Responses to the Editor and Referees

General Comments:

Dear Dr. Gunter Stober.

EDITOR: **"Thanks for your revisions. As both reviewers raised still major concerns, I decided to have another round of review of the revised manuscript.."**

AUTHORS: Thank you for conducting the revision process of our manuscript. We also express our gratitude to the valuable comments from the referees, which help us to improve this manuscript. We did our best to properly address all concerns from them.

Please, find below our point-by-point responses to the referees and we have also tracked changes in the manuscript to make easy the third round of revision by the Referees. We have also included the competing interest as requested.

Best regards,

The authors.

Referee #1:

REFEREE: **"I was asked to review the revised manuscript entitled 'Comparison of meteor radar and TIDI winds in the Brazilian equatorial region'. This manuscript focuses on the comparison of horizontal neutral winds obtained from a meteor radar, and the TIDI on board the TIMED satellite. It was found that substantial differences existed between the measurements from the two types of instruments. This difference, however, is expected to exist because that the wind from meteor radar is space-time-averaged wind and the wind from TIDI is almost instantaneous wind. It's difficult to get the new/important points of this manuscript in its present form, whereas such a comparison of winds by the two types of instruments may be important and valuable."**

AUTHORS: We really appreciate the kindly acceptance of the Referee #1 to revise the second version of the manuscript. The referee has pointed out important concerns and we have done our best to address them. Regarding the importance of this manuscript, although the two techniques for measuring the wind are different, we have worked in this manuscript to show to the readers which technique is more appropriate to be used depending on the time scale of the investigation. In this aspect, the manuscript offers an important contribution, primarily to the community that does not have expertise in wind measurements in the MLT, but needs this kind of data to advance in different studies.

REFEREE: **"Page 3, line 73, please briefly mention why consider the grid ±10 degree of latitude and longitude around the meteor radar. Is it because that the spatial coverage of meteors detected by the radar covers ±10 degree? (lines 4, 41, 71-73, 122, of the manuscript file)."**

AUTHORS: Thank you for this comment. We have changed the size of the window to match with the field of view of the meteor radar, which is plus or minus 5 degrees. We have changed the text as suggested.

REFEREE: **"Figure 2. Please mark the location of meteor radar in Figure 2. For meteor backscatter observation, less echoes are usually expected at the locations right over the radar site (-7.4S, -36.5W). 'red star' should be 'blue star'. "**

AUTHORS: Thank you for the suggestion. We have marked the point where the radar is deployed as a black triangle. We have also corrected the text in the manuscript (Caption of Figure 1). Please see in Figure 1 (of this document) the integrated distribution of the detected echoes for 15 March 2006, which is in agreement with the Referee comment.

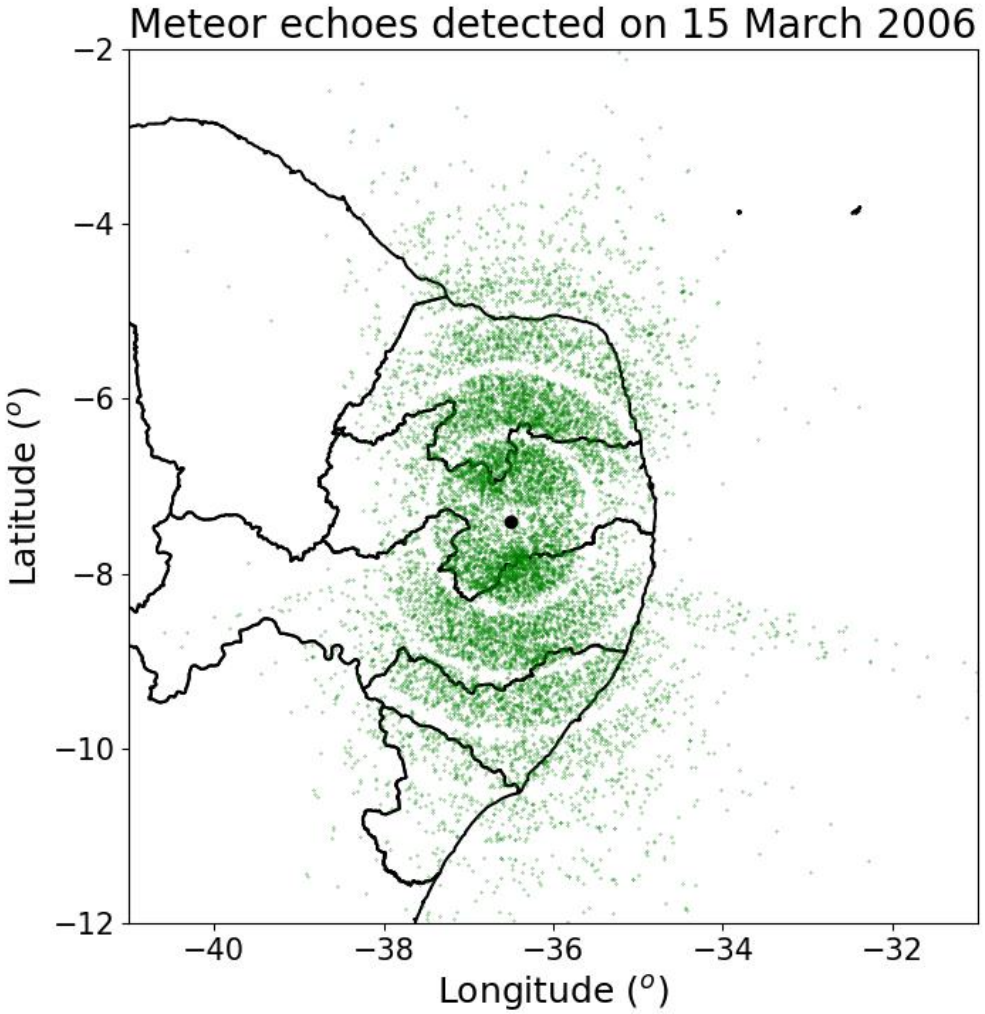

Figure 1: Horizontal distribution of the meteor echoes detected on 15 March 2006 over São João do Cariri (red dots). These meteor echoes were detected from ∼78 up to 102 km altitude.

REFEREE: **"Figure 8. The zonal wind derived from meteor radar shows a semiannual oscillation, but the zonal wind from TIDI shows a triannual oscillation with three peaks around March, July and November. Please discuss the difference."**

AUTHORS: Thank you for this observation. Indeed the triannual component is stronger in the satellite data, but we are not sure if it is a real behaviour of the wind or it comes from the spreading of the data. For example, Figure 2 shows the zonal wind for a grid of the same size centered at (27°S, 6°W), arbitrarily chosen. It can be seen that the behavior is quite different.

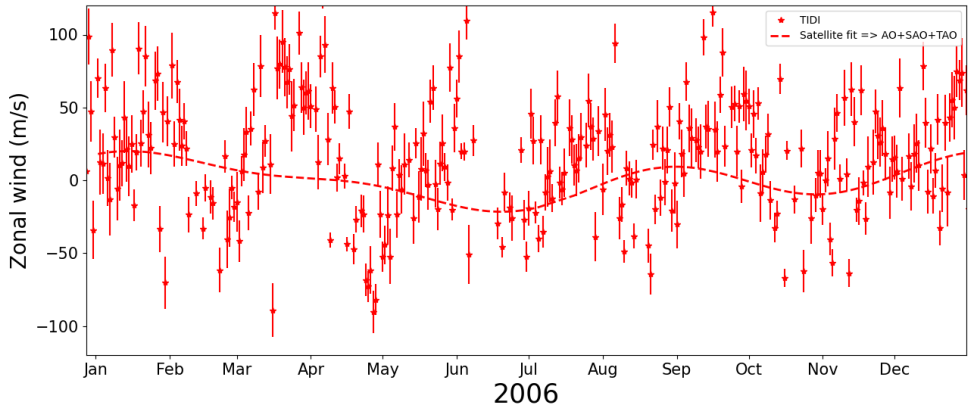

Figure 2: Zonal daily wind calculated using the TIDI measurement for 90 km at (27^{o}S, 6^{o}W).Dashed line show a least square fit for annual, semiannual e triennial oscillation.

Additionally, Figure 3 shows many spreading points from the TIDI that can contribute to this behavior. So, following the suggestion of the Referee #1, we mention the presence of this oscillation in the manuscript (lines 154-155), but we prefer to hold on to a deep discussion for a while, because it is out of the scope of the manuscript.

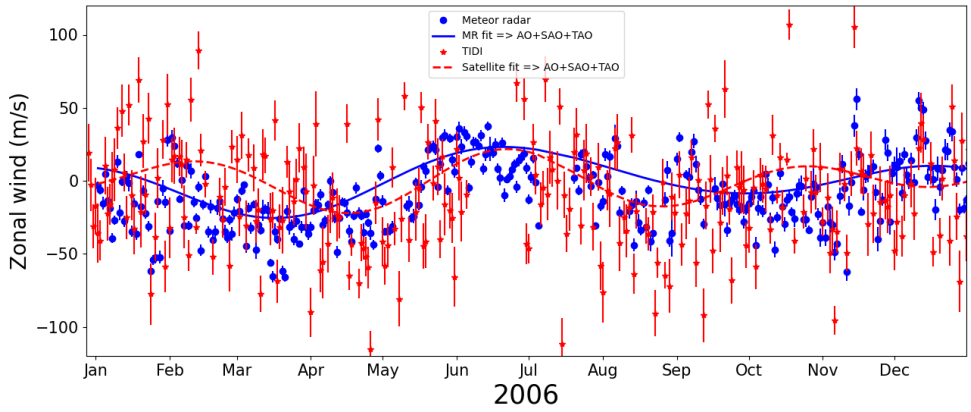

Figure 3: Same of Figure 2, but for São João do Cariri and including the meteor radar data (blue symbols).

Referee #2:

REFEREE:**"The theme of this study is relevant for the journal. However, the analysis is poorly described and is not accurate. The study needs additional data processing and more comprehensive analysis. "**

AUTHORS: We thank the important comments of the Referee #2, which kindly agree in revise our manuscript and contribute to improve it. We have followed the suggestions in order to address what was pointed out by the Referee #2.

REFEREE:**"Abstract. The authors write in the abstract that they use a grid of -10 - +10 degrees. However, the reader find in the text, that a grid of -20 - +20 degrees was used."**

AUTHORS: Thank you for checking this mistake. We have revised the text and corrected it following the suggestion of the Referee #1 (lines 4, 41, 71-73, 122, of the manuscript file).

REFEREE:**"The first question that naturally arises: why 2006 year, why only 2006?"**

AUTHORS: Thank you for asking. 2006 was the first year of operation of the São João do Cariri's meteor radar. During this year, we obtained very good quality data. Figure 7 and 8 of the manuscripts shows the complete sequence of the measurements (without gaps for this year). We have included this motivation in this manuscript (lines 73-75). Furthermore, for this kind of study, which the main objectiveÂ is to compare the advantages of each technique, one year is enough.

REFEREE:**"According to the rules for the TIDI data analysis the authors should clearly indicate the data type and the data version used for the analysis. It is recommended that TIDI data users specify these version numbers when publishing results to avoid any uncertainty related to the origin of the data."**

AUTHORS: Thank you for the comment. We have added the description of the data type and version in the section 'Data availability'.

REFEREE:**"The authors do not provide a detail description of the TIDI data processing. It is not clear what time interval they use to estimate the TIDI mean winds and how they estimate the winds. The correct procedure employs at least a 60-day time interval. Even the 60-day time interval is not always enough. A few gaps in the local time coverage could be obtained. It is not clear: how the authors deal with gaps, how the authors deal with seasonal changes and long-period variations."**

AUTHORS: The referee is right regarding the presence of gaps. We have used a 60-day wind to compute the composite days in Figures 4 and 6 of the manuscript. One can see that there are gaps in Figures 4 and 6. If we enlarge the window size, those gaps diminish (One can see it in Figures 4 and 5 of this document). However, we are using a window size comparable to the field of view of the meteor radar (it has been requested by the Referee #1). On the other hand, the objective of the manuscript is to compare the advantages of the two techniques. Then, the presence

of the gaps help us to discuss that for the usage of the TIDI data in climatological winds, it is necessary a wind size larger than the field of view of the meteor radar and time interval as long as 60 days. We have added a statement explaining the question of the Referee #2 about the temporal and spatial window size (lines 121-127). Additionally, we have also commented about the seasonal changes in the manuscript. Thank you for this important comment.

REFEREE:**"It is not clear why the authors presented fig.1. The TIDI instantaneous profile variability is well known (see, references in the manuscript). The comparison is doubtful as described by the authors."**

AUTHORS: Thanks for this comment.Yes, the Referee is right and this concern was discussed in the manuscript. The objective was to compare this well known variability with the meteor radar mean profile. We have pointed out that depending on the objective of the study, the measurements from the TIDI has advantage because they show the real and instantaneous condition of the atmosphere. We have added this explanation in the manuscript to address the concern of the Referee #1 (lines 80-82).

REFEREE:**"Page 5. Incorrect reference to John et al. (2011). They used much longer time interval to calculate the wind profiles."**

AUTHORS: Our apologies for this mistake, we have corrected it (lines 89-90).

REFEREE:**"Fig.7 The authors use the fitting of the meteor hourly mean winds but the separate TIDI profile data. This approach does not take into account that the TIDI data may provide many profiles for some local hours and significantly fewer for the others."**

AUTHORS: The referee is right. We have corrected it and used the same methodology, i.e., we have used one day bin to average the TIDI data as well. It was corrected in the text. (lines 246-147)

REFEREE:**"The authors write: 'Figure 7 and 8 obey a statistical Gaussian distribution'. This is an incorrect statement. Please, change."**

AUTHORS: Thank you for this observation. We have correct it (lines 155-156).

REFEREE:**"Conclusions Ln. 150. The authors draw very general conclusions based on a couple of examples analyzed in the work. It is even impossible to say about any statistical analysis. Therefore, I propose to remove this and the next one conclusion from the text."**

AUTHORS: Thank you for the suggestions.We have revised them including the information that we have used case studies in the present manuscript (line 16)). Additionally, we have changed the section name to "Summary", which, certainly will address the concerns of the Referee #2.

REFEREE:**"Conclusions Ln. 170. The authors state, that: 'Extending the temporal window for integrating the daily wind from the TIDI mea-**

surements, the behaviours approaches each other.' Sorry, I didn't find this type of an analysis in the text."

AUTHORS: The Referee is right. We have suppressed these Figures from the manuscript because we think they are not necessary. We have now revised the text of the manuscript to emphasises this (lines 125-128, 178-179). Figures 4 and 5 of this document shows the variation of the mean wind along the day for the TIDI measurements enlarging the size of the window to 30 x 30 degrees. Please note that the gaps were reduced compared to Figure 4 and 6 of the manuscript.

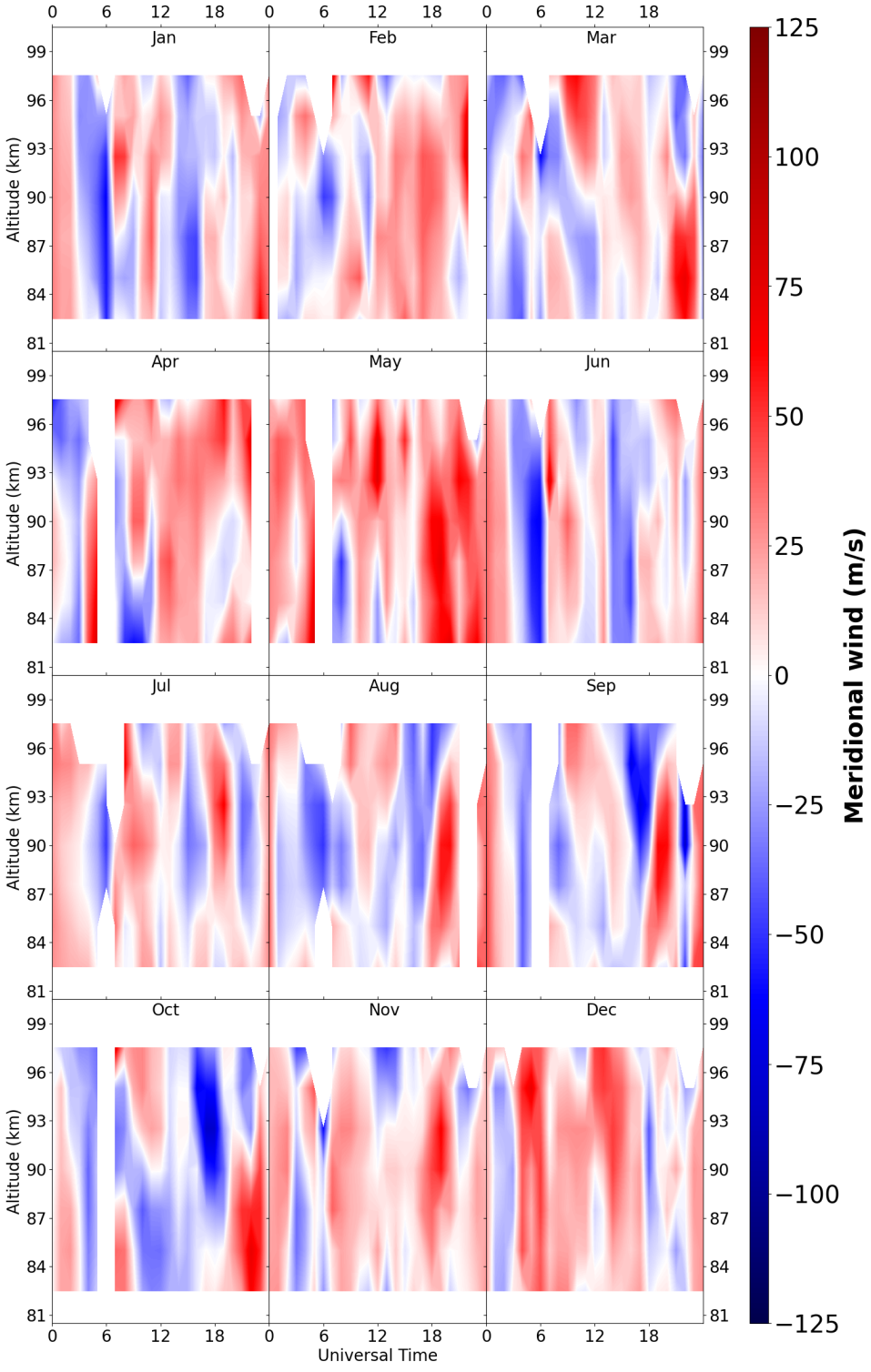

Figure 4: Monthly time variation of averaged meridional wind for 2006 calculated used the TIDI for a window of 30×30 degrees latitude x longitude centered at São João do Cariri for 2006 with a temporal window of 60 days.

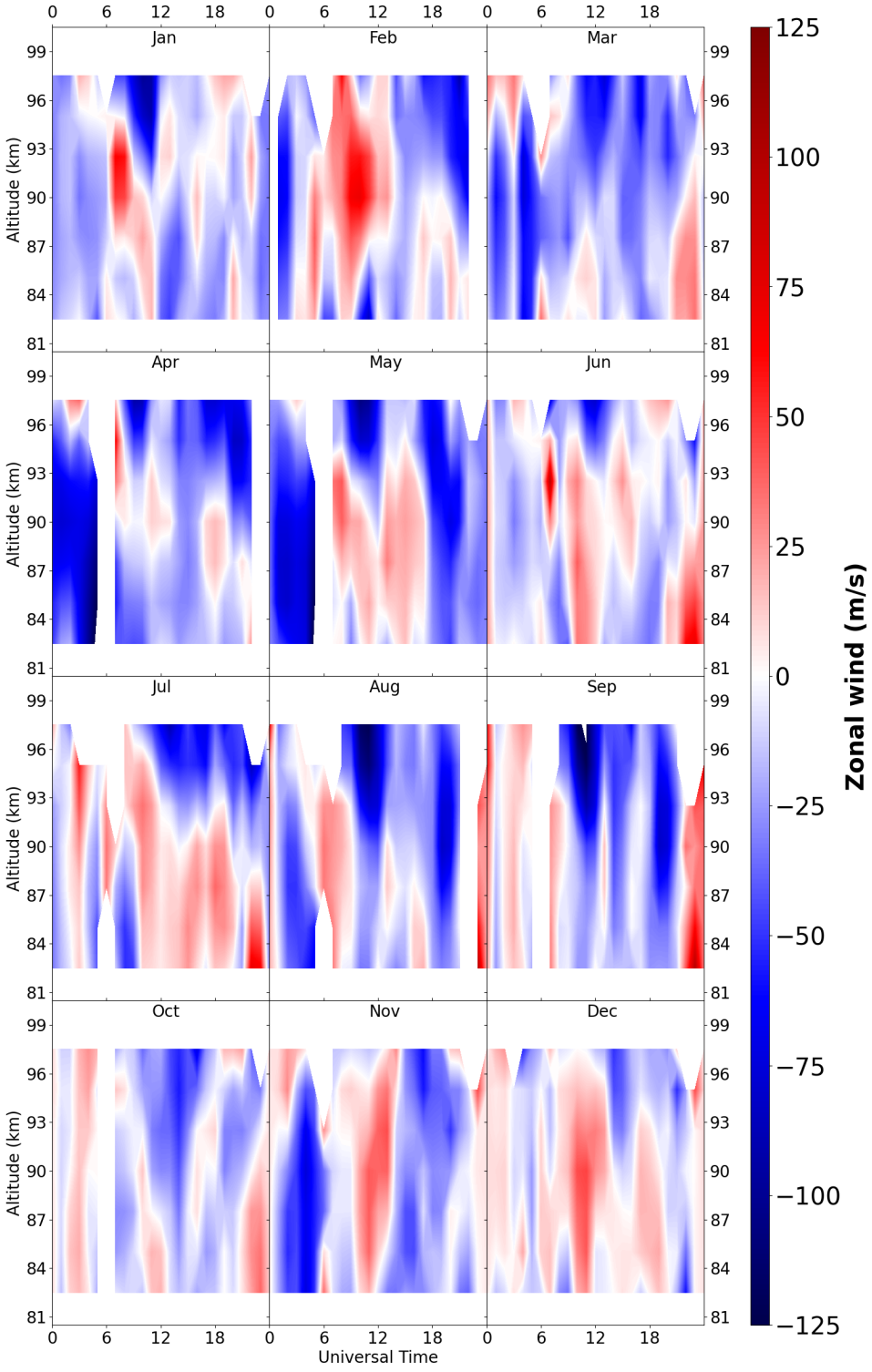

Figure 5: Same of Figure 4, but for the zonal component.

REFEREE:**"Table 1. The authors state that the TIDI wind data obey the Gaussian distribution. Please, provide statistical arguments for this statement. In fact, it is not necessary to have the Gaussian distribution to find the mean and standard deviation."**

AUTHORS: Thank you for this important comment. We agree with the Referee

#2 that it is not necessary that the data obey a gaussian distribution to calculate the mean and standard deviation. Fortunately, in this case they obey as shown in Figures 6 and 7 of this document. We have revised the text according to the Referee suggestion (line 156).

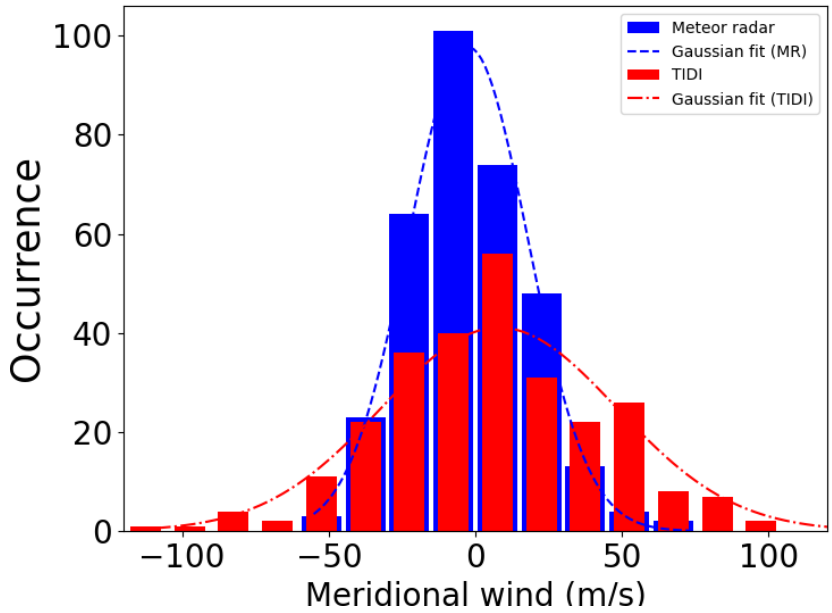

Figure 6: Histogram for the meridional component of the wind measured by the meteor radar (blue) and TIDI (red). Gaussian fit were over plotted to both histograms.

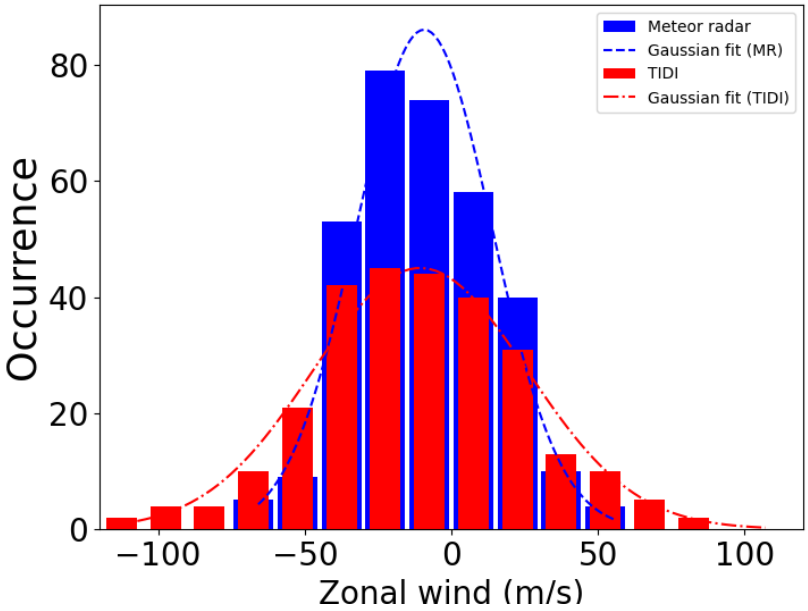

Figure 7: Same of Figure 6, but for the zonal component.