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The global ocean mixed layer depth derived from an energy approach based on buoyancy work

Efraín Moreles et al.

Correspondence to: Efraín Moreles (moreles@cmarl.unam.mx)

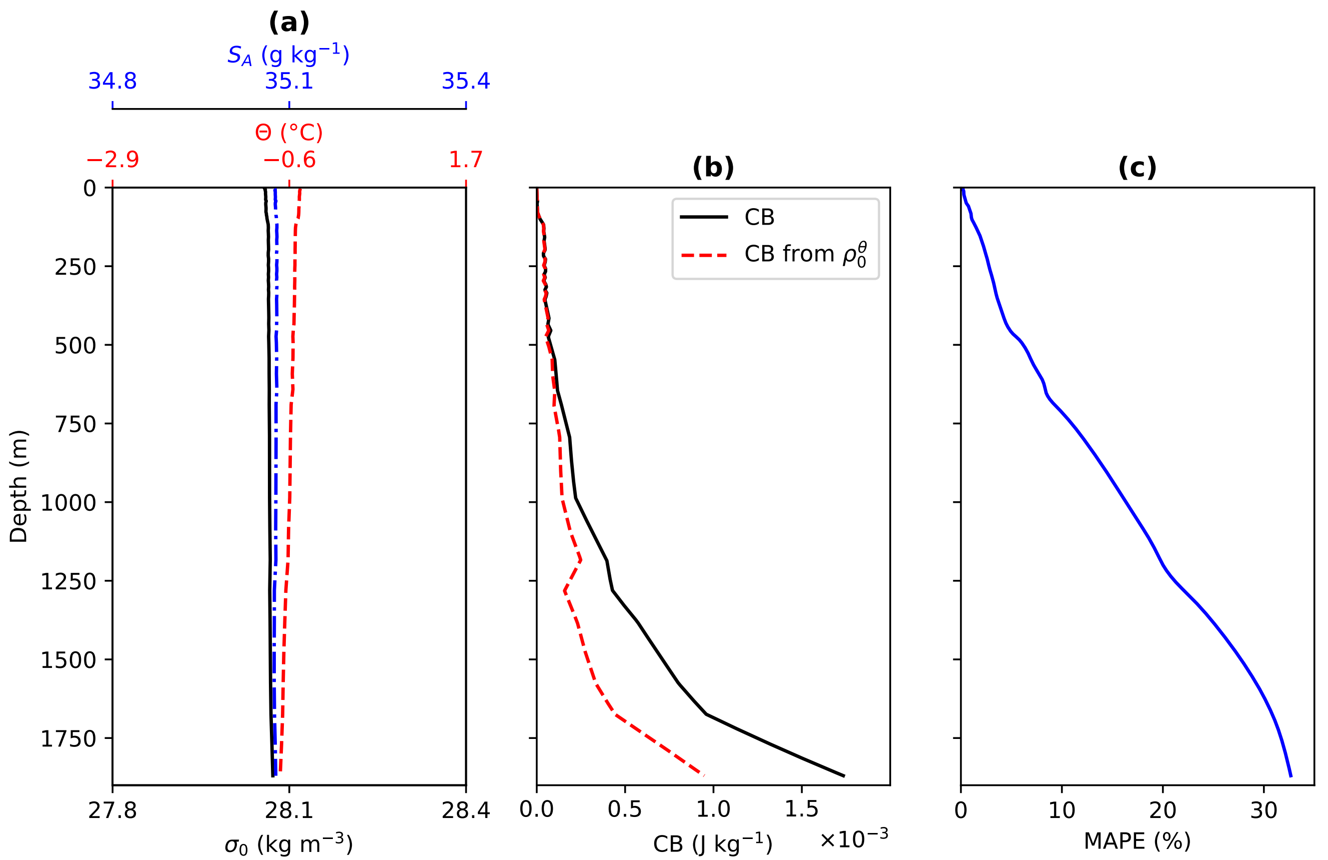

Figure S1. (a) Vertical profiles of potential density anomaly referred to 0 dbar, σ_0 (solid line), conservative temperature, Θ (dashed line), and absolute salinity, S_A (dash-dotted line), in a location in the Greenland Sea (74.43°N, 3.07°W) on April 22, 2013. (b) Columnar buoyancy, CB, at various depths, using two approaches: from the locally referenced potential density (solid line) and ρ_0^θ (dashed line). (c) Mean absolute percentage error, MAPE, between both expressions of columnar buoyancy at various depths. The variables σ_0, Θ, S_A, N^2, and depth were calculated using the TEOS-10 toolbox; both expressions of CB were calculated using trapezoidal integration.

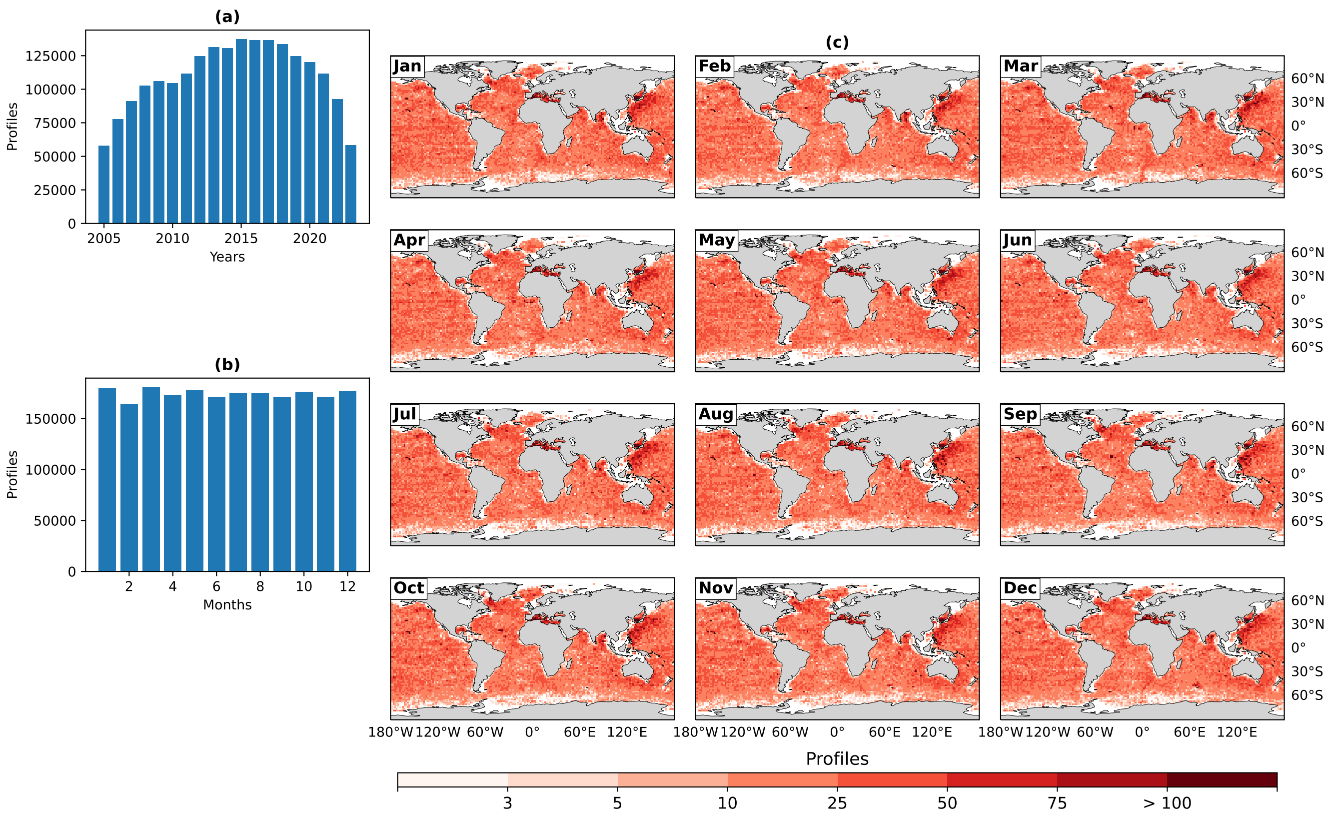

Figure S2. (a) Annual and (b) monthly histograms of the number of Argo profiles in the long-term record. (c) Monthly maps of the spatial distribution of the number of Argo profiles in the long-term record.

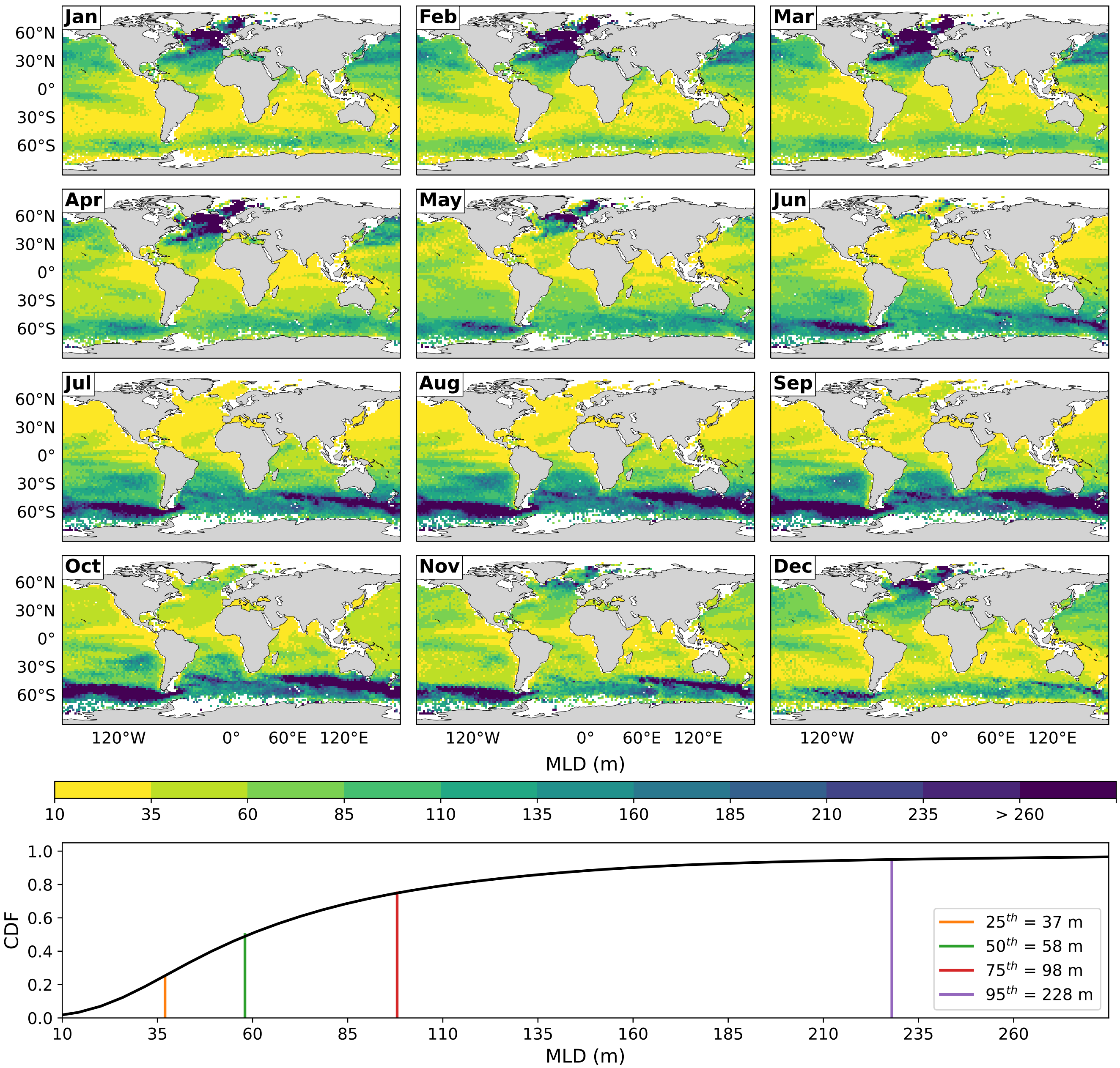

Figure S3. Upper panel: global monthly MLD climatology calculated with EBM, considering $\Delta\overline{\rho^{\theta}} = 0.0625\ \mathrm{kg\,m^{-3}}$. Lower panel: the cumulative density function (CDF) of the conjoint distribution in space and time of MLD, with various percentiles shown.

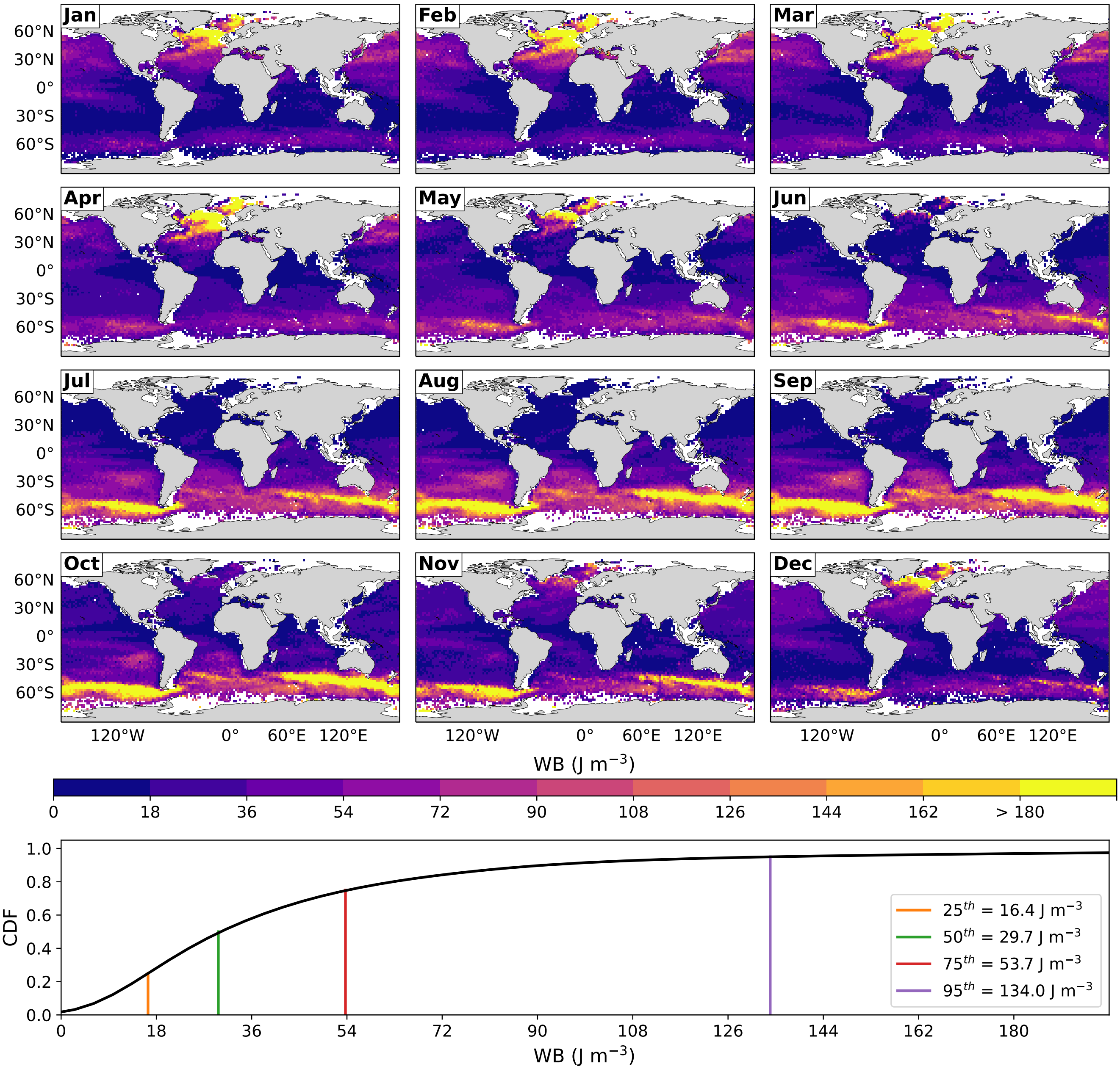

Figure S4. Upper panel: global monthly climatology of the WB threshold characterizing the EBM-MLD, i.e., $\mathrm{WB}(z = \mathrm{MLD})$, considering $\Delta\overline{\rho^{\theta}} = 0.0625\,\mathrm{kg\,m^{-3}}$. Lower panel: the cumulative density function (CDF) of the conjoint distribution in space and time of $\mathrm{WB}(z = \mathrm{MLD})$, with various percentiles shown.

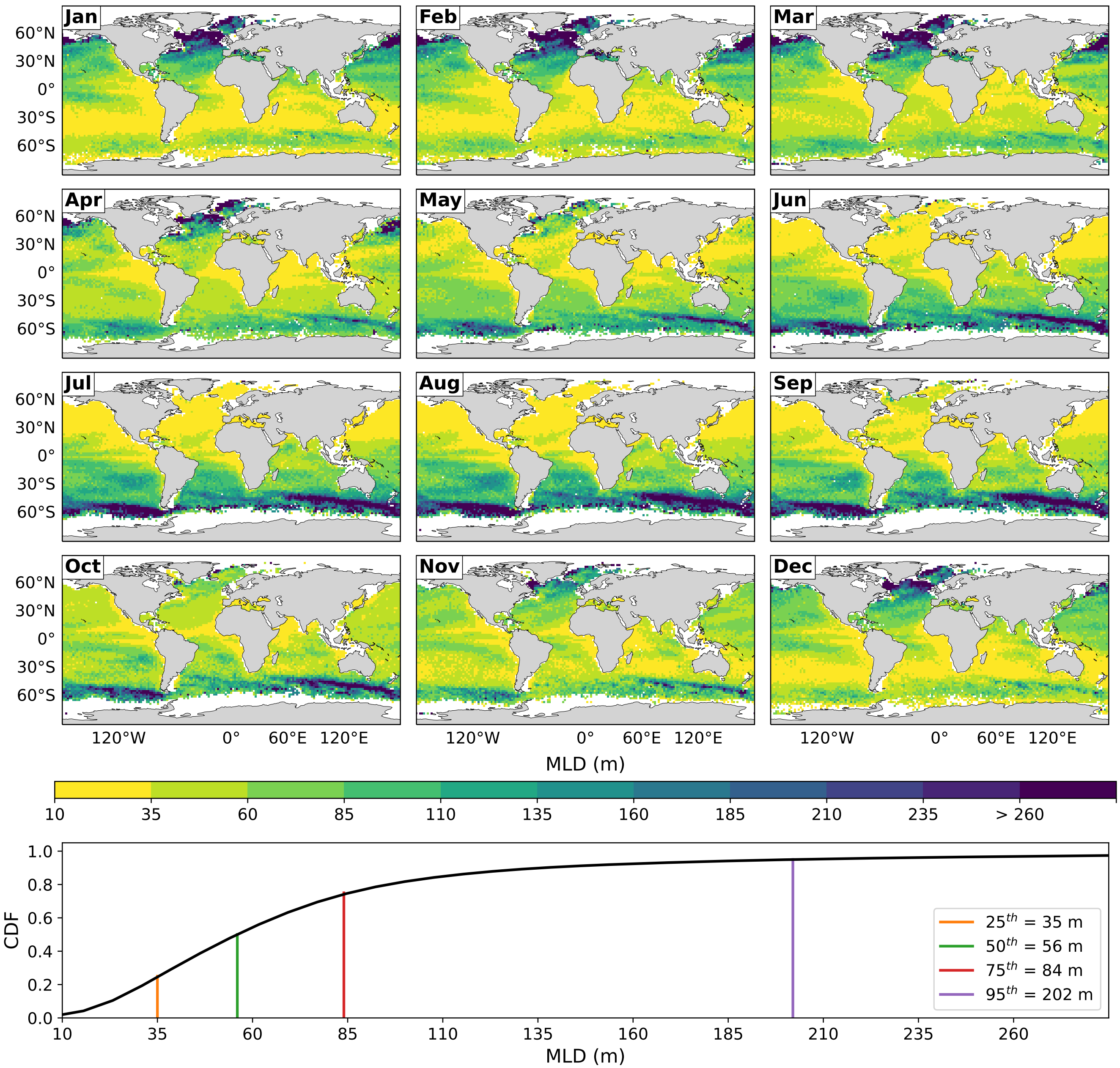

Figure S5. Upper panel: global monthly MLD climatology calculated with B04T. Lower panel: the cumulative density function (CDF) of the conjoint distribution in space and time of MLD, with various percentiles shown.

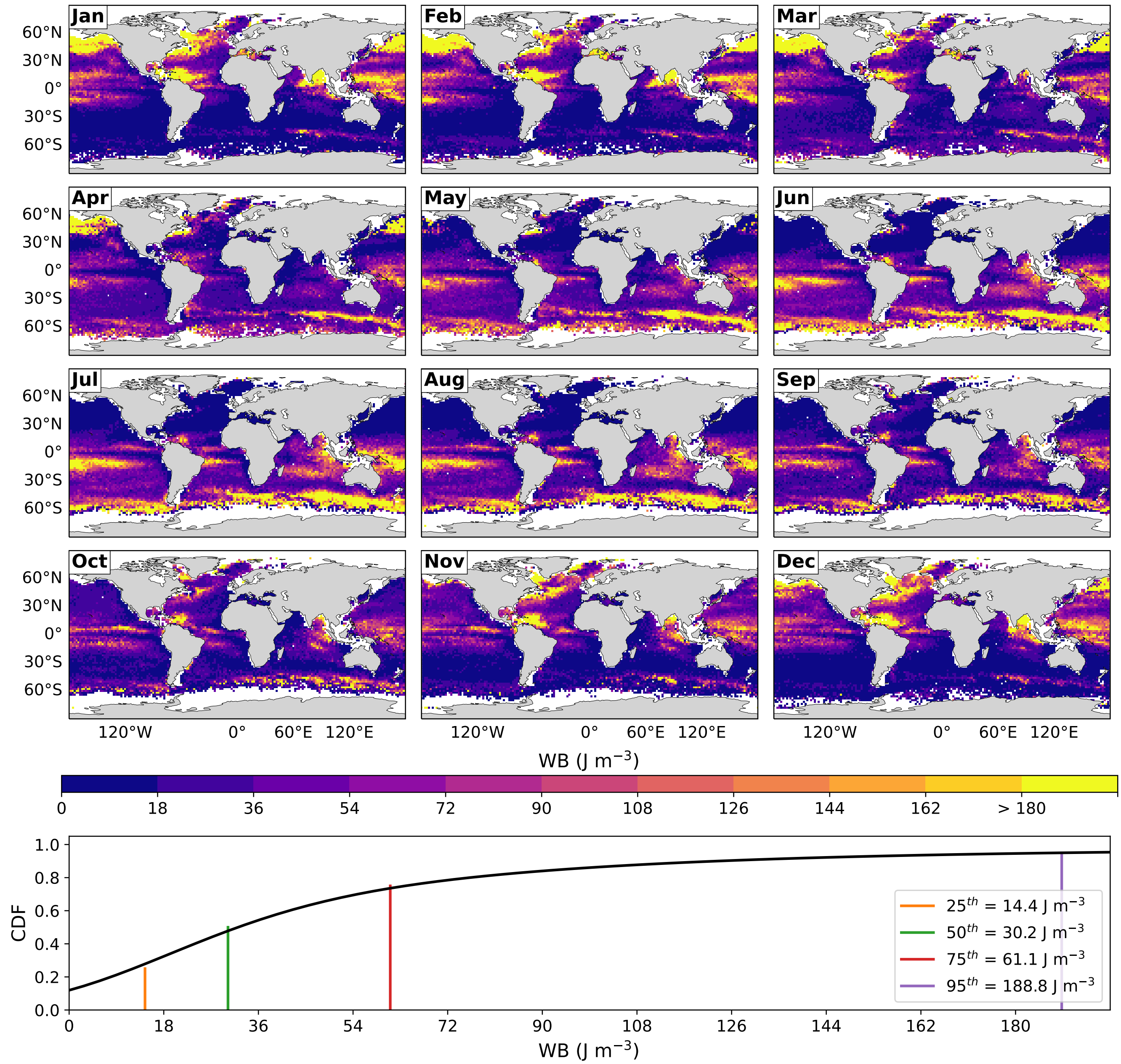

Figure S6. Upper panel: global monthly climatology of the WB threshold characterizing the B04T-MLD, i.e., WB$(z = \text{MLD})$. Lower panel: the cumulative density function (CDF) of the conjoint distribution in space and time of WB$(z = \text{MLD})$, with various percentiles shown.

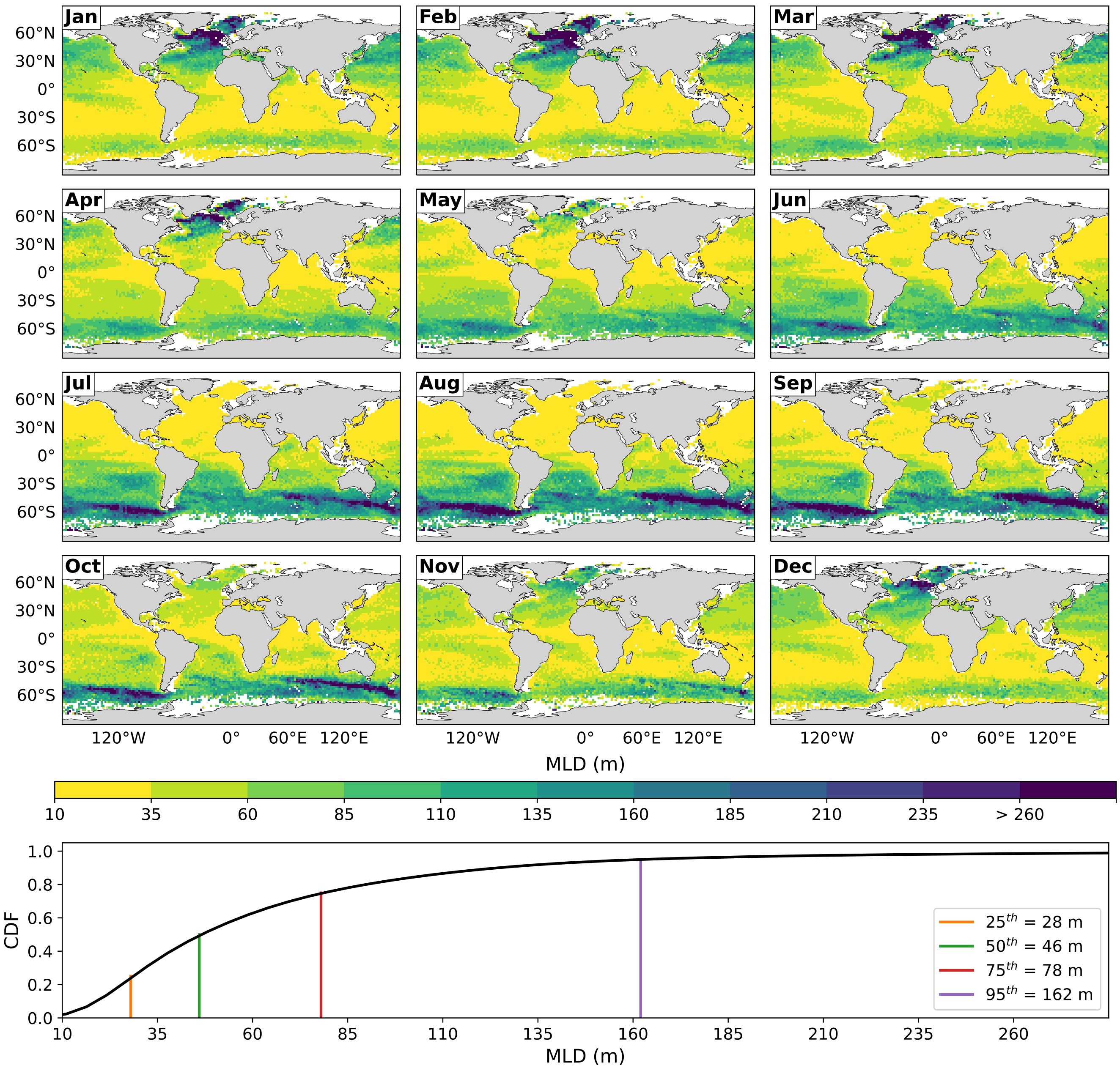

Figure S7. Upper panel: global monthly MLD climatology calculated with B04D. Lower panel: the cumulative density function (CDF) of the conjoint distribution in space and time of MLD, with various percentiles shown.

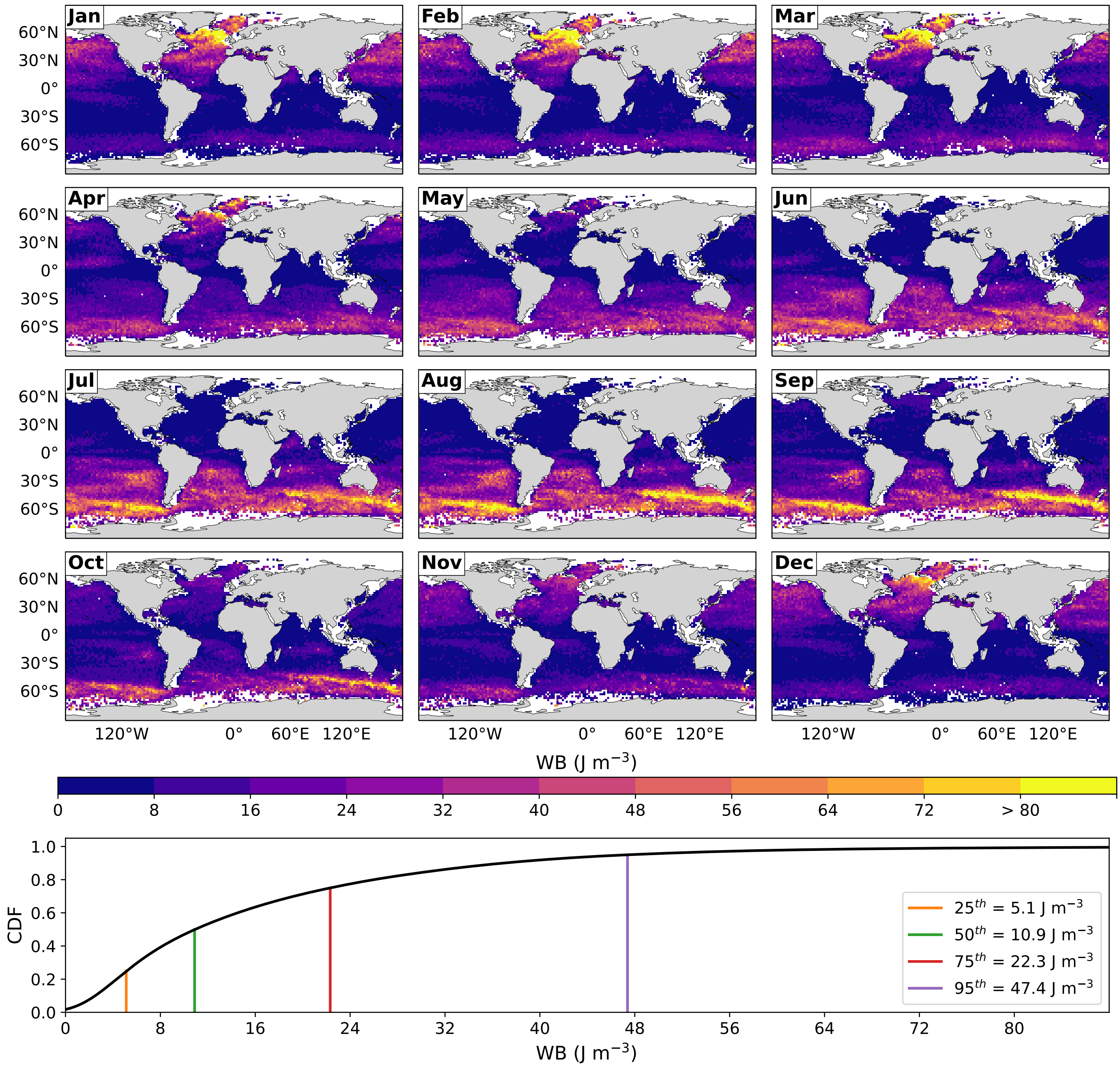

Figure S8. Upper panel: global monthly climatology of the WB threshold characterizing the B04D-MLD, i.e., WB$(z = \mathrm{MLD})$. Lower panel: the cumulative density function (CDF) of the conjoint distribution in space and time of WB$(z = \mathrm{MLD})$, with various percentiles shown.

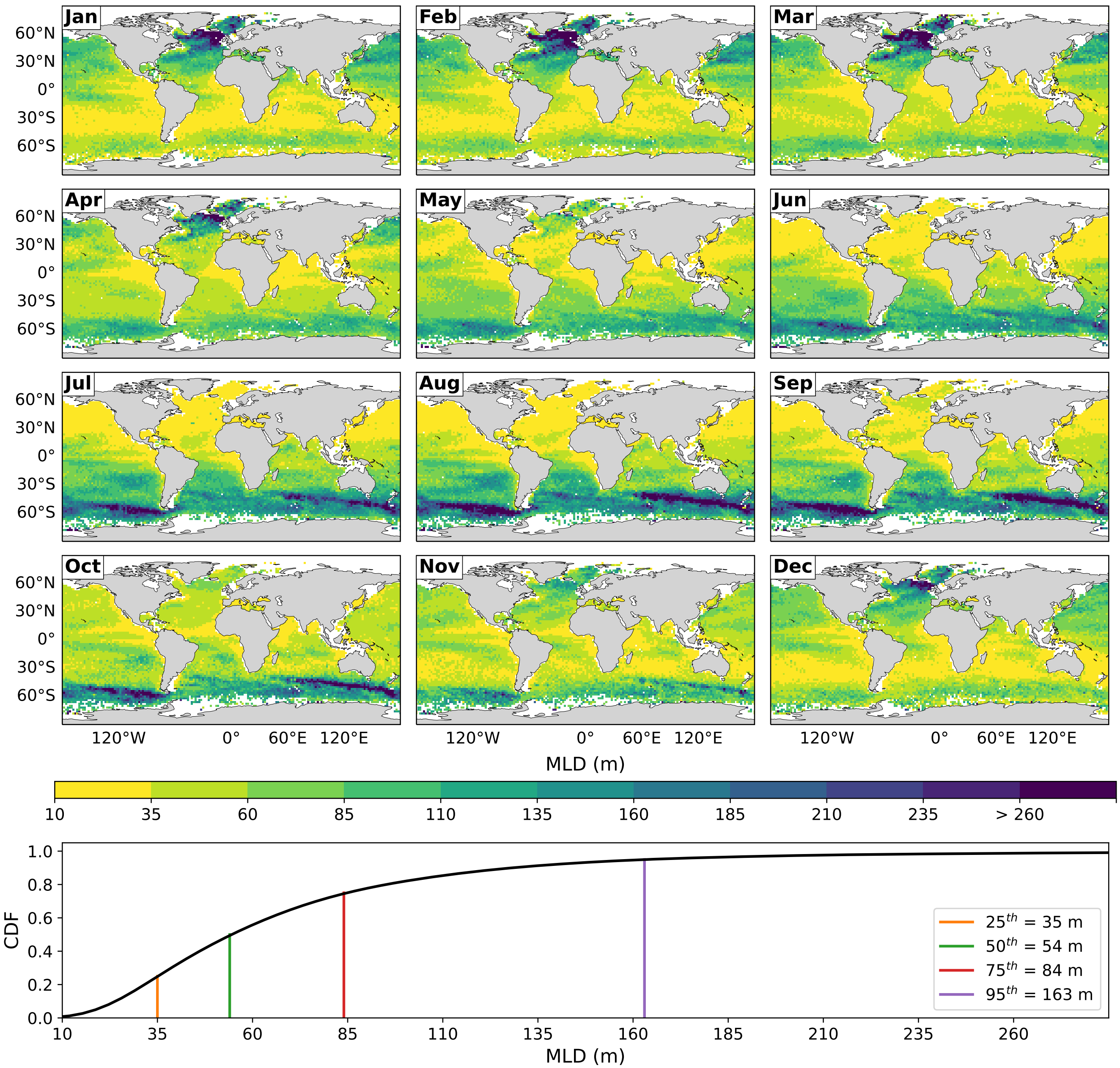

Figure S9. Upper panel: global monthly MLD climatology calculated with HT09. Lower panel: the cumulative density function (CDF) of the conjoint distribution in space and time of MLD, with various percentiles shown.

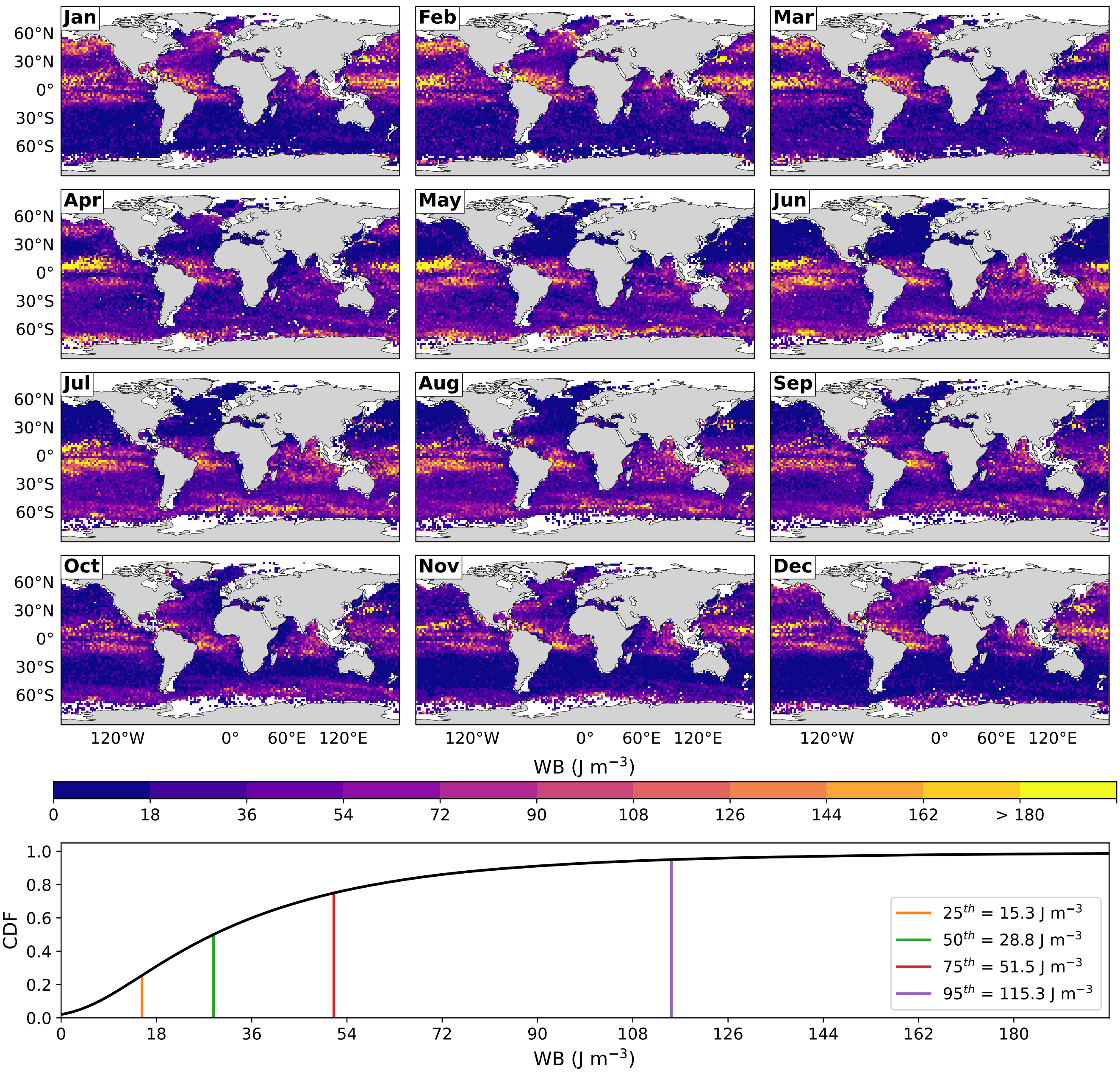

Figure S10. Upper panel: global monthly climatology of the WB threshold characterizing the HT09-MLD, i.e., WB$(z = \mathrm{MLD})$. Lower panel: the cumulative density function (CDF) of the conjoint distribution in space and time of WB$(z = \mathrm{MLD})$, with various percentiles shown.

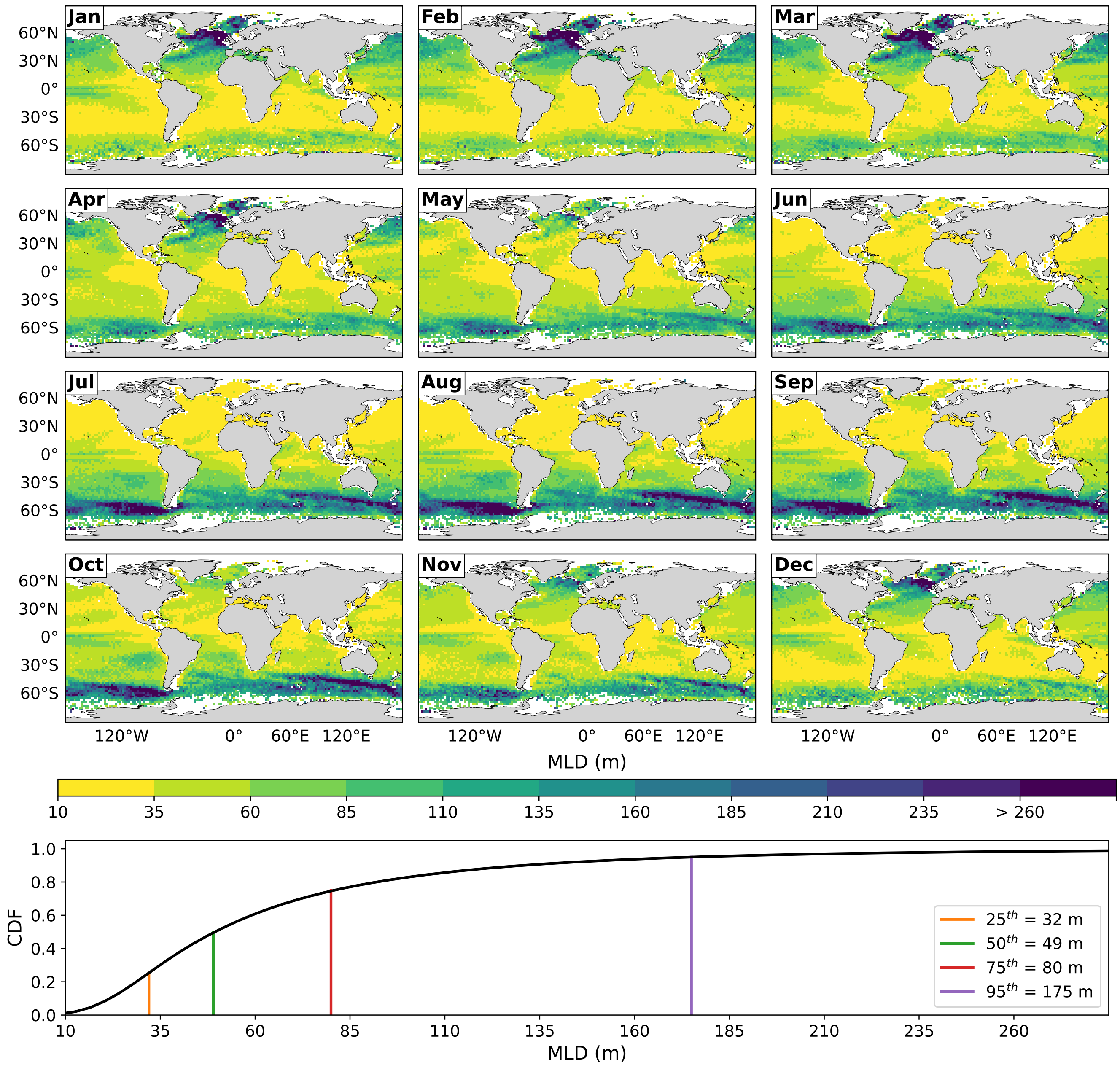

Figure S11. Upper panel: global monthly MLD climatology calculated with R23. Lower panel: the cumulative density function (CDF) of the conjoint distribution in space and time of MLD, with various percentiles shown.

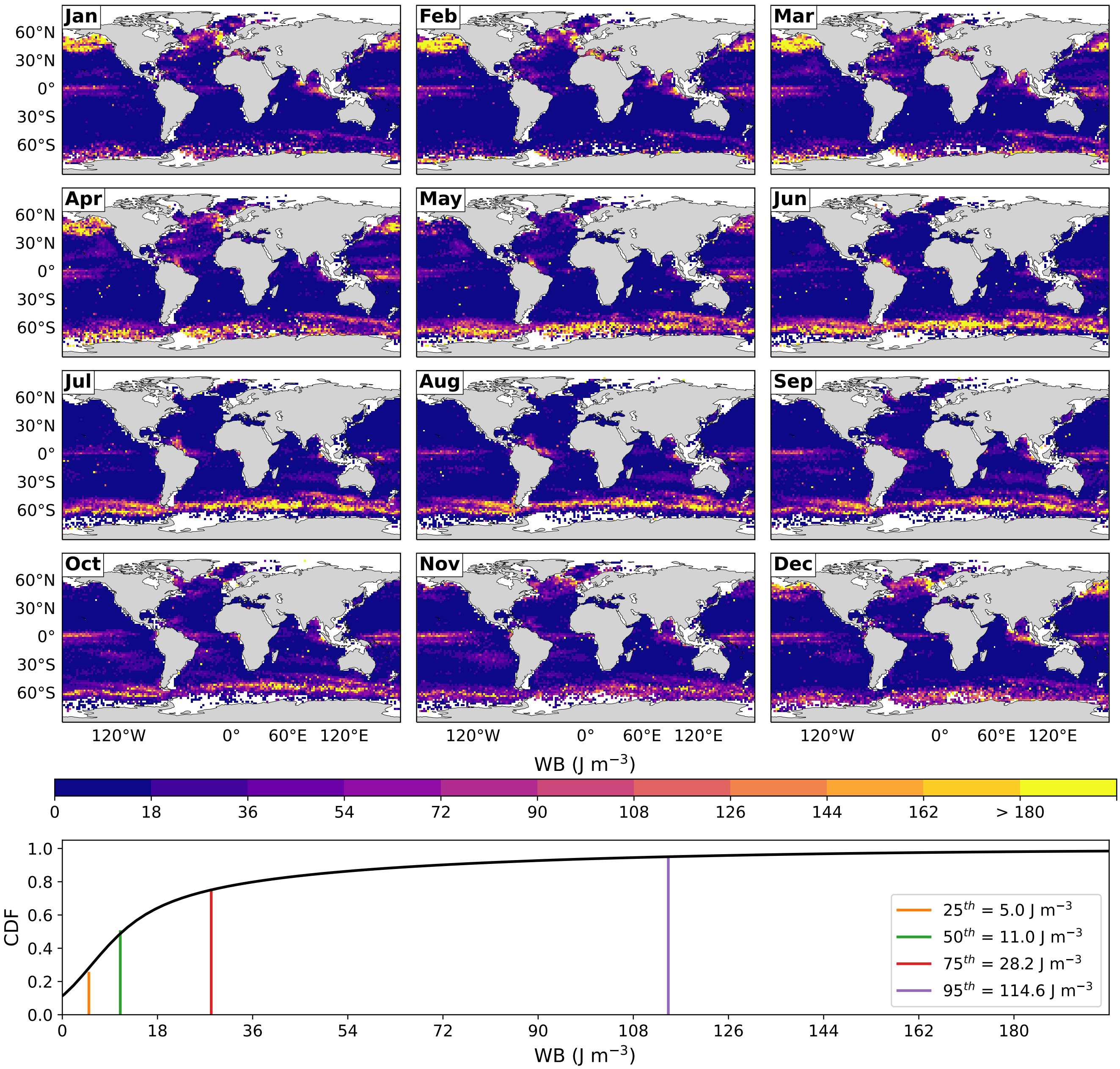

Figure S12. Upper panel: global monthly climatology of the WB threshold characterizing the R23-MLD, i.e., WB$(z = \mathrm{MLD})$. Lower panel: the cumulative density function (CDF) of the conjoint distribution in space and time of WB$(z = \mathrm{MLD})$, with various percentiles shown.