

**Authors' response to Editor and Referees' comments
on the revised manuscript "Using deep learning to assimilate
sun-induced fluorescence satellite observations in the ISBA
land surface model"**

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(bold +italic = referee comment)

Authors' response to the Editor

We've received follow up reviews of the manuscript. The reviewers are mostly satisfied with the revisions with one reviewer requesting additional minor revisions. Before we can accept the manuscript, we request that the authors address the remaining comments.
Sincerely, Andrew Feldman.

RESPONSE: Thank you for this comment. We address below the remaining comments of Dr Alban Farchi.

Authors' response to Dr. Alban Farchi

We would like, again, to acknowledge the meticulous review of our article done by Dr. Farchi, and we thank him for his relevant remarks and comments that have helped us to improve the article content further.

(1) L 40-41: the updated sentence is not clear, please check.

RESPONSE 1: We agree that this sentence could be confusing. We replaced:

"To enable more real-time and operational monitoring of vegetation, Garrigues et al. (2026) have assimilated the 8-day SIF retrieval reprocessed from raw TROPOMI data into the IFS land surface model developed at ECMWF at a global scale."

by

"In order to improve operational monitoring of vegetation, Garrigues et al. (2026) assimilated the reprocessed and consolidated 8-day SIF retrieval from raw TROPOMI data into the IFS land surface model developed at ECMWF on a global scale."

(2) L 45-46: "our model" and "this model" refer to the same model if I am not mistaken, but this is rather confusing

RESPONSE 2: We replaced:

"Unlike Garrigues et al. (2026), our land surface model simulates LAI. As the SIF is not explicitly simulated by this model, a new observation operator is required to map the model variables into observation space."

by

"Unlike Garrigues et al. (2026), the ISBA land surface model simulates LAI. As the SIF is not explicitly simulated by ISBA, a new observation operator is required to map the model variables into observation space."

(3) L 84-86: *"This process ensures that the distribution of TROPOMI SIF observations is centred on zero over bare soil. This means that non-physical negative values for TROPOMI SIF can occur." From the use of "non-physical" I understand that SIF is supposed to be non-negative. Then in the following paragraph ("Only all positive instantaneous measurements [...] are aggregated"), I understand that non-positive measurements are discarded. Does that mean that approximately half of the observations are discarded? (At least that is what I would assume from the statement saying that the distribution of observations is centred on zero)?*

RESPONSE 3: The distribution of SIF retrieval is centred on zero where there is only bare soil present. Where vegetation is present, the distribution is no longer centred on zero. However, some negative retrievals may remain and are discarded when aggregating over grid cells. To make it clearer we replaced

"This process ensures that the distribution of TROPOMI SIF observations is centered on zero over bare soil."

by

"This process ensures that the distribution of TROPOMI SIF observations is centred on zero over grid cells where there is only bare soil (i.e. where MODIS classifies the land as having no vegetation)."

(4) Section 3.2: *This is now much clearer, thank you. Three final comments:*

** using $\mathbf{J}$ for the TL of the observation operator feels (at least to me) a bit confusing. I would advise sticking to $\mathbf{H}$. In that case, there is no confusion with the (non-linear) observation operator even though they share the same symbol because the non-linear operator is always followed by parentheses and an argument: $\mathbf{H}(\mathbf{x})$. But if you want to be really safe, you could also use $\boldsymbol{\mathcal{H}}$ and $\boldsymbol{\mathcal{M}}$ for non-linear operators...*

** in eq. 3, I don't understand why the argument of $\mathbf{H}$ is the background and the denominator is the analysis?*

** in the end, I think that you could use directly "t" and "t-1" as subscripts if you want to simplify a bit the presentation.*

RESPONSE 4: Yes. We adopted your notations in the revised manuscript and developed the equation 3 to make it clearer.

(5) L 182: *"Eq. (4)(b)" -> "Eq. (4b)".*

RESPONSE 5: This has now been corrected in the revised manuscript.

(6) FiG 6: *you could perhaps reverse the colour maps to show improvements in blue and degradations in red?*

RESPONSE 1.6: Yes. The colour maps have been reversed in the revised manuscript.