Supplement of

Skin sea surface temperature schemes in coupled ocean–atmosphere modelling: the impact of chlorophyll-interactive e-folding depth

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**Figure S1.** Basic validation of foundation SST averaged over the Western and Eastern Mediterranean Sea, respectively on left and right panels. Upper panels show the bias with respect to CMEMS monthly averaged foundation SST, while lower panels show the reference CMEMS absolute values.
Table S1: Table outlining the number of Drifter’s observations in each month, for each hour of the day in that given month: the greatest number of measurements in total is April, with a peak of 10361 measurements at 9:00 am.

Details on cool skin depth and solar fraction in the warm layer

The parameters used follow the choices reported in Zeng and Beljaars 2005 and references therein, with

\[ f_s = 0.065 + 11\delta - \frac{6.6 \times 10^{-5}}{\delta} \left[ 1 - e^{-\frac{\delta}{8 \times 10^{-4}}} \right], \]

\[ \lambda = 6 \left[ 1 + \left( \frac{-16g\alpha_w v_w^3}{u_{*w}^4 k_w^2 \rho_w c_w} (Q + R_s f_s) \right)^{3/4} \right]^{-1/3}, \]

\[ \delta = \frac{\lambda v_w}{\left( \rho_a/\rho_w \right)^{1/2} u_{*w}}, \]

where \( \rho_a \) denotes air density at the interface of separation.

The equation for the prognostic variable \( \Delta T_w \) is solved, after being discretized in time, as follows:
\[ \Delta T_{w}^{(n+1)} = \left[ \Delta T_{w}^{(n)} + \frac{Q + R_{s}f_{s} \nu + 1}{d \rho_{w} c_{w}} \Delta t \right] \bigg/ \left[ 1 + \Delta t \frac{(\nu + 1)k_{w}w}{d \phi (d/L)} \right]. \] (12)

where \( \Delta T_{w}^{(n)} \) is the difference \((T_w - T_{\text{ref}})\) at time \( t_n = n\Delta t \). The warm layer reference depth \( d \) is an important parameter in this scheme, since it’s very closely linked to solar radiation extinction, which is the main responsible for the diurnal warming. Its redefinition is the starting point of our modification to the existing schemes, as we discussed in the main text.