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Supplemental Material

Weather and Forecasting

Assessment of Cloud Retrieval for IASI 1D-Var Cloudy-Sky Assimilation and Improvement
with an ANN Approach

<https://doi.org/10.1175/WAF-D-19-0218.1>

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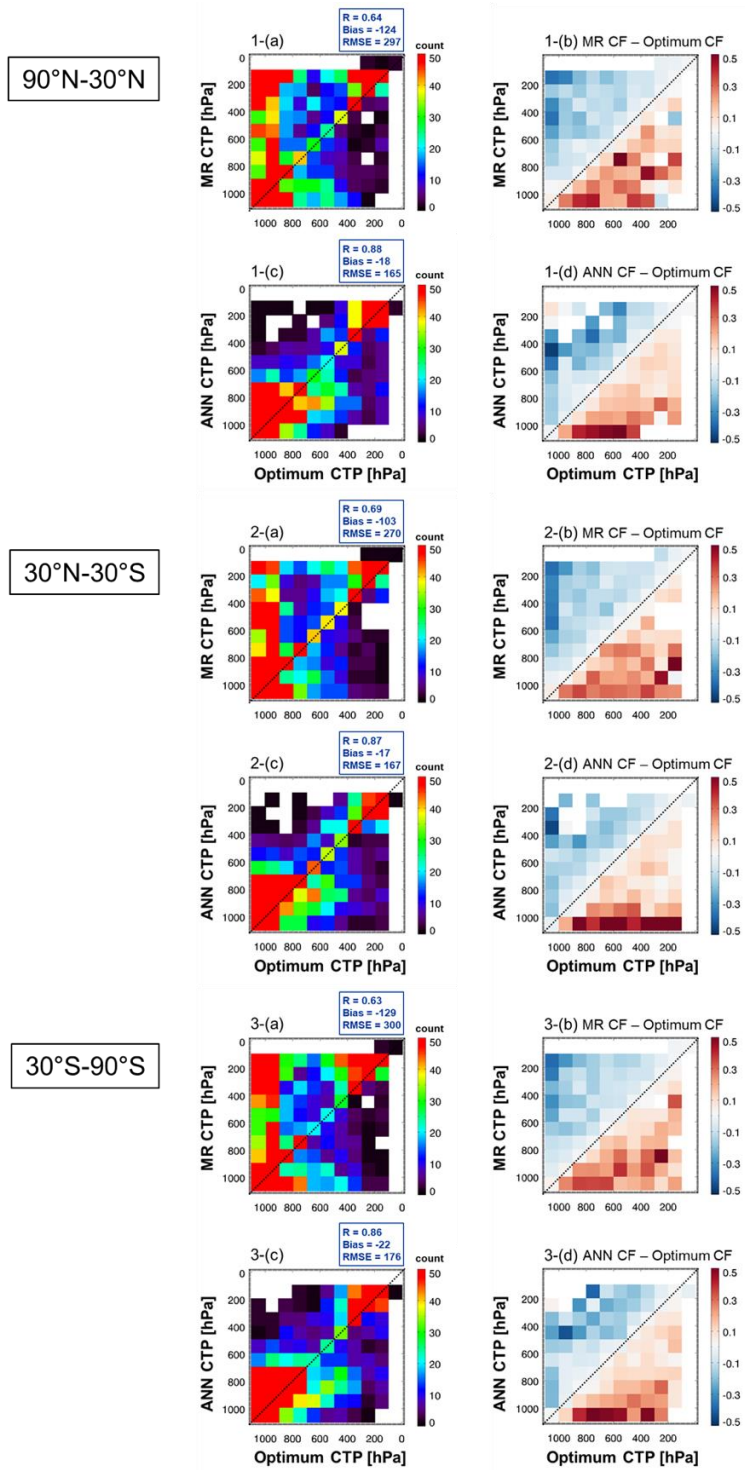
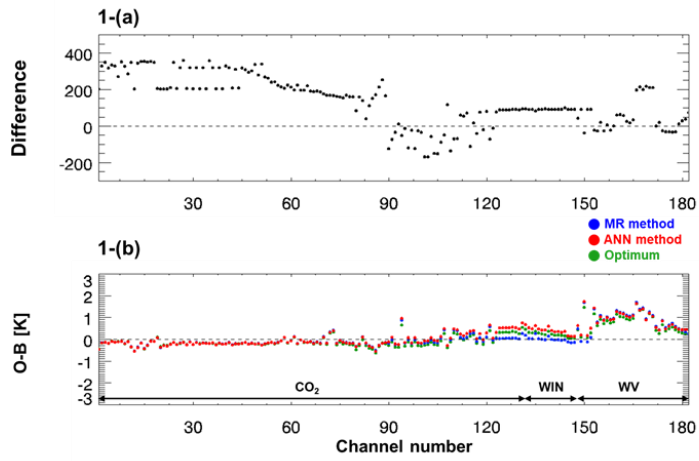
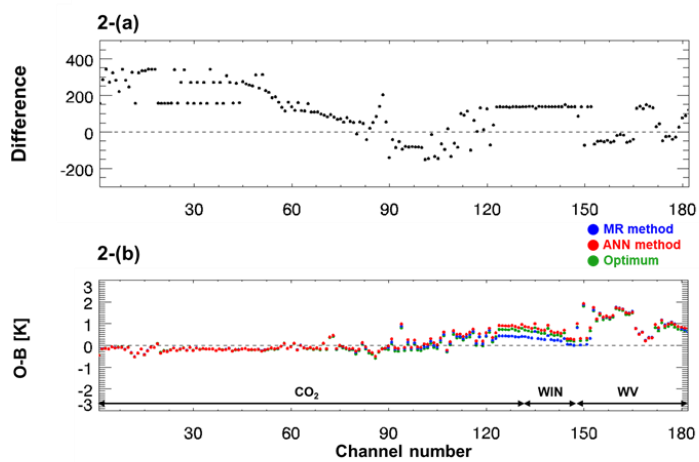


Figure S1. (Left) Two-dimensional histograms of frequencies of (a) optimum CTP vs. optimized CTP from the MR method (MR CTP), and (c) optimum CTP vs. optimized CTP from the ANN method (ANN CTP). Color represents data count. (right) Mean CF difference (b) between optimum and the MR method, and (d) between optimum and the ANN method. The mean differences are given in the same CTP pressure coordinates as in the left panels. The results for the ANN model in (1) 90°N–30°N, (2) 30°N–30°S, and (3) 30°S–90°S regions are given from the top to the bottom.

90°N-30°N



30°N-30°S



30°S-90°S

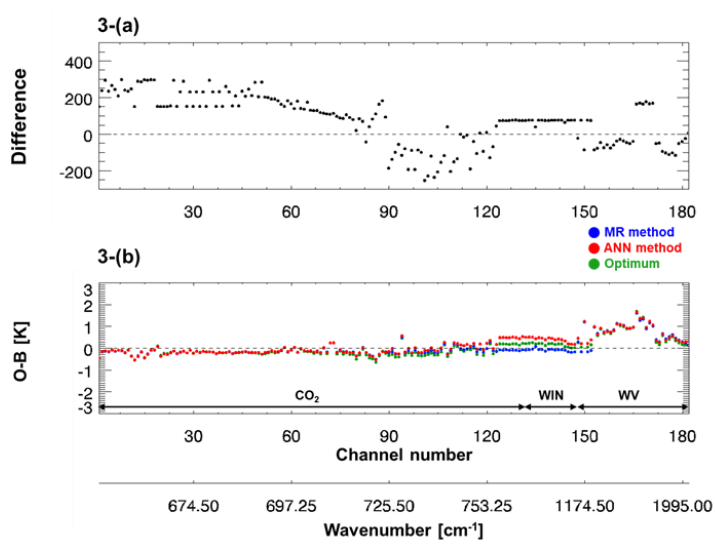


Figure S2. (a) Difference in the number of used measurements (ANN method minus MR method) at each of the 182 IASI channels. (b) Mean O-B for the optimum (green), the MR method (blue), and ANN method (red). Black arrows at bottom figure represent IASI channels in CO₂, window, and water vapor absorption bands. The results for the ANN model in (1) 90°N–30°N, (2) 30°N–30°S, and (3) 30°S–90°S regions are given from the top to the bottom.

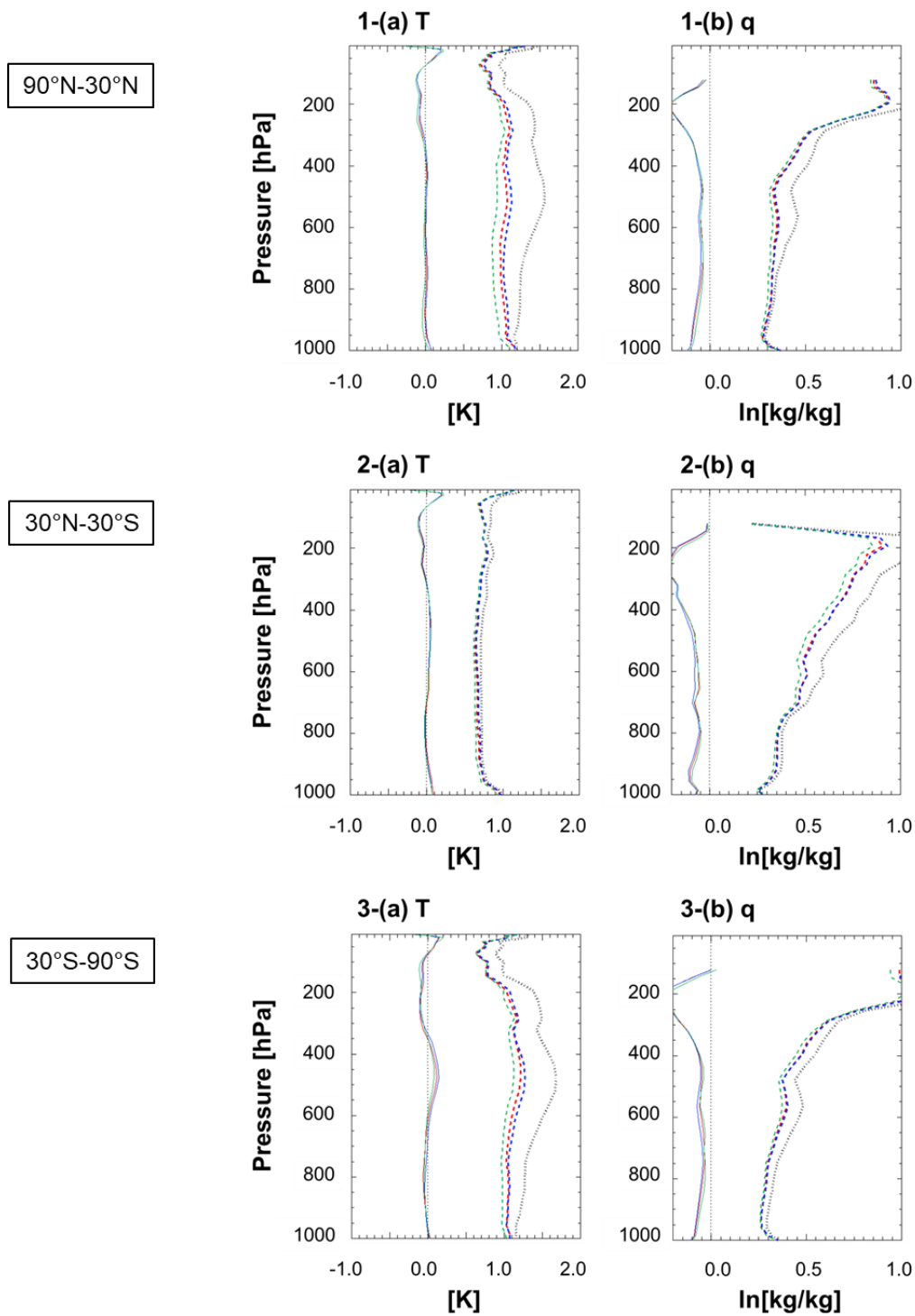


Figure S3. Mean bias (solid lines) and RMSE (dashed lines) of (a) temperature and (b) humidity analysis profiles from the 1D-Var analysis with the use of the MR method (blue), and ANN method (red), and the optimum values (green). Black dotted lines in the RMSE profiles represent the RMSE profiles of the background state. The results for the ANN model in (1) 90°N–30°N, (2) 30°N–30°S, and (3) 30°S–90°S regions are given from the top to the bottom.

Temperature (deg K),
 Root Mean Square Error (Forecast - Observations), T+0,
 Meaned between 20170730 00:00 and 20170813 00:00, Sondes

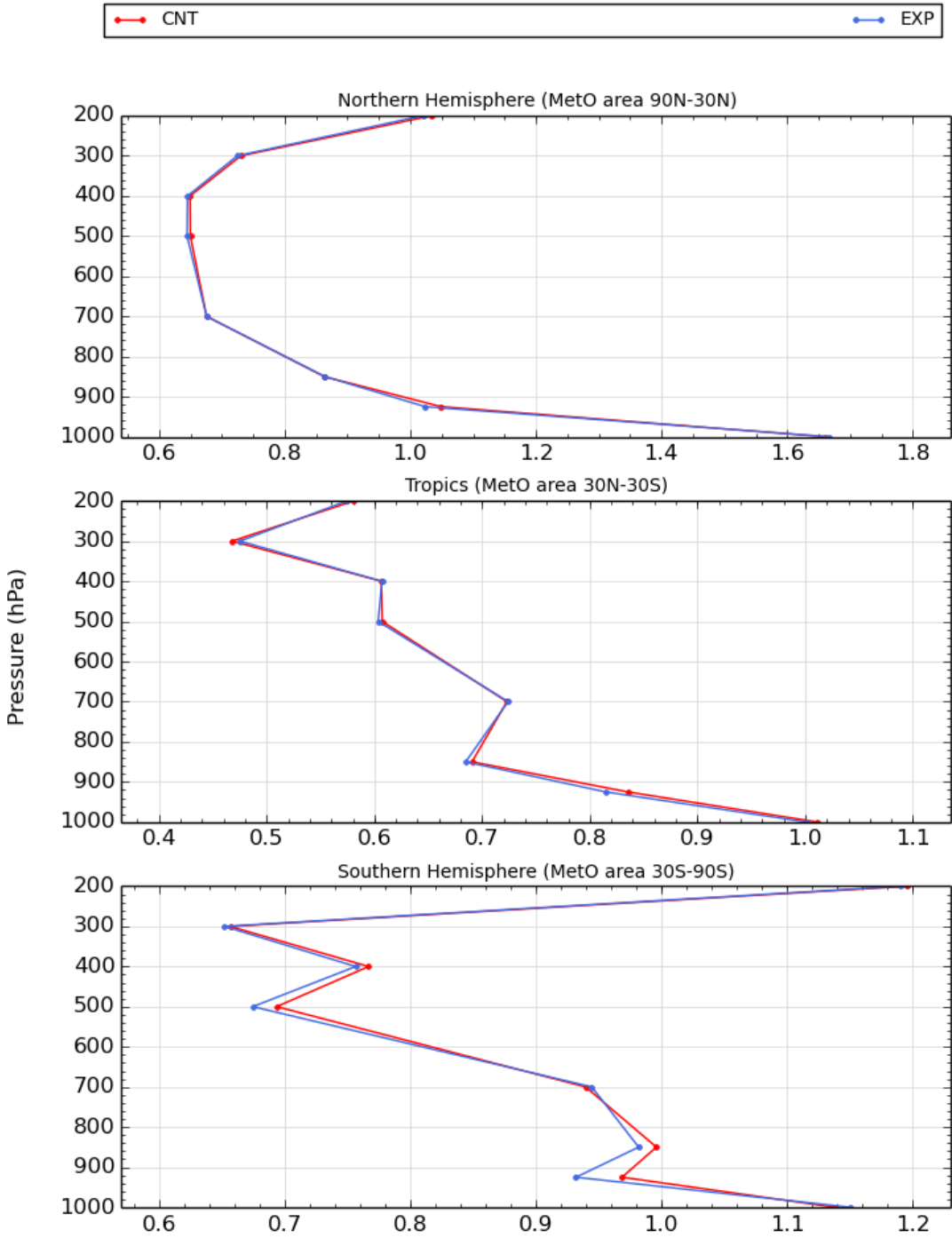


Figure S4. RMSE for temperature profiles at T+0 in the control (red) and the experiment (blue) runs at (a) 90°N–30°N, (b) 30°N–30°S, and (c) 30°S–90°S.

Relative Humidity (%),
 Root Mean Square Error (Forecast - Observations), T+0,
 Meaned between 20170730 00:00 and 20170813 00:00, Sondes

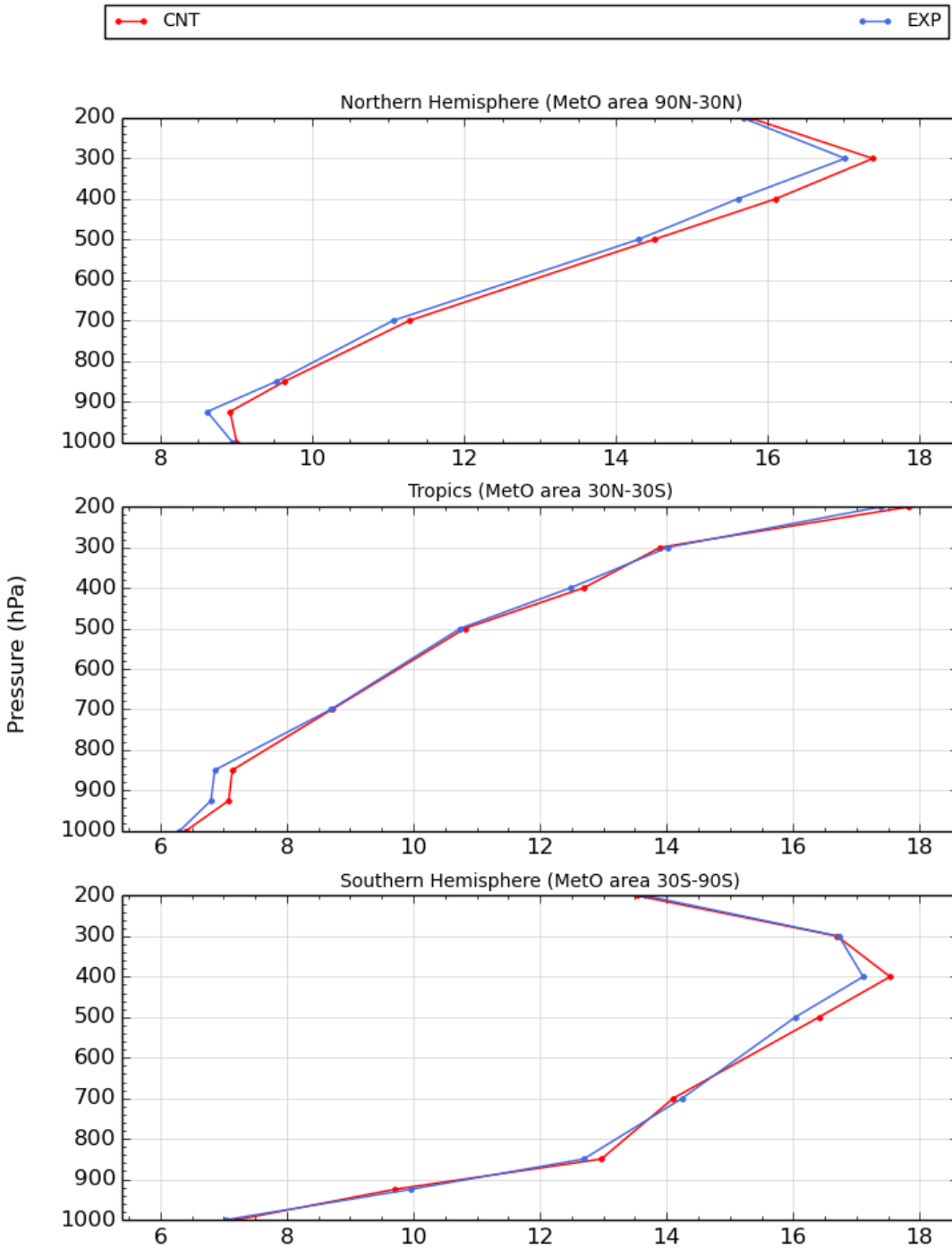


Figure S5. RMSE for relative humidity profiles at T+0 in the control (red) and the experiment (blue) runs at (a) 90°N–30°N, (b) 30°N–30°S, and (c) 30°S–90°S.