The paper by Giongo et al. investigates the activity of medium scale gravity waves over the Antarctic Peninsula by developing an algorithm that identifies the waves automatically on the airglow images and estimates their parameters. This automatic process is based on the well known keogram analysis. Although new approaches to improve image analysis are welcome, there are issues that prevent the paper being published in the present form.

Although the paper presents some results on medium-scale gravity waves, its main focus is on the method used to identify the waves and estimate their parameters. However, the description of the method lacks clarity, and the results obtained are not adequately discussed.

As the authors propose a new method to analyze images and extract wave parameters, they should be as clear as possible in explaining it. The description of the spectral analysis procedure lacks a clear and logical sequence, making it difficult to follow. While the authors claim the process is fully automatic, it appears to require user intervention at certain stages. To improve clarity, the steps of the analysis should be explicitly defined, distinguishing between automated and manual actions. Ensure that the steps of the analysis are presented in a logical order, from data acquisition to final output. If the process is automatic, specify which steps are handled by the system and which (if any) require user intervention. Additionally, the method should be tested by calculating the wave parameters as in standard keogram analysis, as quoted in the manuscript, and comparing the results with those obtained from their automated method.

Specific questions.

At page 4, lines 101-103, the authors state that "Peaks in the wavelet power spectrum are selected using a peak selection procedure to identify the significant oscillations and their temporal position". Please describe the details of the procedure.

Is the central line of the keograms the horizontal line in Figure 2 that intersects the vertical axis at the zero mark?

In Figure 2, does the vertical axis represent distances from the central point of the image? If so, it should be labeled with appropriate units.

The following sentence needs some clarification.
"**The peak identification procedure needs an equally dimensioned array. A linear spline interpolation is performed in the vertical columns of the spectrum to give it the same number of points in the vertical as in the horizontal lines**".
What are vertical and horizontal lines?
I understand that wavelet analysis demands time series equally spaced. The authors inform that they use interpolation. Are the images equally sampled? i.e. is the interval between two images always constant?
What is the source of the difference between the number of vertical and horizontal data points?

Each data point of the time series is the pixel intensity along the night. What is the source of the unequal time resolution of the zonal and meridional keograms?

What the authors mean in the phrase “**with temporal variation and combination among them**”, in the sentence “**Prominent peaks can be seen near 20, 30, 50, 80, and 140 minutes of period, with temporal variation and combination among them**”, at page 4, lines 105-106?

The following sentences are unclear. “The peak identification procedure needs an equally dimensioned array. A linear spline interpolation is performed in the vertical columns of the spectrum to give it the same number of points in the vertical as in the horizontal lines”.

Do the vertical columns correspond to the meridional keogram and the horizontal ones to the zonal keogram?"

On page 5, line 112. Does the sentence, “**Several lines are selected half period long before and half period long after the peak central position**”, mean the authors selected a symmetrical time window centered on the peak position, extending half a period before and half a period after the peak? From which figure are these lines selected?

It is not clear how the keogram in figure 4 is reconstructed. The wavelet analysis takes into account only the central line (which is the same for zonal and meridional directions) of the keogram. How are the keograms off the central line reconstructed?

In Figure 4, there are vertical red lines indicating the selected lines. Are these lines inserted manually? Those lines are placed at distinct spots in the zonal and meridional keograms. How is their placement?

In Figure 5, what is the meaning of the red phase lines? The figure legend does not inform it. Additionally, the vertical axis lacks units, which I suppose should be kilometers.

Regarding the two synthetic waves used to test the method. Do they have the same amplitude? The wavelet spectrum in Figure 7 shows distinct power for the waves.

Figure 8, what are the units of the vertical axis?

Authors state that they used “**more than 800 keograms to run the tests of method**”. How were those keograms generated? Do the synthetic waves have the same properties (e.g. wavelengths, periods, amplitudes)? Explain the distribution of the wave parameters.

At page 11, lines 191-196, the authors state some issues related to the amplitude of the synthetic waves retrieved through their method. The main reason is the superposition of the waves. In the atmosphere, waves do coexist, making this an issue that is difficult to avoid.

On page 12, lines 215-218, the authors suggest that the direction of propagation is isotropic, but say that the waves propagate preferentially eastward. It seems contradictory. Additionally, state that there is no filtering pattern. I infer they are referring to filtering by background wind. It is important to make this clear. Moreover, explain why such filtering is not observed for these waves.

On page 14, line 240-244. The expression “**Above the equatorial region**” is used a couple of times referring to observations at Cariri (7.4º S). This phrasing sounds unusual.

On page 15, lines 250-255. Amplitudes of gravity waves inferred from airglow are rare because the all-sky imagers must be calibrated to measure absolute intensity.

The authors analyzed gravity waves observed in the Antarctic Peninsula and compared them with waves observed in the equatorial region. For the purpose of the paper, which I assume is to validate their methodology, this comparison may not be ideal.

The keogram technique is widely used to investigate medium-scale gravity waves in airglow images. Since the authors are proposing an automatic algorithm, they should validate their results against the standard keogram analysis by manually analyzing the wave parameters.

Minor

page 3, line 63
63ºC degree -> 63ºC
page 3, line 79
Fig 1a -> Figure 1a
page 3, line 87
disposing of them -> disposing them
Maybe the word “disposing” is not the best choice to describe the situation. It could be “arranging them”, “stacking them”.
page 3, lines 87-88
shorter periods representing high-frequency waves easily analyzed by other methods -> shorter periods representing high-frequency waves can be easily analyzed by other methods

page 4, lines 105-106
Prominent peaks can be seen near 20, 30, 50, 80, and 140 minutes of period ->Prominent peaks can be seen at periods near 20, 30, 50, 80, and 140 minutes

page, 5, line 118 average around ->averaged around

page 12, line 212, 20 min was the lesser value ->20 min was the lowest value