the ECMWF model analysis wind product as can be seen in Figure 4 and with the in-situ data (not shown). However, fine tuning of the wind algorithm may be needed at some stage to match the performance of the Jason-1 wind product, which is slightly better by 1–2%.

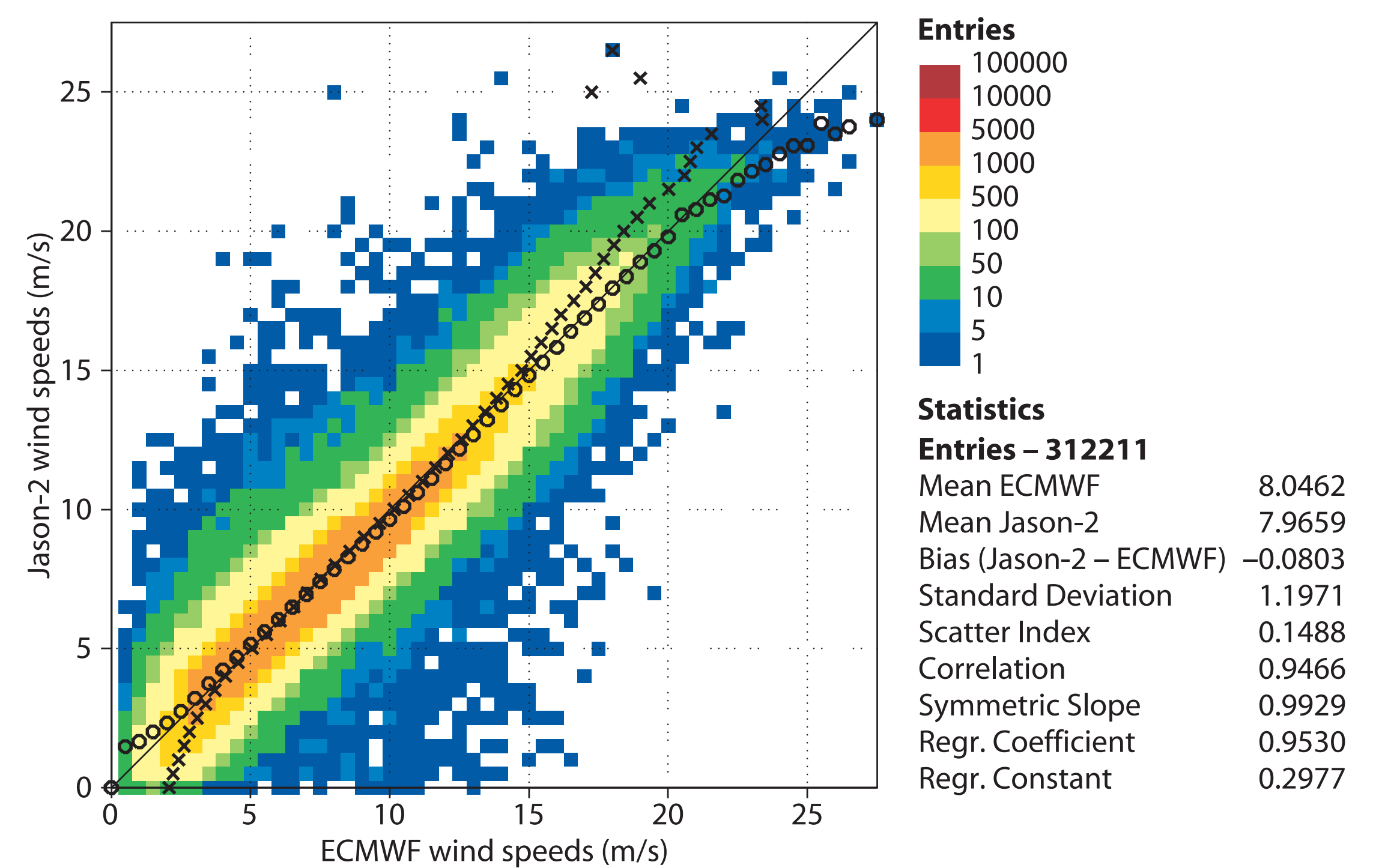


Figure 4 Global comparison between Jason-2 altimeter and ECMWF atmospheric model surface wind speed values during the period from 1 August to 31 October 2008.

The microwave radiometer water vapour content, or the total column water vapour (TCWV), product from Jason-2 also agrees very well with the corresponding product from ECMWF model analysis as can be seen in Figure 5. The agreement is comparable, if not better for the bulk of the data, with that of Jason-1 except for slightly increased number of outliers. Jason-2 TCWV product tends to be slightly wetter than the model and Jason-1.

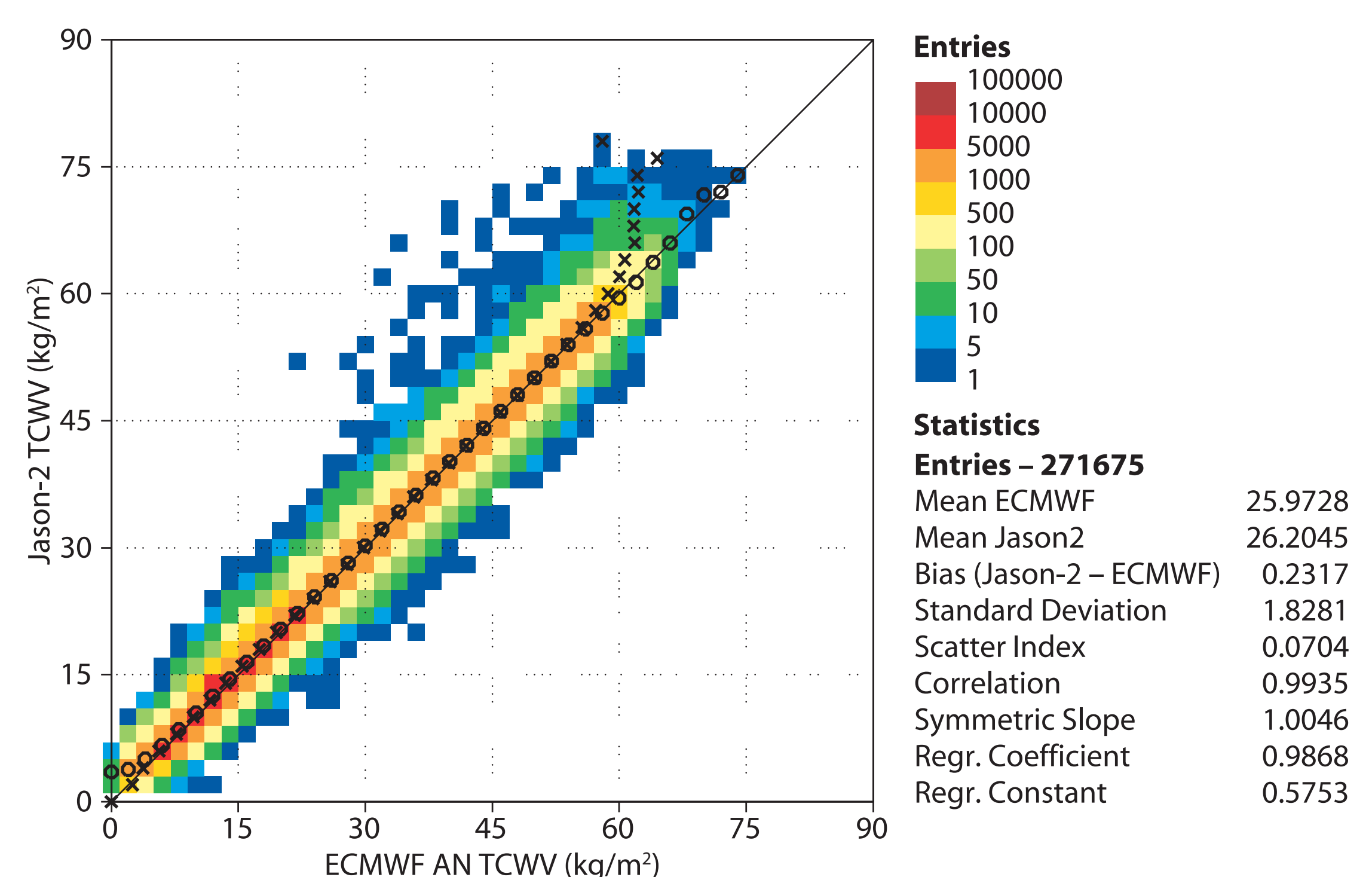


Figure 5 Global comparison between Jason-2 microwave radiometer and ECMWF atmospheric model water vapour content values during the period from 1 August to 31 October 2008.

Summary

Wind and wave related parameters from Jason-2 NRT OGDR-BUFR product were monitored and verified during the last three months. The results can be summarised as follows:

- The amount of Jason-2 OGDR-BUFR product received through EUMETCast at ECMWF is about 88% of the corresponding Jason-1 product.
- Wave height parameter is in very good agreement with the model and in-situ data. It is better than that of Jason-1.
- Wind speed parameter agrees very well with the model and in-situ data. However, it is slightly worse than Jason-1.
- Although slightly wetter, the microwave radiometer water vapour content (TCWV) is in very good agreement with the corresponding product from ECMWF model. However, there are slightly more outliers compared to Jason-1.
- Assimilation of Jason-2 significant wave heights in the ECMWF model has a positive impact on the model forecasts.
- If Jason-1 and Jason-2 are not shifted apart, we will not be able to make use of both data streams and therefore Jason-2 data will be favoured by ECMWF.