

EDITOR'S COMMENTS

1. A "Short summary" system section contains scientific abbreviations. Please provide a written-out version to ensure it is understandable for non-experts. Kindly remember that the short summary is limited to a maximum of 500 characters (including spaces).

REPLY: short summary updated according to request.

2. Please add the following attribution texts to the following figure captions: Figures 2, 3, 5 - Moon mosaic © NASA / LROC Team. Figure 6 - Earth basemap © Natural Earth. Figure 7 - Moon mosaic © NASA / LROC Team. Earth basemap © Natural Earth.

REPLY: Text added to the figure captions.

REVIEWER 1

This paper presents a useful description of how JANUS observations were planned for the unique double gravity assist flyby JUICE performed in 2024. Such details are often lost in papers focussed on the results of observations, and it is good to see the effort that goes into making the observations carefully described. The paper is well written and clear, and I have only minor comments and suggestions that the authors may choose to implement. I give them by line number:

L35: the CA distances are apparently from the surface, not the body centre, but it would be good to state this for clarity.

REPLY: "from the surface" added to the manuscript.

L50/51 (and elsewhere): various papers are referenced without a year (Agostini et al., Lucchetti et al.) while Hueso et al. (2026) is cited properly. I understand that those without a year are others in this issue - perhaps cite them as such in the text? Or at least remember to update these references in the final version when all these papers are available (perhaps more a comment for the editors than the authors).

REPLY: all papers not yet accepted to this special issue are appearing without year, we have included the proper citation and this is corrected now.

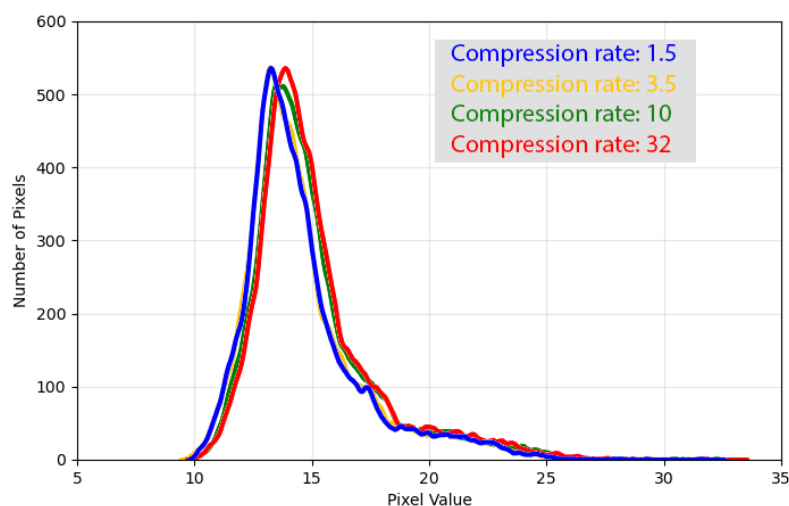
L72: It is stated that thermal stability is reached 12 hours after the instrument is switched on, but the operations windows in the flybys are shorter than this. Later it is explained that this was solved using survival heaters, but it appears contradictory here - maybe point to the later section already so the reader is not initially confused?

REPLY: the original statement has been expanded adding some clarifications and reference to the power-reduced strategy used in LEGA. "Nominally, thermal stability is reached, in about 12

hours, and maintained by the JANUS thermal control which is activated just after the instrument is powered ON. Due to power limitations during specific mission phases, power and/or duration reduced strategies, as the one used during LEGA, are under investigation (see Sec. 3.1.2).”

L165-170: I realise that the authors say that the results of the compression test are preliminary, but I wonder if there is any way that they can show how well photometric accuracy is preserved? I agree that there is no visible degradation of the image quality with compression, but are pixel-to-pixel brightness variations affected? Perhaps showing some image histograms for the lower panels of fig 4 would be a way to do this? Alternatively, if a more detailed analysis is planned, perhaps the authors can simply cite the (in prep?) paper that will look at it.

REPLY: A quantitative analysis of the effect of compression on the image quality and the photometric accuracy is planned and will be carried out in the next months, but it is not yet ongoing. We have modified the figure to show three images with compression ratios of 1:1, 3.5:1, 10:1 and 33:1. Compression effects are very small at small to moderate compression rates and some degradation is observable at compression rate 10, with sharp horizontal and vertical lines that are added over the structures in the images. Since lunar images have very strong contrast these lines are better observed when displaying a high-pass filtered version of zoom-up versions of the images (bottom row in figure 4). A very strong compression ratio of 33:1 produces strong artifacts that degrade the visibility of small craters present in the images. Radiance values from these images are nearly identical and histograms of common regions in the images show nearly identical results. We believe including histograms of these images is not needed as rows 1 and 2 in Figure 4 are shown using exactly the same radiance range showing strong consistency in the pixel values. Histograms of the four small panels in row 2 in Figure 4 are given below but we think adding those histograms in the manuscript would remove part of the focus. We have updated the figure and text in the manuscript. We have also updated statements in the manuscript about future observing strategies and data.



Histogram of three subsections of JANUS images in Figure 4. Each subpanel contains 150x140 pix and represents the same area although observed on a slightly different time from a slightly different perspective.

L236: For the farewell image the instrument was brought to operating temperature 'normally' rather than using the survival heaters. Was there any difference in performance (other than this taking more power)? Some statement on this would help reinforce the conclusion that the survival heaters can be used in future to save power.

REPLY: No obvious difference in performance (apart for the power reduction) derived from the use of the survival heaters to reach thermal stability. Moon and Earth images do not indicate reduced quality. A quantitative assessment of the normal and “reduced power” warm up will be carried on during the next in-flight activities.

Added to the text: since no operations restriction, as in the case of LEGA, were in place, the nominal warm up procedure was used. A quantitative assessment of the performances will be carried on during the next activities in flight.

Fig 7: Could the MAJIS footprints also be shown in this figure?

REPLY: Done, the MAJIS footprints have been added to the figure.

Fig 8: Please list which filters were used to make this (very nice!) colour composite.

REPLY: list of filters added in the text (line 241): ... shown in Fig, 8, obtain combining a red (F4), blue (F2) and green (F3) image.

L287: I would go further in the final conclusion - these observations show that instrument operations are useful in general during spacecraft gravity assists, and making the effort to do them should be considered for all missions, not just JUICE.

REPLY: text modified adding “More in general, LEGA observations demonstrate that instrument operations during spacecraft gravity assists are important and should be considered for all missions.”

REVIEWER 2

The article by Tubiana et al. describes observations of the JANUS camera system during LEGA. Its purpose (in my view) is to provide an overview for science and calibration to be performed on this data set and provide an exemplary template for coming (Jupiter system) observations. I consider instrument operation during cruise essential and much appreciate the effort to provide a clean article like this.

The article serves a clear scope, is well written and very informative. I have no substantial criticism and recommend acceptance after fixing or considering a few minor comments below. I fully trust the authors on this and do not need to see the article again.

Line 51: LEGA is never define, this is the place.

REPLY: Lunar Earth Gravity Assist (LEGA) added at line 51.

Line 51 (and others) Hueso et al. is cited with year, others are not. I'm not sure about journal requirements but please consider to be consistent.

REPLY: all papers not yet accepted to this special issue are appearing without year, we have corrected the citation.

Table 2 (and others): The header line is inconsistent in bold face. Symbols are bold indexes not? Also, I think indexes in this case need to be roman.

REPLY: all header lines have been made uniform: bold face, subscripts in roman.

Table 2: It would be interesting to provide saturation levels.

REPLY: saturation level added to the table.

Line 90: The nadir direction usually relates to the target body, not to the s/c coordinate system. I imagine this is a JUICE naming convention? Sounds odd but 1-3 words can fix it.

REPLY: sentence clarified in the text: "i.e. the nadir direction, the one that will face the target during scientific observations (Sarri et al)".

Sect. 3.1.: The whole section is on thermal warmup, except for the first two sentences. I propose to drop the subsection title and continue with 3.1.1.

REPLY: Section 3.1 addressed a number of constraints that were faced during the planning of the LEGA observations. The thermal constrain is only one of those. We believe that keeping the sub-sections as they are is allowing to describe the different constraints.

Line 131: described -> describes

REPLY: corrected

Fig. 3 (applies to others): Does the used background image require a reference?

REPLY: Reference to the background image(s) added in the caption of the figures.

Line 170: Remove blank at end of sentence.

REPLY: Done.

Line 187ff: This section refers to dwell times. It is not clear to me what is meant. I assume you refer to exposure times, in this case I recommend to say so and remain consistent with the rest of the article.

REPLY: the dwell time is the time in which the boresight is moving of less than 1/4 of a pixel, thus considered “stable”. We have added a clarification in the text.

Line 184: “...test for smearing effects associated to short dwell times (where the dwell time is the time in which the boresight is moving of less than 1/4 of a pixel, thus considered at a fixed position) ...”

Fig. 4: Several issues keep me from judging the quality. First, I do not know the pixel size and processing steps applied to the bottom line. I assume that compression acts like a smear. Is this correct? That depends on the actual compression algorithm applied, which is not provided. I would be able to see compression artefacts only if I can see individual pixels. Zooming into the image, Firefox & Adobe Reader seem to apply some sort of filtering (Lanczos or such). That’s how far I went. Please provide some more information.

REPLY: info about the compression algorithm added in the camera description (line 68, added: JANUS is equipped with a compression unit that compresses the data using a standard wavelet compressor, allowing both lossless and lossy compression up to a factor 33:1.). Additional details about the very preliminary assessment of the compression analysis has been added following the request of referee 1.

Table 3: Time in the header should be lower case t, I guess. Otherwise the table is fantastic!

REPLY: corrected.