Supplementary material to: Global vertically resolved reconstruction of cloud droplet number concentration combining satellite retrievals, reanalysis data, and in situ observations

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1 Supplementary Figures

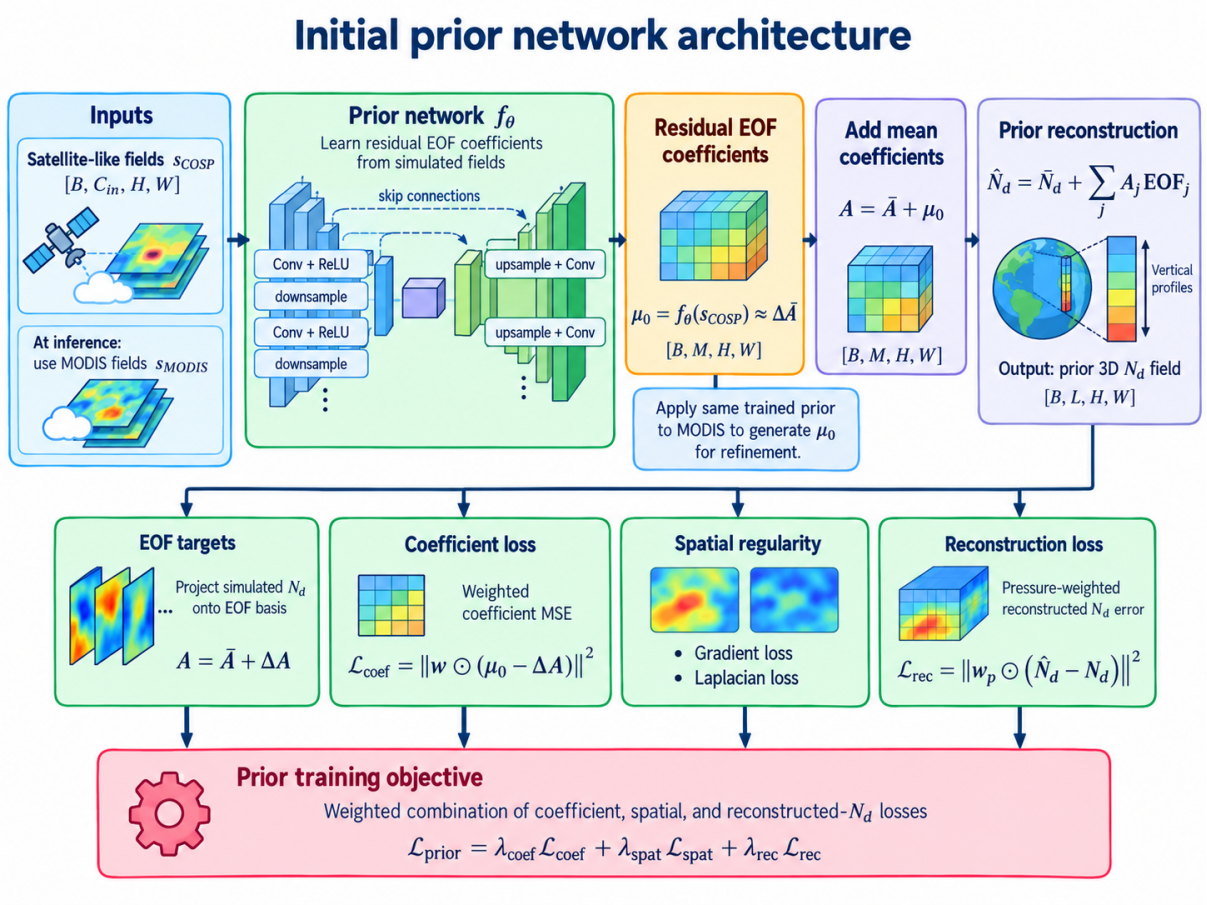


Figure S1. Data workflow and architecture of the NDnet-prior network.

References

Grosvenor, D. P. and Wood, R.: Daily MODIS (MODerate Imaging Spectroradiometer) derived cloud droplet number concentration global dataset for 2003–2015, https://catalogue.ceda.ac.uk/uuid/cf97ccc802d348ec8a3b6f2995dfbbff, published 23 May 2018, 2018.

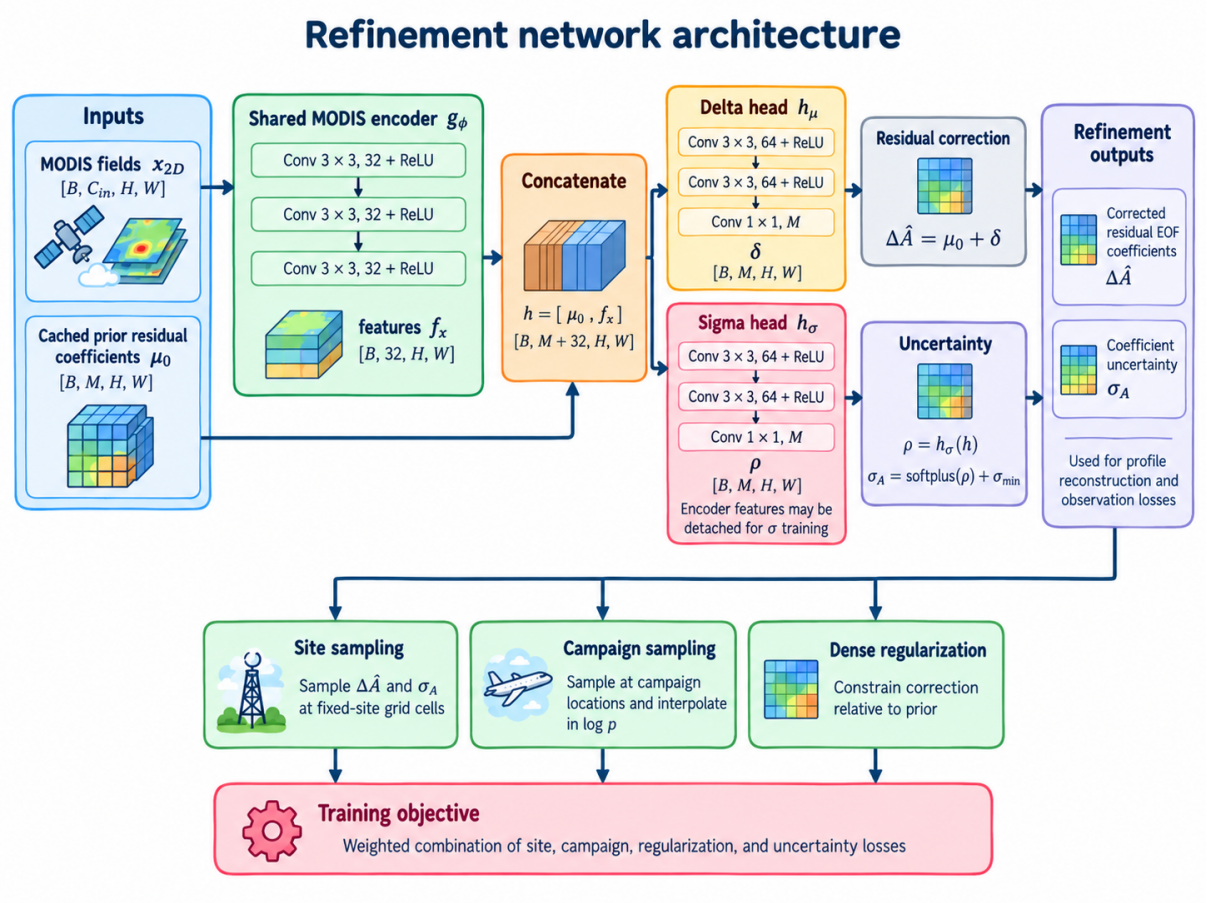


Figure S2. Data workflow and architecture of the NDnet network.

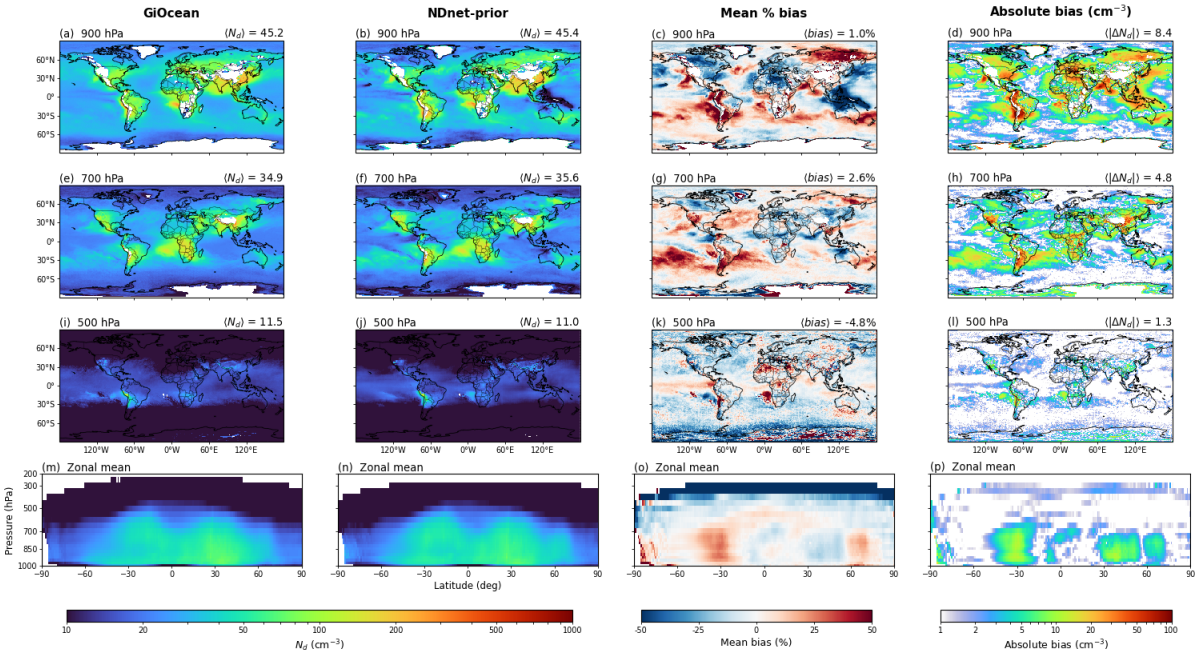


Figure S3. Performance of the NDnet-prior network for the year 2020, not used during training, against GiOcean data.

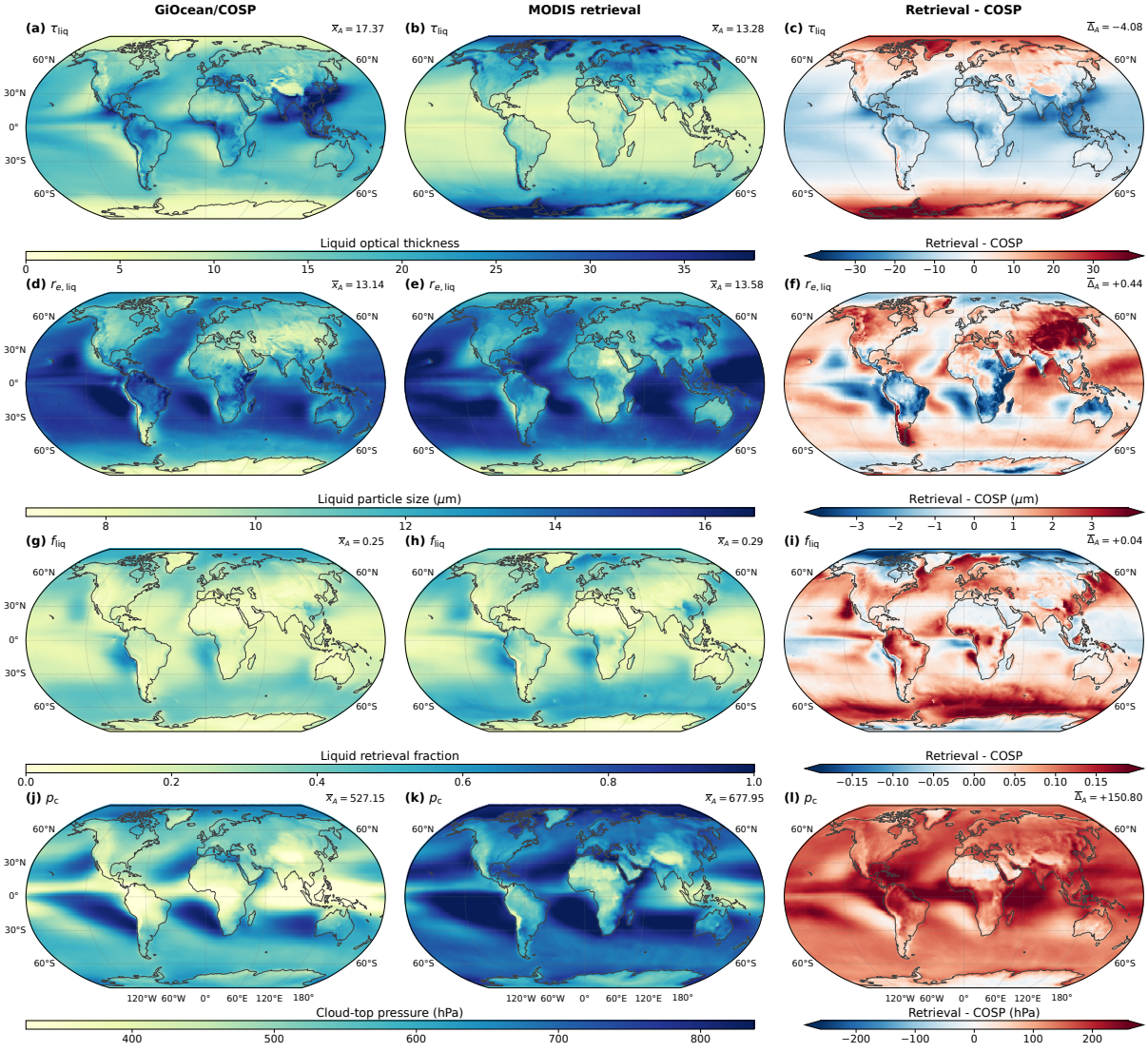


Figure S4. Global mean GiOcean COSP output (left panels), MODIS retrieval (middle panels), and their mean difference (right panels).

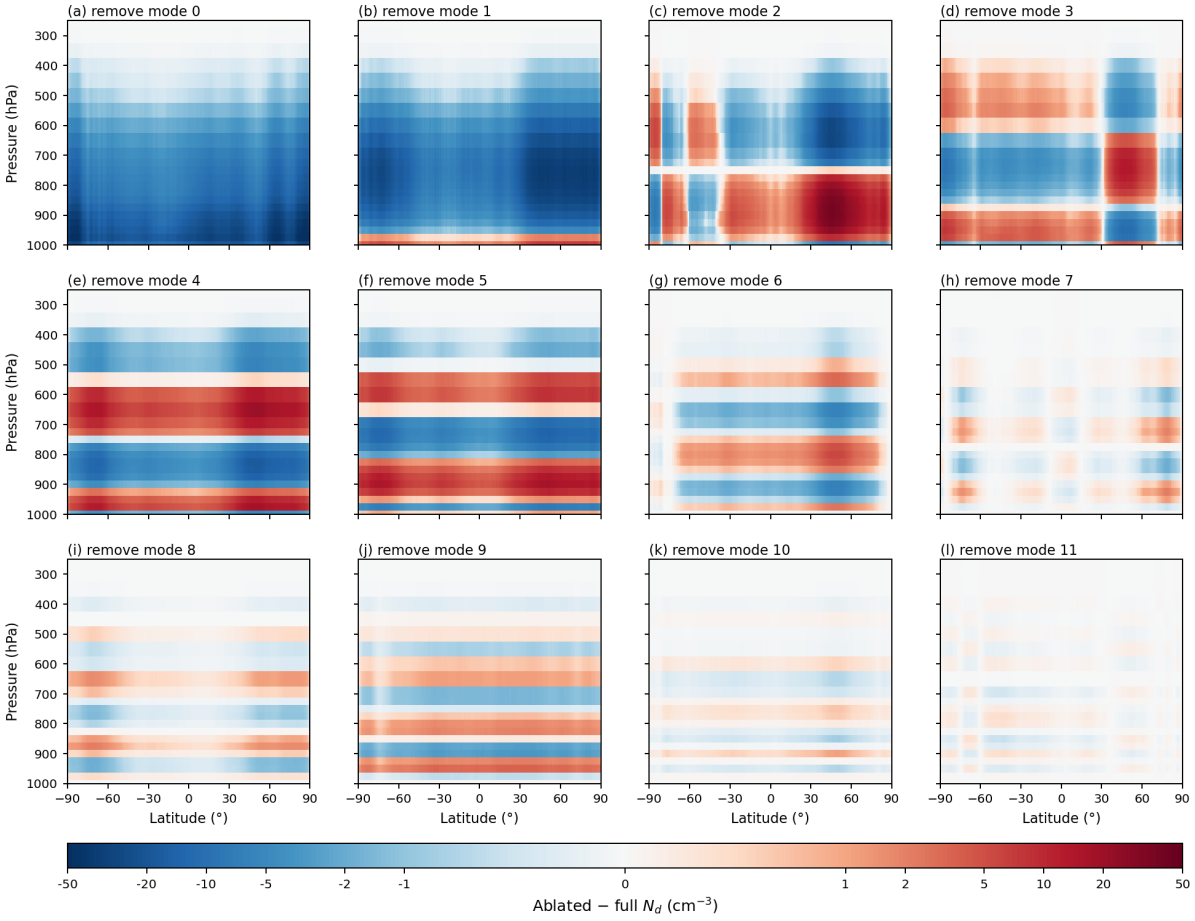


Figure S5. Mode ablation analysis of NDnet for the year 2009. Each panel represents the overall effect of removing a given Empirical Orthogonal Function Mode during inference.

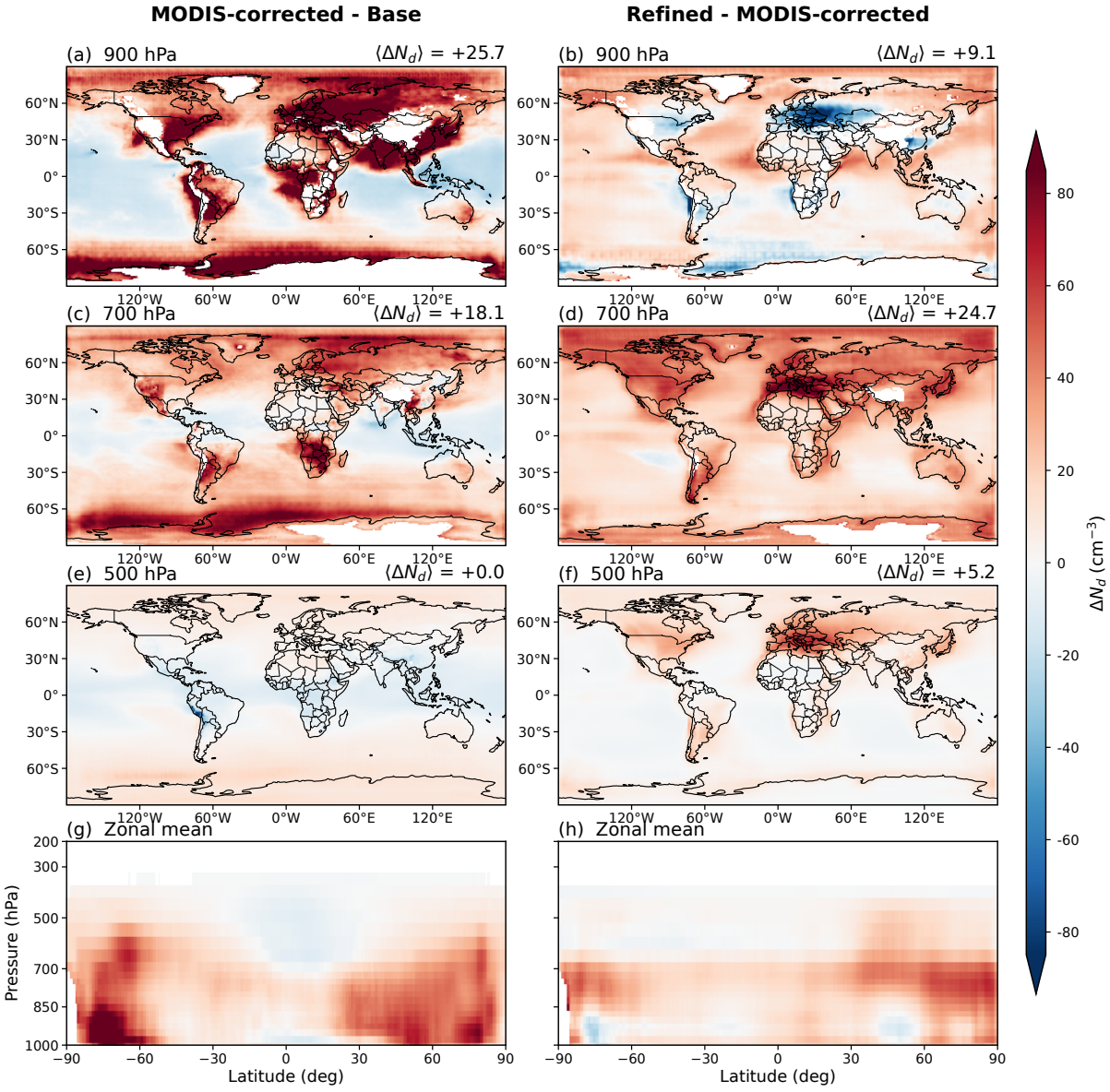


Figure S6. Mean differences in cloud droplet number concentration for 2003–2024. Left panels: NDnet-prior driven by MODIS retrievals relative to NDnet-prior driven by GiOcean/COSP inputs. Right panels: refined NDnet relative to NDnet-prior, with both driven by MODIS retrievals.

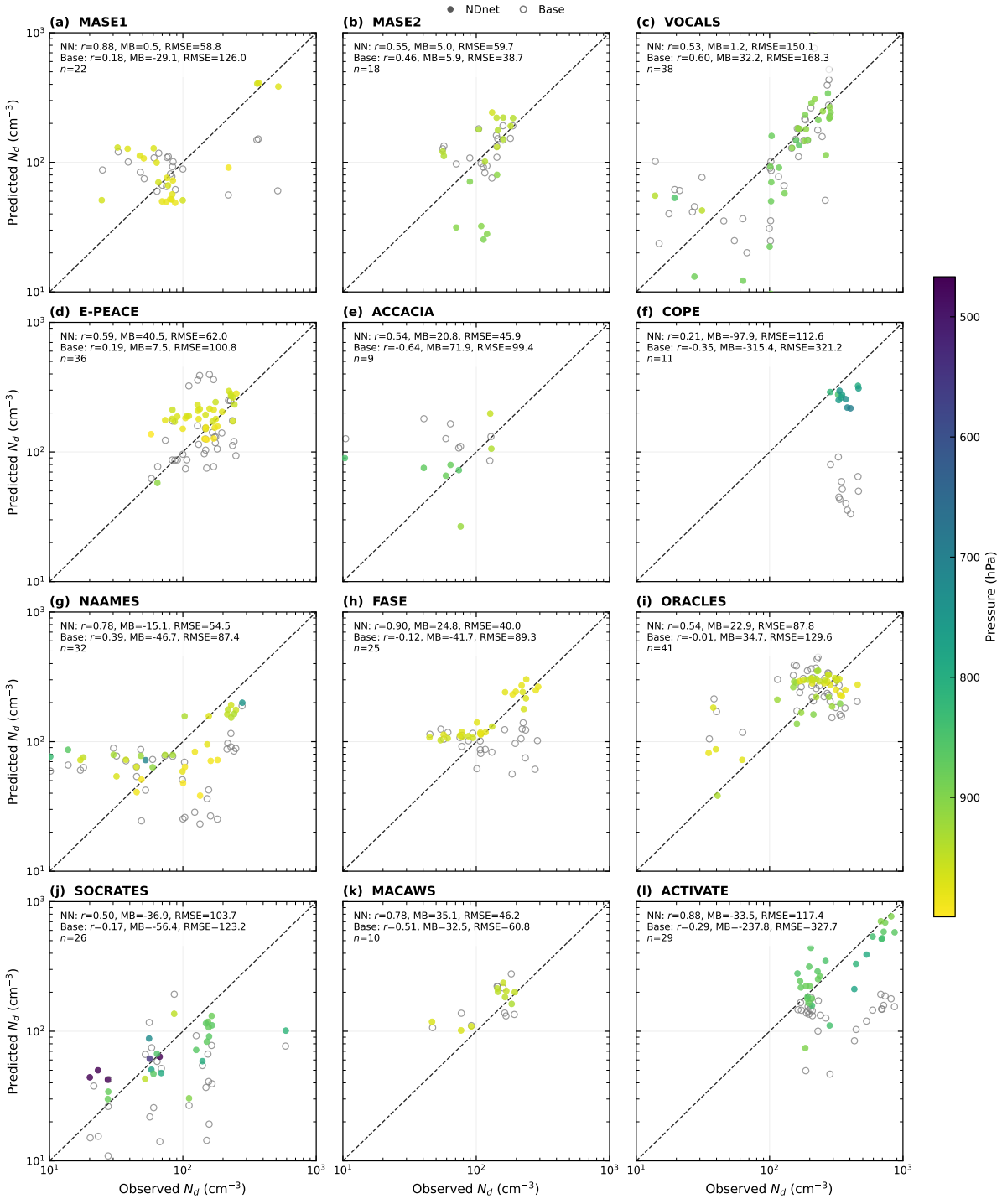


Figure S7. Performance of NDnet and NDnet-prior for the field campaigns on a separate test set not used during training. Each panel reports the time series correlation (r) and root mean square error (RMSE) with respect to observations, for NDnet (NN) and NDnet-prior (Base).

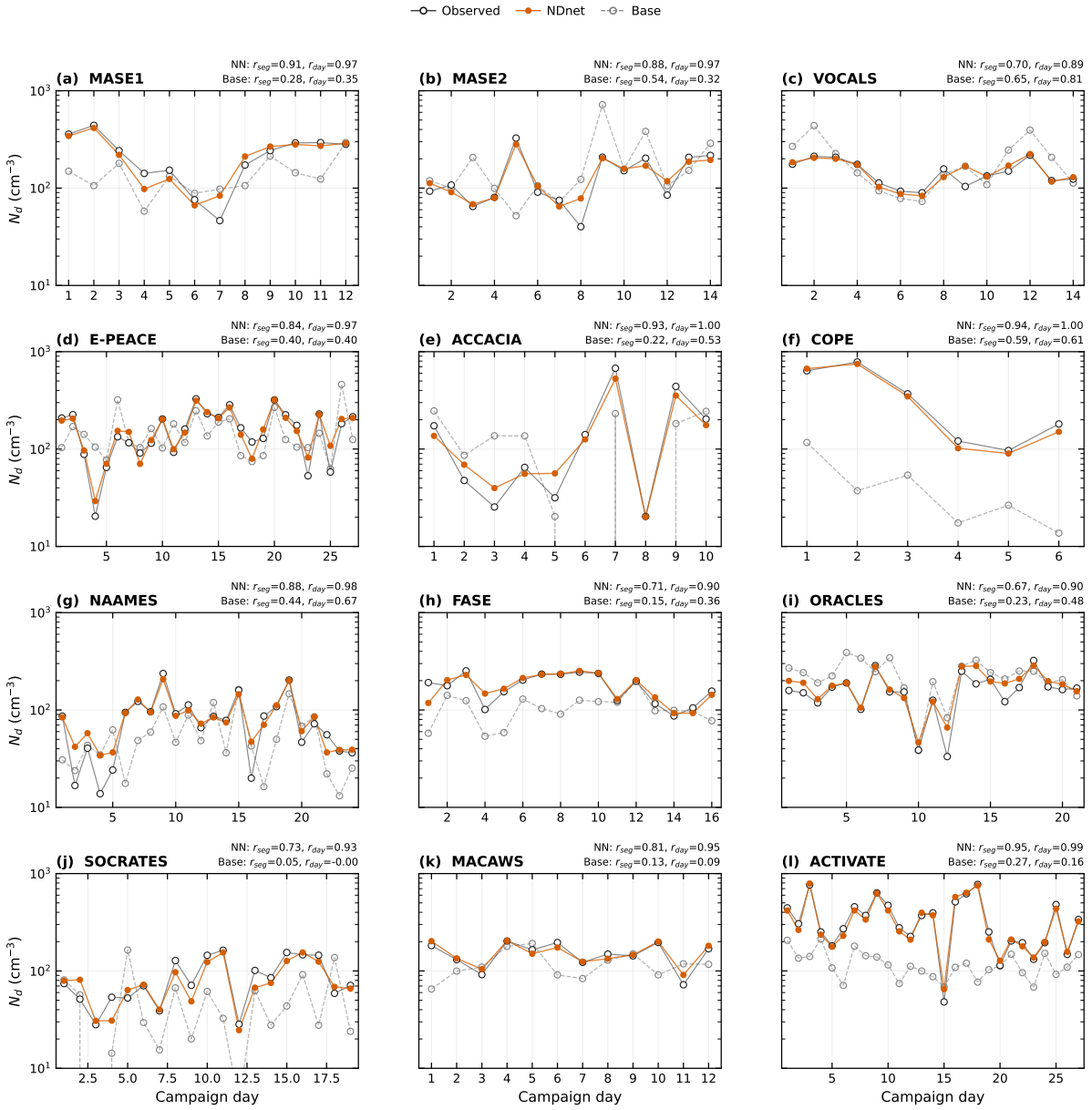


Figure S8. Cloud droplet number concentration predicted by NDnet and NDnet-prior compared with observations and aggregated by campaign day. Each panel reports the correlation coefficient for NDnet (NN) and NDnet-prior (Base), calculated using all campaign segments (r_{seg}) and daily aggregated values (r_{day}).

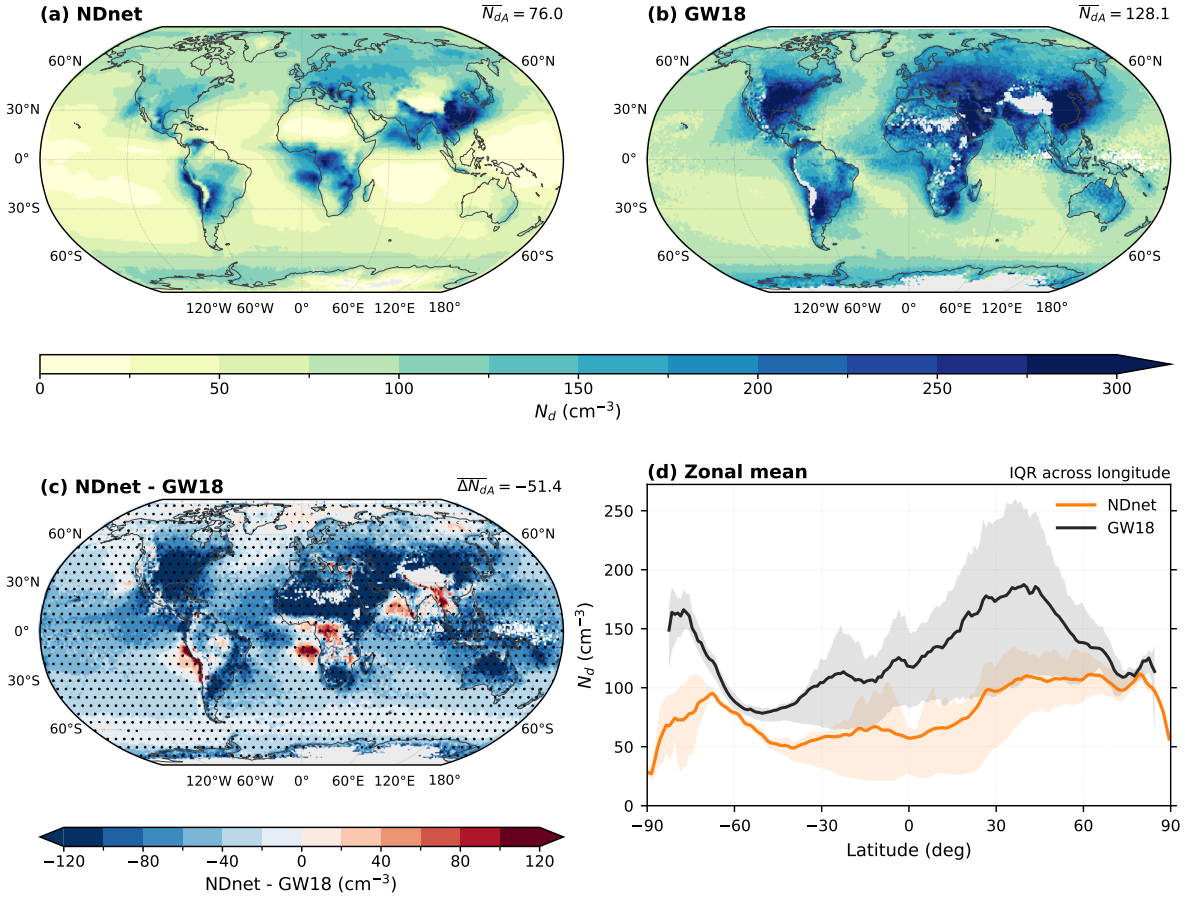


Figure S9. Layer mean $(800 - 950$ hPa$)$ N_{d} with no screening criteria applied compared to the data reported by Grosvenor and Wood (2018) (shown as GW18). Hatching indicates differences that are statistically significant at more than two standard errors.