The topic of this paper is of high interest. Indeed, multiple skin temperature datasets are currently available, yet this variable has not received much attention from the climate community. There are three main reasons for this: 1) Clouds introduce substantial uncertainties and errors in LST/SST retrievals. 2) Multi-sensor datasets often suffer from inhomogeneities during sensor transitions, making the calculation of trends extremely challenging and uncertain, ad 3) Even the highest-quality datasets are still not long enough to allow the derivation of robust and meaningful trends.

We thank the reviewer for their comments. Our responses are listed in blue for each of the comments raised. New text is shown in *italic.*

Therefore, in a paper whose main motivation is to encourage the use of these datasets, I would expect these issues to be addressed with particular care. Unfortunately, this does not appear to be the case here. All-sky datasets are compared with clear-sky datasets, and sea ice is not treated appropriately. The LST CCI dataset exhibits clear problems when compared with the remaining datasets (large biases and apparent inhomogeneities). The manuscript even states that "This version of the CCI product has not yet been fully validated," which raises the question of why it is used in the analysis at all.

In the updated version of the paper, we cloud-filtered all datasets and the figures/discussion have been updated accordingly. As for the LST CCI product, the idea behind presenting it, is a first step validation, because very little literature review exist that evaluates this dataset. We discuss this further in the review.

Regarding the selection of datasets, one may also question why ERA5-Land was not used over land, given that surface processes are represented much more accurately there. ERA5 appears to be treated as an absolute "truth," despite the fact that it has several well-documented issues. Over the ocean, similarly to the approach taken over land, it is unclear why a CCI-like product was not included in the comparison (see minor comments below). Additionally, the IASI-NN product does not appear to have been validated (at least no reference to a validation study is provided).

The different points are discussed in this review in much detail, to sum up:

- ERA5 land: since we are now using the total cloud cover to clear cloudy scenes, and it is not available in ERA5 Land, we choose to keep ERA5.
- ERA5 as ground truth: we added a discussion on the ERA5 limitations. Indeed, we do believe that Tskin ERA5 has caveats, as it is a model output, and not an assimilated product.
- CCI like products: we added SST CCI ESA product as the Reviewer suggests.
- IASI-NN: the initial goal of this paper was to validate this product and the trends associated. Then it became a more general paper, with several products available to compare. We find that this paper could serve as a reference for many LST/SST products. We hope that this version is suitable for publication.

Overall, I feel that there are too many unresolved issues, and that both the discussion and the data treatment remain too superficial. Therefore, I recommend that the paper undergo **major revision** before it can be considered for final publication.

We hope that with this new version, the issues that the Reviewer raises are now solved.

List of Issues:

- **L14** – "Earth's skin temperature (Tskin), i.e. land and sea surface temperature (LST and SST)" – perhaps ice should also be mentioned.

Correct. The phrase now reads: *"Earth's skin temperature (Tskin), i.e. land, ocean/sea, and ice surface temperatures (LST, SST, and IST)."*

The first phrase of the introduction is now also updated to: *"In contrast, land and, ocean/sea and ice surface temperatures (LST, and SST and IST), collectively referred to as Earth's skin temperature (Tskin), [...]"*

- **L16** – "infrared sounders" should be **"sounder"**, since only IASI is used.

"Infrared sounders" is now replaced with "infrared instruments" to account for IASI, MODIS, AATSR and SLSTR-B (used in the LST CCI).

- **L39** – "Owing to its direct sensitivity to surface–atmosphere interactions, Tskin serves as a reliable tracer of climate variability."

  This statement appears to be more of a hypothesis that the paper aims to demonstrate rather than an established premise. Many researchers would disagree with this claim, since Tskin datasets are affected by several issues that limit their reliability. These challenges are precisely why they remain underused in climate studies.

This phrase is now rephraseded to: "Owing to its direct sensitivity to surface–atmosphere interactions, Tskin *is expected to* serve as a reliable tracer of climate variability, *provided dataset consistency and quality are ensured.*"

- **L44–45** – Please format variable symbols in italic.

Done.

- **Section 2.3** – For a full understanding of the results, the manuscript should provide a broader explanation of how ERA5 Tskin is derived in the model for both land and ocean. The caveats associated with ERA5 Tskin are not sufficiently emphasized and may create the misleading impression that it can be used as an absolute "truth." It would also be useful to comment on the independence of ERA5 relative to the other datasets.

Section 2.3 is now Section 2.4 (since we added a new ESA CCI SST section 2.3). ERA5 is considered by many as the reference for temperatures as it assimilates a lot of data. We also think it might have caveats, in particular for Tskin as not many instruments can measure it. We added the following at the end of section 2.4 in order to make it clear, and not mislead the reader with this impression. We also added a section 2.7 called "Interdependency between datasets" that addresses the Reviewer's second remark.

We added the following at the end of (now) Section 2.4:

"ERA5 should not be treated as an independent ground truth, but rather as a physically consistent reference that is subject to its own model-dependent uncertainties. Over land, ERA5 Tskin is a prognostic variable computed within the HTESSEL (Hydrology-Tiled ECMWF Scheme for Surface Exchanges over Land) land surface scheme (Balsamo et al., 2009), as part of the Integrated Forecast System (IFS). It is integrated forward in time by solving the surface energy balance at each model timestep, and is therefore sensitive to model parameterisations of soil thermal properties, vegetation, and snow. Over ocean, ERA5 Tskin is not prognostic but is instead derived from a prescribed SST analysis with a diagnostic cool-skin correction applied (Hirahara et al., 2016; Zeng & Beljaars, 2005). ERA5 does not directly assimilate Tskin, but does assimilate SST analyses over ocean and infrared radiances over both land and sea (Hersbach et al., 2020), which carry indirect surface temperature information."

And a new section 2.7 is added:

"***2.7. Interdependency between datasets***

The datasets used in this study are not fully independent of one another, which is relevant when interpreting intercomparison results. ERA5 assimilates IASI radiances for atmospheric profile retrieval (Hersbach et al., 2020), which partially constrains its land surface scheme and thus its Tskin. IASI-CDR in turn uses ERA5 atmospheric profiles as training input, introducing a dependency on ERA5. IASI-NN uses the EUMETSAT NRT product as its training target, making it more independent; however, it incorporates MODIS emissivities as auxiliary input, linking it partially to the MODIS instrument which retrieves LST directly from infrared radiances (and is effectively independent of ERA5 Tskin). Finally, LST CCI, although also derived from infrared radiances, was intercalibrated against IASI (Ghent et al., 2025), introducing a degree of dependency between these two datasets. The ESA CCI/C3S SST and IST product is derived from an independent suite of satellite radiometers and is anchored to in-situ drifting-buoy measurements (Embury et al., 2024), making it largely independent of both the IASI and ERA5 datasets used here. Over sea-ice-covered regions, the definition and measurement of Tskin becomes more complex. Infrared satellite retrievals such as IASI and MODIS are sensitive to the radiometric skin temperature of the ice surface, but their accuracy depends on cloud screening and surface emissivity characterisation, both of which are particularly challenging in polar regions. ERA5 treats sea ice explicitly through a dedicated surface scheme. In this study, sea-ice-covered areas are not analysed separately and are included within SST, and the inter-dataset biases observed at high latitudes and discussed later are partly attributable to these differences in sea-ice treatment across datasets."

- **L104** – "making a reference instrument" → **"making it a reference instrument."**

Done.

- **Table 1** – The table is not rendered correctly in the manuscript version I am reading.

This is Table 1. We will work eventually with the production team so that the Table is rendered correctly.

Table 1. Inputs and target variables for neural network training. Total features/inputs: 90 over sea and 94 over land. Target variable: EUMETSAT Tskin.

Sea	Land
Longitudes	Longitudes
Latitudes	Latitudes
87 radiance channels (scaled ×1e^5)	87 radiance channels (scaled ×1e^5)
Pixel number	Pixel number
–	Four CAMEL emissivity channels
Target: EUMETSAT Tskin	Target: EUMETSAT Tskin

- **Section 2.5.1** – It would be useful to explicitly state that this variability is completely missed in ERA5, which relies on static ancillary information.

We thank the reviewer for this comment. The following sentence *in italic* is now added:

"Across all four TIR channels, CAMEL exhibits predominantly negative emissivity trends, with spatially coherent patterns. Although the magnitude of these trends is small (>-0.1%/year), their persistence across channels suggests a systematic signal rather than random noise. The trends in emissivities therefore affect the Tskin trends and are a necessary input to the Tskin retrievals. *We note that this monthly and interannual emissivity variability is not accounted for in ERA5, which relies on static, time-invariant emissivity climatology*".

- **Figure S1** – This figure raises several questions. For example, what is the source of the statistically significant positive trends over desert regions?

  Also correct the typo in the caption: **"emissvities"** → **"emissivities."**

The typo is now corrected. The statistically significant positive trends over desert regions, in particular the Sahara, the Arabian Peninsula and parts of Central Asia are indeed intriguing, and difficult to explain. The following phrase is now added to the legend in Figure S1.

"Positive trends over arid and hyper-arid regions are likely associated with known limitations of the CAMEL dataset over deserts, where ASTER GED sampling is sparse and surface emissivity estimates are sensitive to episodic wetting and dust events."

- **L172** – "January 2018 onward" – onward until when? Please specify the last month included in the analysis.

This line is now changed to: January 2018 – *December 2022*.

- **L185** – It may be fairer to use ERA5-Land in this comparison, as the representation of land surface processes is significantly improved relative to ERA5.

Thank you for this comment. We do agree with you, however since we are now using the total cloud cover to clear ERA5 cloudy scenes, and it is not available in ERA5 Land, we choose to keep ERA5.

- **L195** – "The shift from ASTER to MODIS/Terra in April 2012" – this likely refers to a shift from **AATSR**, not ASTER.

This typo is now corrected, thanks.

- **L197** – "This version of the CCI product has not yet been fully validated."

  What aspects are still missing from the validation? Why is the dataset published and used here if it has not been fully validated?

The phrasing has been corrected to "not yet been validated" to avoid ambiguity. By this we mean that LST CCI v3.00 is a relatively recent product (August 2025) for which a comprehensive, peer-reviewed validation against independent datasets has not yet been published. Rather than relying on external validation, we use the intercomparison itself as an internal consistency check, and we explicitly flag the sensor-transition discontinuities visible in the anomaly time series as evidence of residual inhomogeneities that users should be aware of. The inclusion of an unvalidated product is therefore deliberate — identifying such issues across datasets is precisely one of the contributions of this intercomparison.

- **L230** – "More generally, the IASI-NN product is the only one that is clear-sky."

  This was not clear earlier in the manuscript. In addition, this statement is not entirely correct, as MODIS and LST CCI are also clear-sky products. Please highlight this earlier in Section 2, since this distinction is crucial for understanding differences among the datasets.

Indeed, as per the different reviewers' comments, all datasets are now cloud filtered. And a new section 2.8 is added as follows that addresses the Reviewer comment. Last part of this paragraph is discussed in a later comment related to the added L4 ESA CCI C3S SST.

“2.8 Cloud filtering strategy

To ensure a physically consistent intercomparison, all datasets are evaluated under clear-sky conditions. Each dataset is filtered using the most appropriate cloud screening method. For IASI-NN, clear-sky retrievals are already guaranteed by the cloud mask of Whitburn et al. (2022), which is applied at the pixel level prior to retrieval. The same cloud mask is applied to IASI-CDR, retaining only those IASI-CDR retrievals collocated in space and time with IASI-NN clear-sky pixels. Since both products share the same instrument, orbital swath, and overpass times, this constitutes a physically consistent filter that ensures both IASI products are evaluated over identical scenes.

For ERA5, we apply a threshold on the total cloud cover (tcc) variable, ERA5's native cloud diagnostic, retaining only grid points and time steps where tcc $<$ 0.2 (20%). This clear-sky criterion is consistent with the approach used in comparable studies (Ermida et al., 2019; Ermida & Trigo, 2022), which also demonstrate through sensitivity analysis that varying the cloud fraction threshold between 1% and 30% changes the derived clear-sky bias by less than 0.5 K for 85% of grid points. Moreover, the ERA5 Tskin trends derived from monthly cloud-filtered data are shown to be robust across a wide range of cloud cover thresholds (Wang et al., 2022).

MODIS Terra LST (v6.1) and ESA LST CCI (v3.00) are clear-sky products by construction, as their retrieval algorithms only produce valid retrievals under cloud-free conditions; no additional cloud filtering is therefore applied to these datasets.
The ESA SST CCI/C3S SST and IST product combines infrared clear-sky retrievals with all-sky passive microwave observations through optimal interpolation, and is therefore not cloud-filtered. Applying a cloud mask, a posteriori, using ERA5 monthly cloud cover fraction, for example, would be the only feasible approach to approximate clear-sky conditions, but this would introduce an ERA5-dependent filtering that is inconsistent with the cloud screening applied to IASI and MODIS, which is based on their own instrument-level detection. We therefore present the ESA CCI/C3S SST and IST product as an all-sky all-day reference.”

The figures show that the comparison between the different instruments is now better.

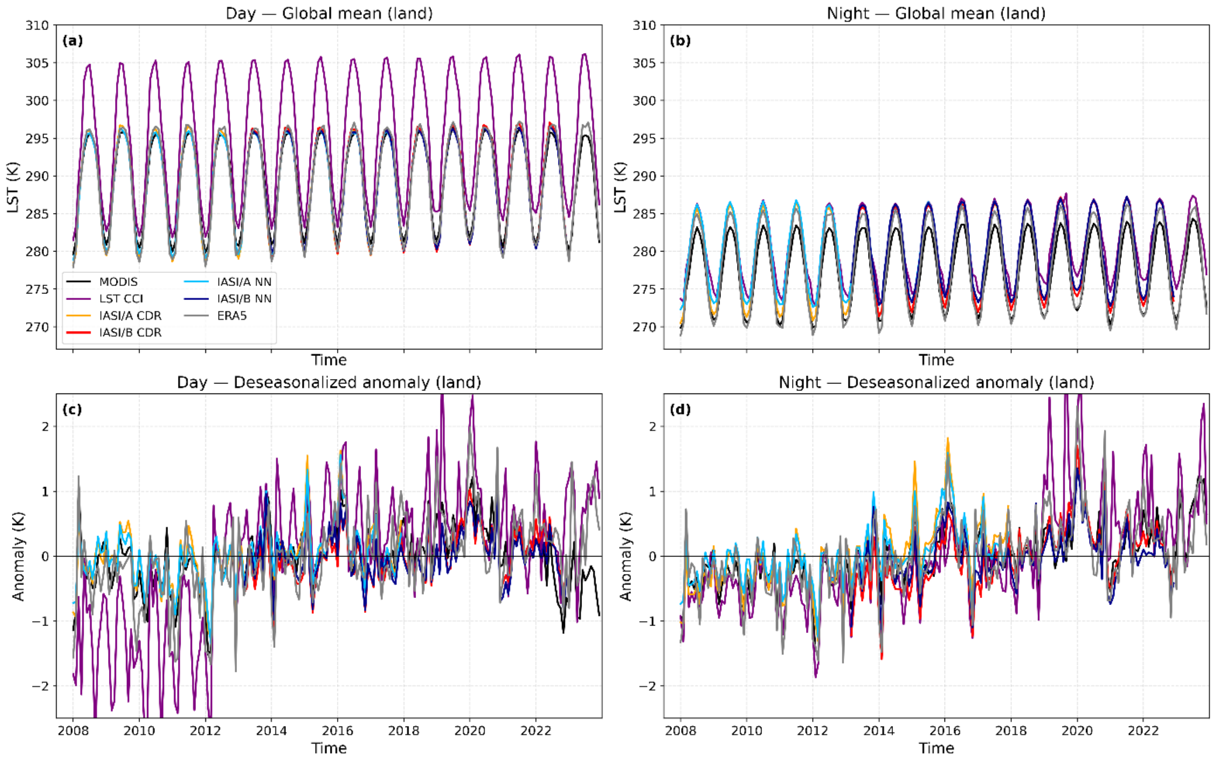


Figure 1. Global mean land surface temperature (LST, panels a and b) and deseasonalised anomalies (panels c and d) for daytime (left) and nighttime (right). IASI Metop-A and Metop-B observations (IASI-A/B) are shown separately for the CDR and NN products. Global means are computed using cosine-latitude weighting.

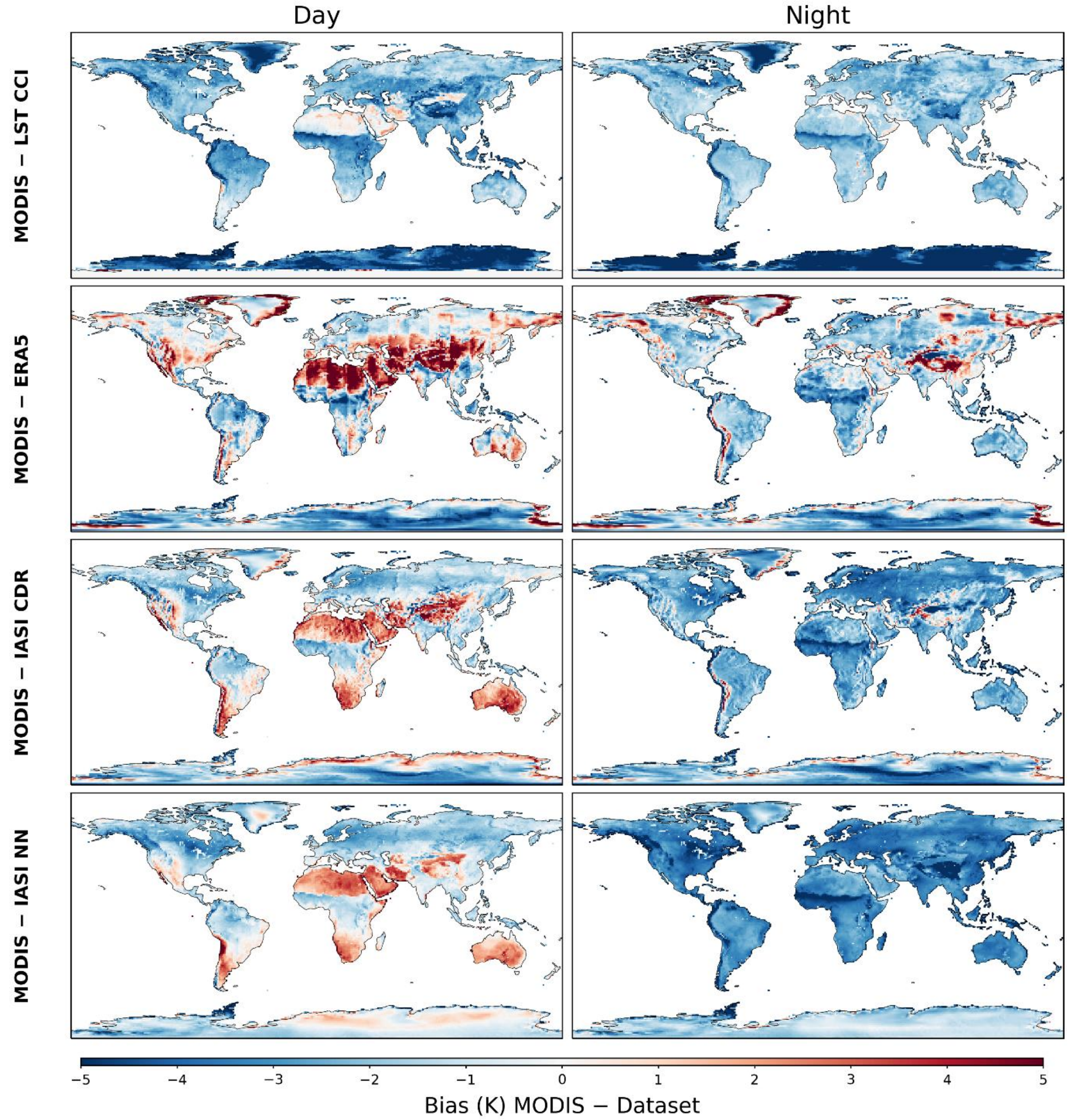


Figure 2. LST spatial bias averaged over the 2007-2022 period of MODIS during the day (left) and the night (right), with respect to ESA LST CCI, ERA5, IASI-CDR and IASI-NN. A *cold nighttime bias with respect to MODIS is evident across all datasets. ERA5 land/sea mask is used to mask IASI and ERA5 sea grid points.*

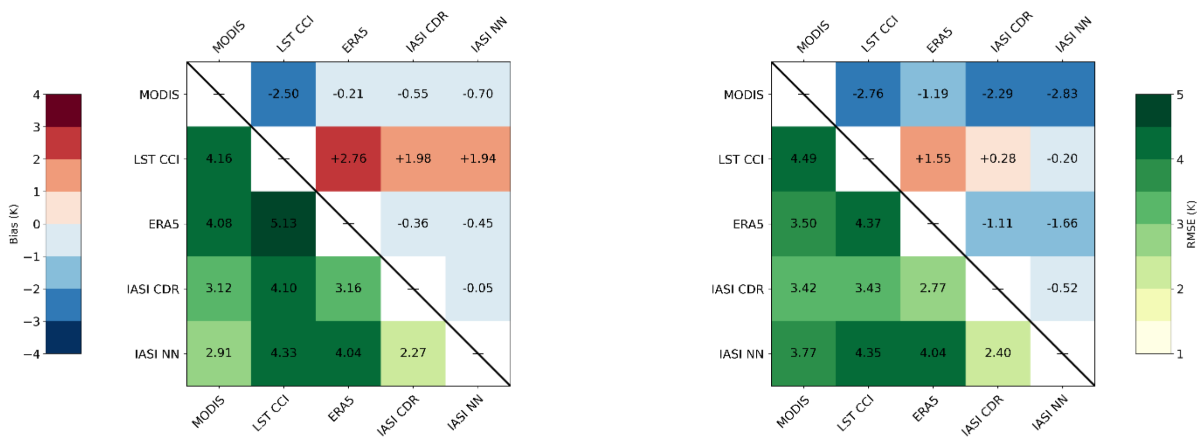


Figure 3. Upper triangle (blue to red): global mean bias (row – column, y -x): Lower triangle (in yellow to green): root mean square error (RMSE) between the different pairs of LST datasets, for day (left) and night (right). Statistics are computed over land grid cells only (using the ERA5 land-sea mask), weighted by cosine-latitude.

Figure 3 – The top and bottom axis labels are partially cut off. Please correct.

Figure 3 is now in the correct format.

- **Section 3.2 –** A fair comparison would include SST from CCI. Please consider including it in a revised manuscript, as it would be valuable to assess how an independent satellite-based dataset represents these signals. Based on the results shown in Figure 5, I suggest using the SST/IST product:

  https://data.marine.copernicus.eu/product/SST_GLO_SST_L4_REP_OBSERVATIONS_010_024/description

  which properly accounts for temperatures over sea ice.

We thank the reviewer for this suggestion. As this dataset is independent from the other products used, it makes sense to use it too for our validation. But it is worth noting that is it not straightforward as in the new version of the manuscript, all datasets are clear-sky. This L4 product, is not. Moreover, this is a joined (day and night datasets), and our analysis separates day and night. However, according to the ESA website, only this L4 dataset covers (homogeneously) our study period over 2008 to 2022 as shown in Figure Review 1, so indeed this is the right reference dataset to use.

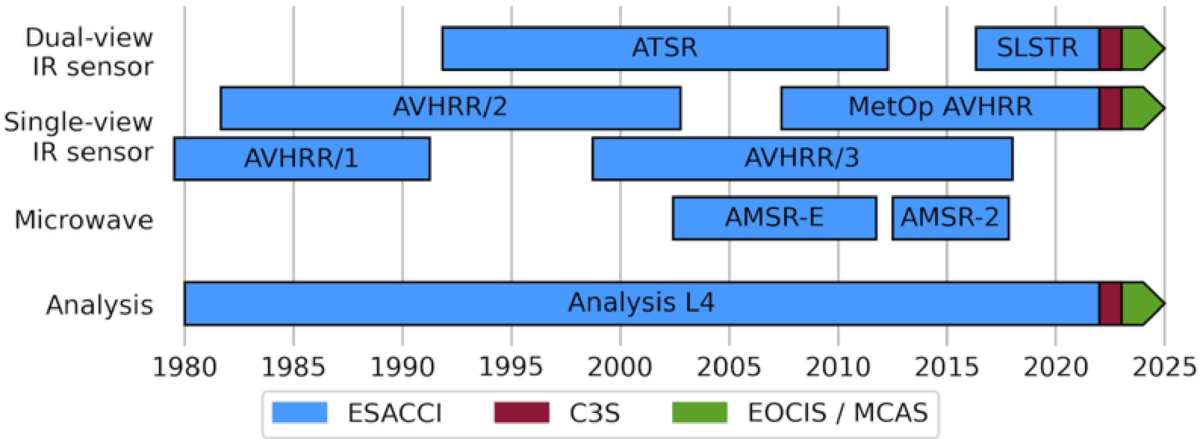


Figure Review 1. Overview of products included in SST-CCI CDR v3.0. Figure from https://climate.esa.int/en/projects/sea-surface-temperature/data/

This section 2.3 has been added, and Figures 4, 5 and 6 have been updated:

"2.3 ESA CCI and Copernicus climate change service (C3S) Reprocessed SST/IST

To extend the ocean surface temperature comparison with an independent satellite-based dataset, we include the ESA SST CCI and C3S Reprocessed Sea Surface and Sea Ice Temperature product, distributed through the Copernicus Marine Service (Høyer et al., 2014; Høyer & She, 2007; Nielsen-Englyst et al., 2023). We use the variable "st", which corresponds to the analysed sea (at 20 cm depth) and ice surface (surface skin) temperature. This Level-4 (L4) product provides gap-free daily analyses at a native horizontal resolution of 0.05° × 0.05°.

The product is generated using the Danish Meteorological Institute Optimal Interpolation (DMIOI) system, which combines input from multiple satellite sources (Embury et al., 2024); and IST retrievals from the AASTI (Arctic and Antarctic Surface Temperatures from thermal Infrared satellite radiometers) and C3S IST CDR/Interim CDR v.1. The inclusion of IST, constrained by a multi-source sea-ice concentration composite, makes this product particularly suited for representing surface temperatures in polar regions, the sea ice, and the marginal ice zone — areas where other SST products are typically undefined or unreliable. The product is extracted over the study period of 2008–2022, which we regrid to a 1° × 1° grid for consistency with the other datasets used in this study. In this work, this dataset is the only one that is all-sky, and not separated between day and night. In this study, we call it ESA CCI/C3S SST and it serves as such as a reference to the other SST datasets."

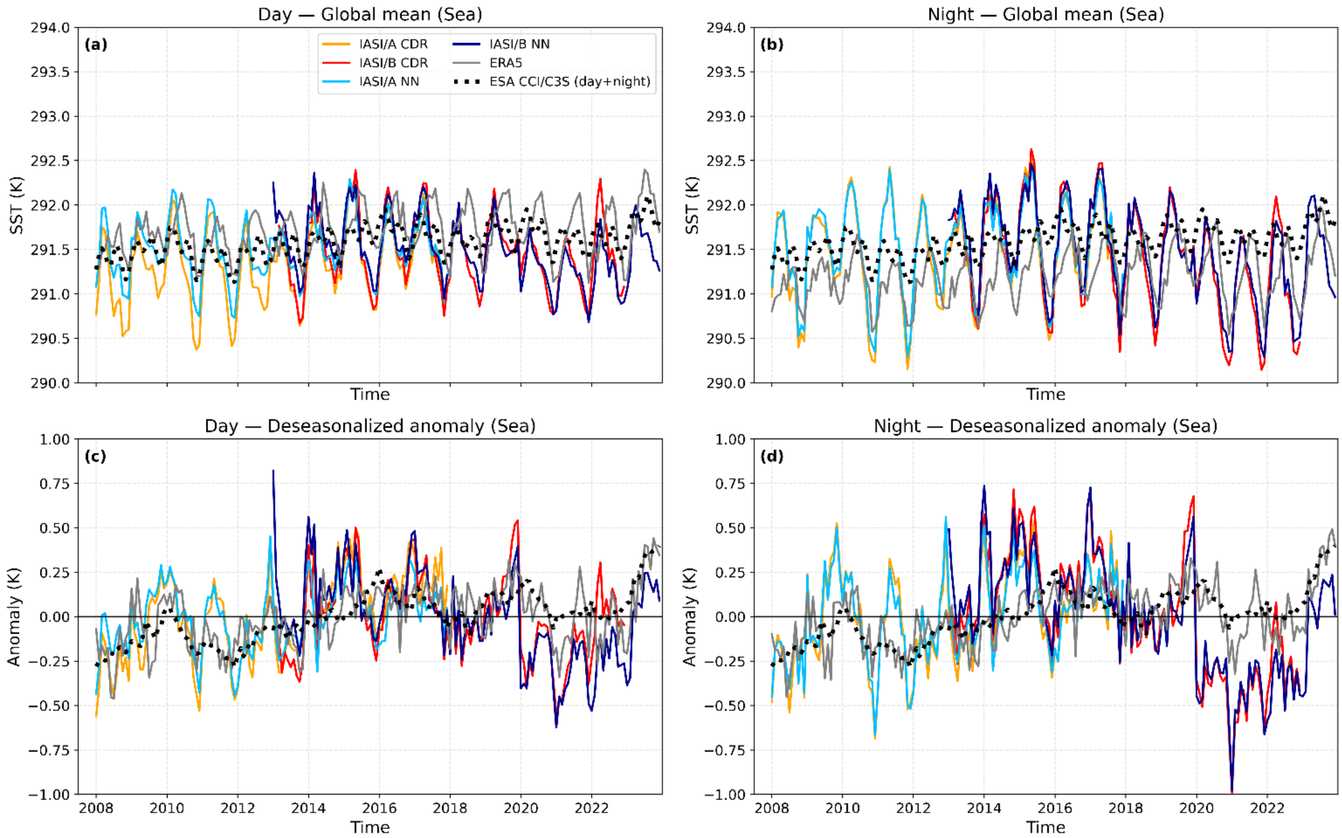


Figure 4. Upper panels: SST global mean during the day (panel a) and the night (panel b) for ERA5, IASI-CDR and IASI-NN**,** and *ERA5 CCI and C3S SST all-sky product which is shown in dotted black line. It is the same for the day and night panels as it is a combined product.* IASI data are separated between Metop A and Metop B. Lower panels: the deseasonalized anomaly of SST for the different products, during the day (panel c) and night (panel d). Global means are computed using cosine-latitude weighting.

The following sentence have been added to the discussion of Figure 4, as well as a sentence to explain the differences seen in 2020 and 2021 for IASI-B (both CDR and NN).

"The deseasonalized anomaly time series (panels c and d) show strong consistency across all datasets in both timing and amplitude of interannual variability, including the 2015–2016 El Niño warming and the subsequent 2020–2022 La Niña cooling. Larger inter-dataset differences, in particular post-2020 for IASI (CDR and NN), reflect systematic offsets attributable to differences in clear-sky sampling strategy rather than spurious trends or variability. The stronger negative anomalies in IASI during 2020–2022 are consistent with the La Niña period, during which increased cloudiness in the tropics reduces the availability of clear-sky retrievals, causing the IASI global mean to be cooler. The ESA CCI/C3S SST product shows systematically damped anomaly peaks in both the positive and negative directions relative to the clear-sky datasets, consistent with the spatial and temporal smoothing inherent to the optimal interpolation scheme used to produce gap-free, all sky, all day coverage, which reduces the amplitude of extreme anomalies by construction."

New figure 5: Since now we have 4 SST datasets (and to not have a large figure of 6x2 panels), we use the IASI NN product as a reference (as it is ours, and we want to indirectly validate it). The new Figure 5 looks as follows:

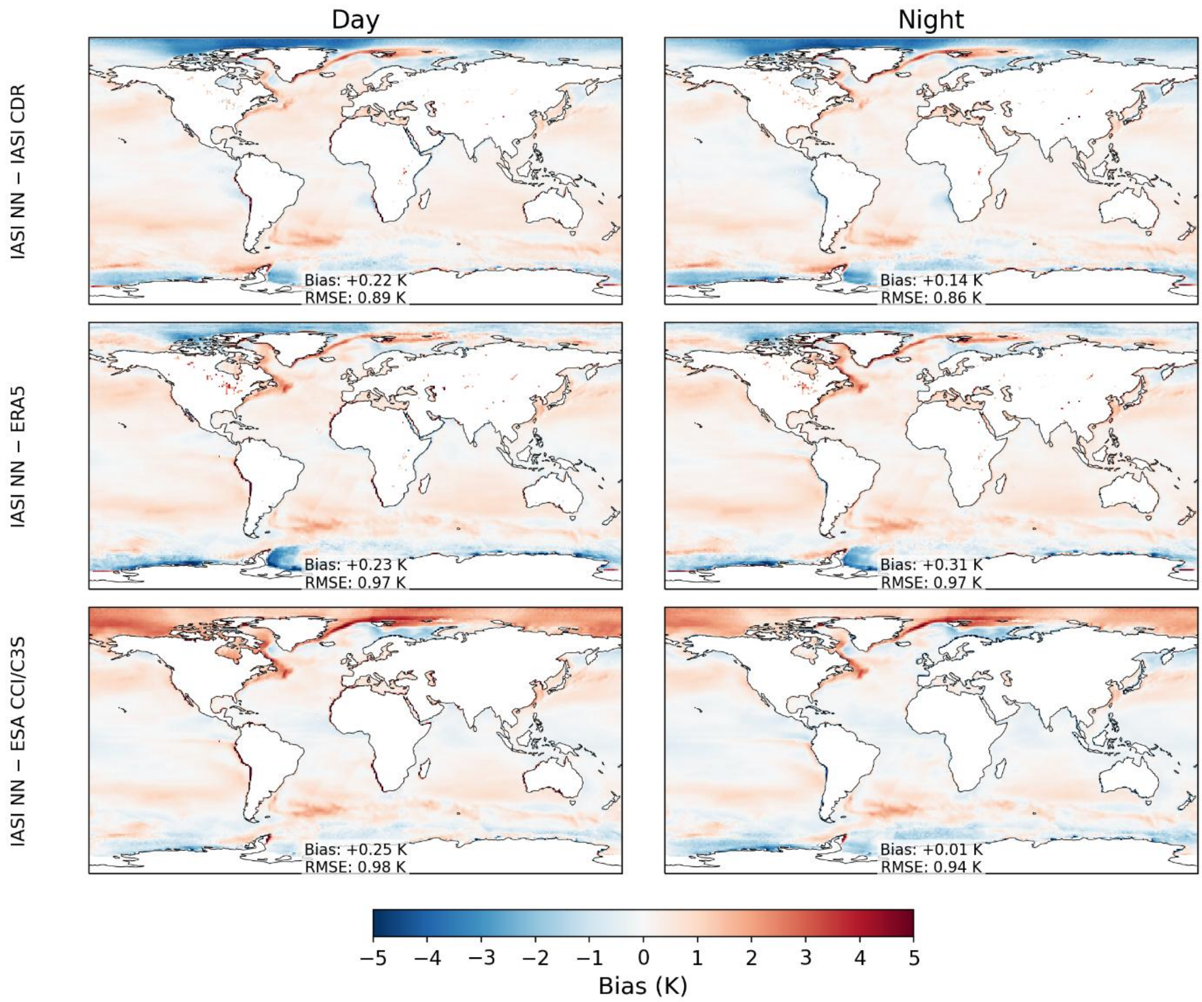


Figure 5. Spatial bias of IASI-NN ocean skin temperature relative to IASI-CDR, ERA5, and the ESA CCI/C3S SST analysis. Maps show daytime (left column) and nighttime (right column) biases, computed as the time mean of the monthly-mean differences over the datasets' common period (2008–2022). The ESA CCI/C3S product is a gap-filled, all-sky, daily-mean analysis with no day/night separation, so the same daily field is differenced against both the daytime and nighttime IASI-NN fields; IASI and ERA5 are restricted to clear-sky scenes. All datasets were regridded to a common 1°×1° grid and land points were masked using the ERA5 land–sea mask. Global mean bias and RMSE, area-weighted by the cosine of latitude, are indicated in each panel.

The updated discussion is now:

"Over the open ocean, IASI-NN agrees closely with all three products: global mean biases are small (+0.01 to +0.31 K), RMSE stays below 1 K in every panel, and differences across most of the ice-free ocean lie within ±1 K. Thin warm filaments along the western boundary currents (Gulf Stream, Kuroshio) mark sharp SST fronts that are smoothed in the gap-filled ESA CCI/C3S

analysis. The largest discrepancies are confined to high latitudes and differ in sign between products. Sharing the same instrument and the same clear-sky sampling, IASI-NN and IASI-CDR isolate the effect of the retrieval method: they show the closest agreement of all pairs (RMSE < 0.9 K), with IASI-NN colder than IASI-CDR over the Arctic, consistent with IASI-CDR being trained on, and therefore not independent of, ERA5 (Sect. 2.7). Relative to ERA5, IASI-NN is colder over the Southern Ocean, in line with ERA5's documented warm bias over sea ice (Graham et al., 2019; Herrmannsdörfer et al., 2023) ; relative to the all-sky ESA CCI/C3S analysis it is instead warmer across the Arctic. These contrasting signs indicate that the high-latitude spread reflects the differing definition, retrieval and sea-ice treatment of skin temperature across the datasets (Sect. 2.7) rather than a single common cause:"

L280 – Given the large daytime inhomogeneity for CCI in 2012, a cautionary note regarding the interpretation of trends should appear at the beginning of Section 4. Currently, this is only mentioned later in the discussion.

This cautionary note is now added at the beginning of Section 4:

"We first note that LST CCI daytime trend results should be interpreted with caution. As shown in Section 3, LST CCI exhibits a marked daytime inhomogeneity around 2012, associated with the sensor transition from AATSR to MODIS Terra within the CCI processing chain. This discontinuity affects the daytime time series over land and may introduce spurious signals in the derived trends."

- **L310 –** "except IASI-NN ones over sea." This statement appears somewhat overstated. Even over land, the areas showing significant trends are quite limited.

To avoid overstatement, this phrase has been removed.

- Although significant trends are shown in the emissivity maps in Figure S1, no interpretation is provided regarding how these trends may affect the LST trends in datasets that rely on these emissivity inputs.

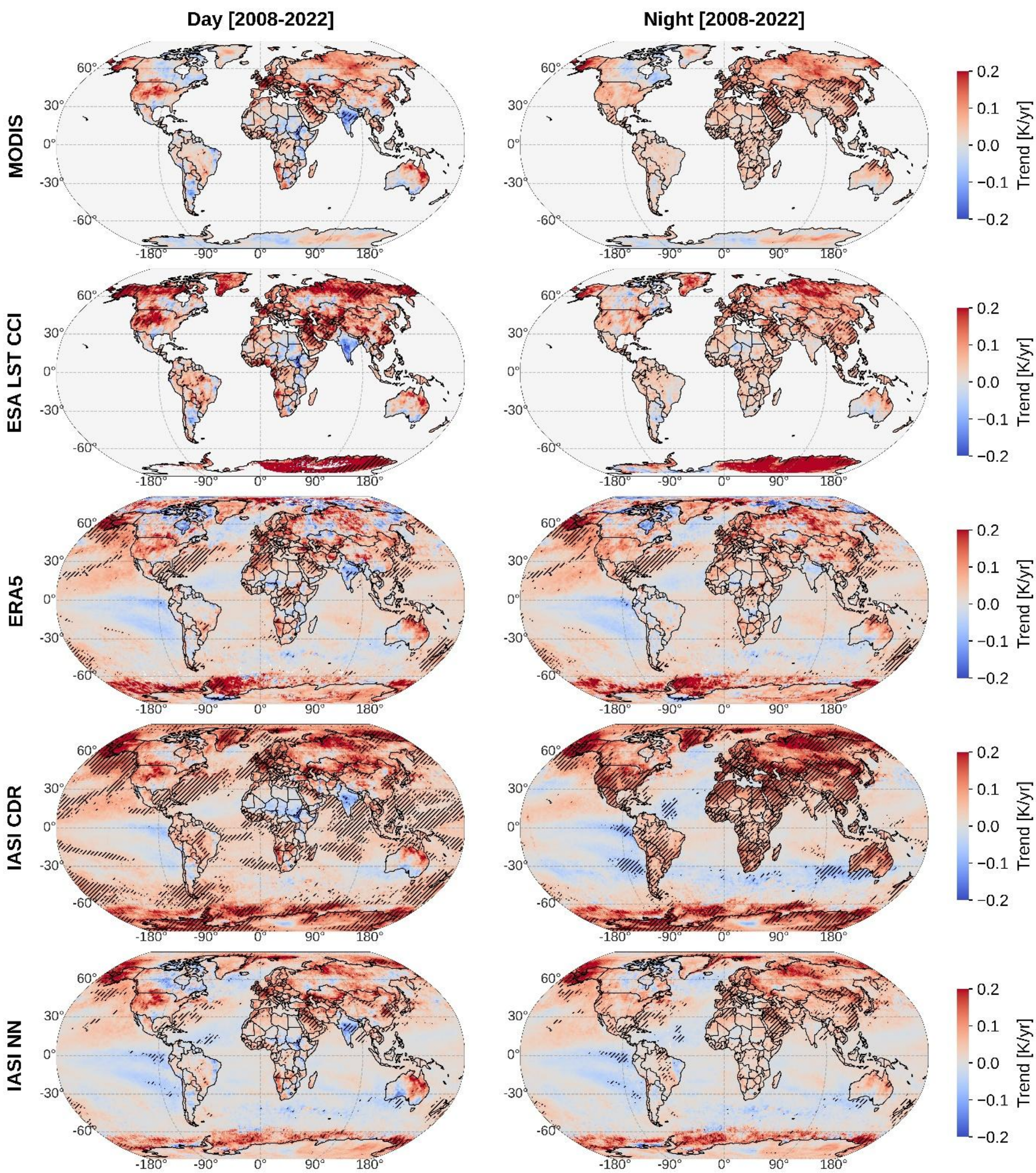
We'd like to note that little literature review exists on the subject as LST and emissivity are interdependent. However, it is indeed interesting to mention the added value of using monthly emissivities. The following discussion is now added in order to highlight the effect of using a monthly variable emissivity trend:

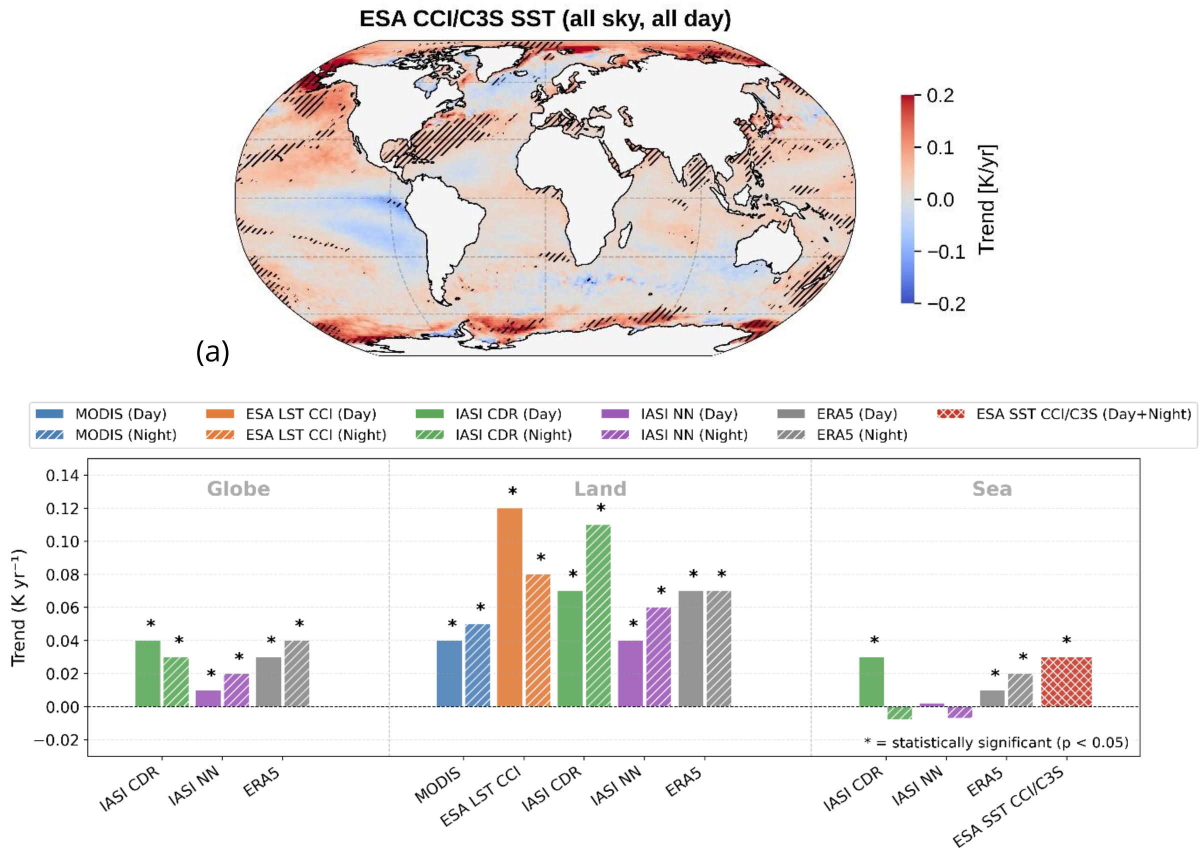
"The inclusion of time-varying CAMEL emissivities in the IASI-NN retrieval has implications for the derived LST trends. For example, Zhou et al. (2021) showed that neglecting emissivity trends leads to an overestimation of the global mean Tskin trend by approximately 4.9 × 10^{-3} K/yr (over the period 2008 to 2020). By explicitly incorporating monthly CAMEL emissivity fields and their interannual variability, the IASI-NN is therefore expected to yield more physically realistic LST trends than datasets relying on static emissivity climatology, such as ERA5."

- **Figure 6 –** It is confusing that LST CCI provides values over sea ice. These were masked in the comparisons shown in Figure 2 but not in Figure 6. Please ensure consistency (also in Figure S2).

Additionally, correct the occurrences of **"°K"** in the caption.

Indeed. This is now corrected for the LST CCI, and the sea ice values are masked using the ERA5 land sea mask. The figure caption is corrected as well for K/yr instead of °K/year. We added the SST trends as suggested by the reviewer in a previous comment. This is the updated Figure 6, panels (a) and (b). The SST trends agree well with our results.





(b)

Figure 6. (a) Spatial trends [K/yr] during day (left column) and night (right column) for MODIS, ESACCI LST, ERA5, IASI-CDR, IASI-NN, and ESA CCI/C3S SST (all sky, all day,) over the period January 2008-December 2022. Stipples correspond to regions where trends are significant according to the standard Mann-Kendall test (p-value < 0.05). (b) Global (Tskin), sea (SST), land (LST) trends (K/yr) from MODIS, ESA CCI LST, IASI-CDR, IASI-NN, ERA5, and ESA CCI/C3S SST over the period [January 2008–December 2022]. Trends are computed with the Theil–Sen estimator on annual latitude-weighted and deseasonalised averages. Significant trends are marked with an Asterix (*) above the bars.

References

Balsamo, G., Beljaars, A., Scipal, K., Viterbo, P., Hurk, B. van den, Hirschi, M., & Betts, A. K. (2009). A Revised Hydrology for the ECMWF Model: Verification from Field Site to Terrestrial Water Storage and Impact in the Integrated Forecast System. *Journal of Hydrometeorology*, *10*(3), 623–643. https://doi.org/10.1175/2008JHM1068.1

Embury, O., Merchant, C. J., Good, S. A., Rayner, N. A., Høyer, J. L., Atkinson, C., Block, T., Alerskans, E., Pearson, K. J., Worsfold, M., McCarroll, N., & Donlon, C. (2024). Satellite-based time-series of sea-surface temperature since 1980 for climate applications. *Scientific Data*, *11*(1), 326. https://doi.org/10.1038/s41597-024-03147-w

Ermida, S. L., & Trigo, I. F. (2022). A Comprehensive Clear-Sky Database for the Development of Land Surface Temperature Algorithms. *Remote Sensing*, *14*(10), 2329. https://doi.org/10.3390/rs14102329

Ermida, S. L., Trigo, I. F., DaCamara, C. C., Jiménez, C., & Prigent, C. (2019). Quantifying the Clear-Sky Bias of Satellite Land Surface Temperature Using Microwave-Based Estimates. *Journal of Geophysical Research: Atmospheres*, *124*(2), 844–857. https://doi.org/10.1029/2018JD029354

Ghent, D., Veal, K., & Perry, M. (2025). *ESA Land Surface Temperature Climate Change Initiative (LST_cci): Daily multisensor Infra-Red (IR) Low Earth Orbit (LEO) land surface temperature (LST) time series level 3 supercollated (L3S) global product (1995-2024), version 3.00* (p. 20258 Files, 5001176579070 B) [Application/xml]. NERC EDS Centre for Environmental Data Analysis. https://doi.org/10.5285/E67B02B814BF4A78B9EC90B4259F0741

Graham, R. M., Hudson, S. R., & Maturilli, M. (2019). Improved Performance of ERA5 in Arctic Gateway Relative to Four Global Atmospheric Reanalyses. *Geophysical Research Letters*, *46*(11), 6138–6147. https://doi.org/10.1029/2019GL082781

Herrmannsdörfer, L., Müller, M., Shupe, M. D., & Rostosky, P. (2023). Surface temperature comparison of the Arctic winter MOSAiC observations, ERA5 reanalysis, and MODIS satellite retrieval. *Elementa: Science of the Anthropocene*, *11*(1), 00085. https://doi.org/10.1525/elementa.2022.00085

Hersbach, H., Bell, B., Berrisford, P., Hirahara, S., Horányi, A., Muñoz-Sabater, J., Nicolas, J., Peubey, C., Radu, R., Schepers, D., Simmons, A., Soci, C., Abdalla, S., Abellan, X., Balsamo, G., Bechtold, P., Biavati, G., Bidlot, J., Bonavita, M., … Thépaut, J.-N. (2020). The ERA5 global reanalysis. *Quarterly Journal of the Royal Meteorological Society*, *146*(n/a), 1999–2049. https://doi.org/10.1002/qj.3803

Hirahara, S., Alonso-Balmaseda, M., de Boisseson, E., & Hersbach, H. (2016). *Sea Surface Temperature and Sea Ice Concentration for ERA5*. ECMWF. https://www.ecmwf.int/en/elibrary/16555-sea-surface-temperature-and-sea-ice-concentration-era5

Høyer, J. L., Le Borgne, P., & Eastwood, S. (2014). A bias correction method for Arctic satellite sea surface temperature observations. *Remote Sensing of Environment, Liege Colloquium Special Issue: Remote Sensing of Ocean Colour, Temperature and Salinity*, *146*, 201–213. https://doi.org/10.1016/j.rse.2013.04.020

Høyer, J. L., & She, J. (2007). Optimal interpolation of sea surface temperature for the North Sea and Baltic Sea. *Journal of Marine Systems, Marine Environmental Monitoring and Prediction*, *65*(1), 176–189. https://doi.org/10.1016/j.jmarsys.2005.03.008

Nielsen-Englyst, P., Høyer, J. L., Kolbe, W. M., Dybkjær, G., Lavergne, T., Tonboe, R. T., Skarpalezos, S., & Karagali, I. (2023). A combined sea and sea-ice surface temperature climate dataset of the Arctic, 1982–2021. *Remote Sensing of Environment*, *284*, 113331. https://doi.org/10.1016/j.rse.2022.113331

Wang, Y.-R., Hessen, D. O., Samset, B. H., & Stordal, F. (2022). Evaluating global and regional land warming trends in the past decades with both MODIS and ERA5-Land land surface temperature data. *Remote Sensing of Environment*, *280*, 113181. https://doi.org/10.1016/j.rse.2022.113181

Zeng, X., & Beljaars, A. (2005). A prognostic scheme of sea surface skin temperature for modeling and data assimilation. *Geophysical Research Letters*, *32*(14). https://doi.org/10.1029/2005GL023030

Zhou, D. K., Larar, A. M., & Liu, X. (2021). Surface Skin Temperature and Its Trend Observations From IASI on Board MetOp Satellites. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, *14*, 1665–1675. https://doi.org/10.1109/JSTARS.2020.3046421