Thank you for the helpful feedback and comments and the time spent on the review! We will address the points raised to the best of our abilities in the revised manuscript. Please see below for responses to specific comments (blue, italic text). – *Kathrin Naegeli on behalf of the authors*

RC2: 'Comment on egusphere-2026-787', Luc Girod, 15 May 2026

Before getting to the content of the paper, I want to address a potential legal issue, both to the authors and to the editorial team: In Section 2.1, the authors state that UAV flights were conducted at 220m AGL. Under current Swiss and EASA regulations (in effect since January 2023, I am less familiar with the previous regulations), the 'Open Category' limit is 120m AGL. While these operations are possible within the 'Specific Category' (requiring a SORA and an approved Operations Manual), the manuscript makes no mention of such authorizations.

As UAV regulations become more stringent, scientific integrity must include compliance with airspace laws, and scientific publications should be very forthcoming about how rules are followed. I recommend that the EO journal (and all other journals) require a formal 'Regulatory Compliance' statement for all UAV-based studies, especially if the flight characteristics are not within the baseline ruleset. It would be even better to share the SORA and OM with the community to help others run similar operations, but it might cause legal issues I am not qualified to judge. In the absence of such statement, it is not unreasonable to question if the operations were indeed conducted within the legal framework, potentially making the study fail the most elementary ethical standard of "not breaking the law", and, in my opinion, condemning a paper to immediate, final rejection.

We appreciate Luc raising the issue of the legality of acquiring UAV data. We like to stress that we are generally in favour of such a "regulatory compliance" statement to be included by authors that publish scientific analyses based on UAV data (or any other data, for that matter). However, in our opinion, we should apply to the individual responsibility and integrity when obtaining any sort of data, and assume that people and scientists work within legal frameworks.
With regard to our UAV data, we refer to the Federal Law Publication Platform (Fedlex), where the 'Exceptions to the regulations governing the operation of unmanned aircraft' were published on 11 January 2023 (see here https://www.fedlex.admin.ch/eli/fga/2023/96/de). Paragraph 1c of the 'Content of the order' clearly states an 8-month transition period from January to August 2023, during which operators may continue to fly without authorisation in accordance with the existing rules. We would therefore like to emphasise that we were fully aware of the changing legal situation and acquired all data within the legal framework applicable in Switzerland at the time.

Now, to the study itself.

This paper attempts at providing guidelines and practical methods to collect ground surface temperatures from an UAV platform. This is a task known to be challenging, and efforts to streamline the process are very welcomed. The paper uses a very well described pair of surveys to show the effect of the discussed methods on data quality.

The surveys are very well complemented by ground truth data (thermal loggers, TCPs for 2023), inspiring confidence in the ability to calibrate/evaluate/validate the UAV data. The effort to qualify the camera system in laboratory conditions is fantastic, and necessary to provide context to the acquired datasets.

Thanks a lot, we appreciate that our efforts are seen and valued.

Then, different correction methods are described, and that section is lacking in details, and sometimes a bit confusing:

3.1 The "lab" correction relies on knowing the camera's internal temperature. How is that measured? Does the Duet-T provide an internal or sensor temperature log? If so, I believe it would be a rather unique feature among UAV based TIR systems (I don't recall the Altum-PT, or any DJI TIR systems to provide such information).

Indeed, the FLIR Tau 2 inbuilt in the Duet T provides sensor temperature in the metadata of each image taken. Hence, we can track sensor temperature along the survey and thus are able to report a cool-down of the camera in the first 10-12 minutes of each survey and a stabilisation thereafter. We will add a respective statement in the description of the UAV data.

3.2 The drift correction seems to rely on the assumption that the average temperature of all pixels in an image should always be the same, which is a good assumption if the surveyed area is homogeneous with randomly distributed small local variations (like flat agricultural land). For the surveyed site in this paper, where large temperature gradients are expected between different areas, it is completely absurd (this is noted in section 5.3). For a scheme called "DRIFT", there it a rather striking lack of a temporal component in the correction. Estimating drift would be better done with a flight path looping on itself, so the same area is seen repeatedly in the survey, providing a time-series of drifting temperature biases.

Thank you for your comment. We agree that the drift correction scheme is not appropriate for our study area. In fact, our motivation for applying it and showing the results was to highlight the crucial importance of local characteristics in the analysis of TIR data. We discuss this in 5.3. We will rephrase this section to make sure that it clearly states that the drift correction scheme is not suitable in complex environments and the reasoning behind.

Additionally, we would like to clarify that there is a temporal component in the correction scheme, which is entirely dependent on sensor/camera temperature. Ideally, imagery would be repeated over the entire survey area or parts of it, but this is hardly feasible in many complex environments due to harsh conditions and limited UAV capabilities. We will take this up in the discussion under 5.3.

3.3 confuses me a little, as it seems like the "T_corr_FIELD" is fitted to images taken by hand, hence with a camera-target distance of 1-2m. Wouldn't that be massively unrelated to the required correction factors at survey height? Were those "thermal GCPs" detected in the flight imagery and used for correction? If so, how? This is quite unclear.

Thank you for this feedback. We agree that this section is indeed not clear enough. For the field correction scheme we used the TCP placed near the take off and landing location. We used the hand-held imagery taken with the UAV TIR camera to derive the linear model. As we account for attenuation and scattering in the atmosphere by applying a atmospheric correction to the UAV TIR data, we are confident in applying the field correction as described.

As mentioned later in the manuscript, the TCP placed within the survey area was unfortunately not usable as it was (i) too small for the flight constellation (i.e. flight height and resulting GSD) and (ii) the temperature contrast between the TCP and the surrounding rocks to large resulting in strong adjacency/spot-size effects. We will clarify this more clearly in the respective discussion section.

Moving on to results:

Fig 8 shows the resulting thermal orthoimages, and the "drift" method is confirmed to just homogenize the data, with no concerns with real large scale temperature variations on the ground. Fig9 seems to be statistics of pixel temperatures over the whole area? How is that a relevant metric for a survey site that isn't expected to be completely homogeneous? Fig10 (and associated discussion) is far more meaningful, but adding the STD to the figure would be better.

We like to split your comment up and reply to each concern about one figure separately.

Figure 8: Indeed, the drift correction homogenises the LST distribution without taking local characteristics into account, i.e. solely fitting to the in-survey camera-target temperature relationship.

Figure 9: This is the quantitative representation of the LST distributions shown in figure 8. We do not want to indicate any homogeneity but rather whether a correction introduced a shift the mean, the entire distribution, or the spread etc.. We will include a histogram plot including some general statistics (mean, median, stdv) inline

with figure 8 to the supplementary.
Figure 10: The standard deviation might indeed of interest. We will look into including another heatmap plotting the standard deviation alongside the validation heat map (to be included in the supplementary or as panel b to the right of the validation heat map).

Section 5.1 mentions terrain following, but nowhere in the paper is the effect of distance to target mentioned. The brightness temperature to skin temperature formula includes the distance as a parameter (see for instance the FLIR documentation https://flir.custhelp.com/app/answers/detail/a$_id/3321/\ /flir-cameras---temperature-measurement-formula$), and data quality goes down with distance as more and more of the signal is perturbed by the layer of atmosphere between the ground and the camera. A lower flight height would also make the required size of the TCP (an issue mentioned in section 5.2) much more manageable.

Thank you for raising this point. Yes, the rather great flight height, and thus thicker atmosphere between the target and our UAV, is likely impacting the resulting LST information more than if we would have flown at a height of 60-80 m above ground. As pointed out in the manuscript, this was not feasible due to cable car cables obstructing the lower flight levels. You correctly mentioned the conversion of raw DNs acquired by FLIR are converted to radiometric (skin) temperature via a correction with standard parameters (e.g. relative humidity = 50%, reflected apparent temperature = 22 °C). We updated these standard parameters and also extended the conversion to account for further atmospheric effects not accounted for in the standard processing conversion. We describe this in the opening paragraph of section "3. Methodology" where we reference the raw2temp function described in Tattersall (2021). We are confident that applying this atmospheric correction addresses the flight height and resulting greater impact of the atmosphere sufficiently. To make this processing step more visible we will include more details about it in the overview flow chart figure 4.
Indeed, a lower flight height would make the required size of TCPs smaller, as outlined in our answer above, while temperature contrasts and related spot-size effect would likely still remain considerable.

Overall, the conclusions seem to indicate a rather minimal, if even a positive one, from the attempted correction methods, which is of course disappointing. The lessons learned about field instrumentation and flight planning seem to be far more influential to the thermal orthomosaic output. In particular, the care in flight planning explains at least in part the low influence of the "lab" correction scheme, as the expected drift that it would have corrected is already eliminated by getting the camera in a stable state before the start of the survey proper.

We agree, the corrections have only minor impact, in particular when looking at the validation. However, they make the retrieved absolute LST more physically sound, regardless of the validation performance (which has its own limitations as highlighted in our uncertainties and limitations section). We hope that our contribution helps to work towards a UAV TIR protocol and is of use for many users that acquire TIR data in complex environments, besides highlighting the fact that UAV TIR observations require the inclusion of different corrections to take the physics of TIR measurements correctly into account.

In conclusion, the study is highly relevant to the field but suffers from some poor methodological choices (the "drift" scheme, in particular), and often unclear descriptions of processes.

We will rework the entire manuscript to make the language more precise and clarify methodology. This will also include a cleaner separation between methodology and results. Please see also our answers to the other reviewer in this context .

Just a few language and figure comments, but the revised paper should be different enough that it wasn't relevant to comb this version in details:

l.119 GSD is Ground Sampling Distance

Thanks, we will change it.

Fig2: using two shades of purple make the figure unreadable

We will improve the figure.

Fig 5: what ius meant by ”detrended” here?

The detrending is described in the paragraph just above the figure ”all temperature time series were detrended by subtracting their respective mean values, thereby removing absolute offsets and emphasizing relative temperature fluctuations between the camera, pixels, and blackbody”.

Fig9: as in Fig2, use colours that are easy to distinguish

We will improve the figure.

l. 388: what is ”flight constellation”? Do you mean ”flight path” or ”flight plan”?

We replace ”constellation” with ”height” to make the statement more precise.

l. 458: experimentations or studies, not experiences

We will replace ”experience” with ”studies”.

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