Response to Reviewer #1 Technical comments:

On behalf of all the authors of the manuscript, I wish to thank Reviewer #1 for dedicating further time and effort to the revision of our manuscript. His attention and care of details really added value to our work.

Here follows a point-by-point response to his comments (bold text denote the comments, plain one the answers – our line numbering refers to the clean version of the updated manuscript):

The authors have engaged with the reviewer comments and made good steps to revise and improve their manuscript. I would like to see this published; however, I have a few remaining (minor) comments and corrections based on the revised manuscript.

The line numbering used below is from the track-changes version of the updated manuscript.

Line 19: "All existing methods ..." I would be happier if this said "All existing prognostic methods ..." as this is not true in general, as there are diurnal skin SST models/methods that do not truncated solar transmission, you are referring to prognostic warm-layer-only methods.

Added the word prognostic, Line 19.

Line 20: "... we develop a new scheme ..." my understanding from what you have written is that it is not a *new* scheme but an option that is already coded within NEMO, your contribute is to implement it for the prognostic skin SST scheme. As such, I think it more appropriate to word as "... we implement a new scheme ...".

Accepted. Reworded from "develop" to "implement". See Line 21.

Line 32-34: "More in detail, the new scheme reduces the RMSE on the top 15 m in the central Mediterranean for summertime months, compared to the one already implemented one within the ocean model."

To improve the English I suggest replacing with

"The new scheme reduces the RMSE in the top 15 m of the central Mediterranean for the summertime months compared to the scheme already implemented within the ocean model."

Accepted. See Lines 31-32.

Line 107: "... coefficients though (Gentemann et al 2009)." Should be "... coefficients through Gentemann et al 2009."

Changed accordingly, see Line 105.

Line 244: "... which however ..." replace with "... although ..."

Changed accordingly, see Line 237.

Line 251: No need for a new line for this last sentence.

Changed accordingly, see Line 243.

Line 297: "... of the of the ..." replace with "... of the ..."

Thanks, changed accordingly. See Line 288.

Line 333: "In out setup …" replace with "In our setup …"

Thanks, changed accordingly. See Line 321.

Figure 1: Your black line depicting the diurnal thermocline has the cool skin effect penetrating to a depth of around 1.5m, this should only be confined to your cool-skin (blue) layer which is the top 10\mu m. From the black line the figure also is indicating a cool-skin effect of over 2 degree C, which is much too large. Please revise the black line in this figure before publication.

Modified. See the new figure 1 in the Figures section.

Lines 584-587: Your panel numbers need to be updated from "2a" and "2b" to "3a" and "3b"

Thanks, changed accordingly. See Lines 569-572.

For panel 3a why does the green line not intercept the y-axis at exactly 1? (like the red line does).

Since the curve is the sum of exponentials, both green and red lines intercept y-axis at 1 only at a depth of zero meters on the x-axis. This point cannot be shown on a log-log plot, so we have to cut at a certain (arbitrary) value, whose choice was dictated by the need to show e-folding depths for both curves. We added a sentence in the figure caption: "Note that the x-axis range does not start from 0 to allow a logarithmic representation of the depth", Lines 572-573.

Line 609: Your panel numbers need to be updated from "6a, 6b, 6c, 6d" to "7a, 7b, 7c, 7d"

Changed accordingly. See Line 594.

Supplemental Materials: I don't have an updated version, but the equation "delta = …" should be "lambda = …". The equation you provide is actually an equation for the Saunders' constant (which is needed for your eqn (6)). To provide closure you will also need an expression that relates delta (coolskin depth) to lambda.

Thanks, we didn't notice the typo in Zeng and Beljaars 2005. Fixed accordingly. See updated supplementary material.