

Figure 1: Flowcharts for training and prediction of the hybrid model. Red and black dotted boxes represent parts for Eqs. (1) and (3), respectively. The RC comprises of an input layer, reservoir, and output layer, and this behaves as the ML component of the hybrid model. The input state vector includes temperature T and humidity q which are predicted by the SCM.

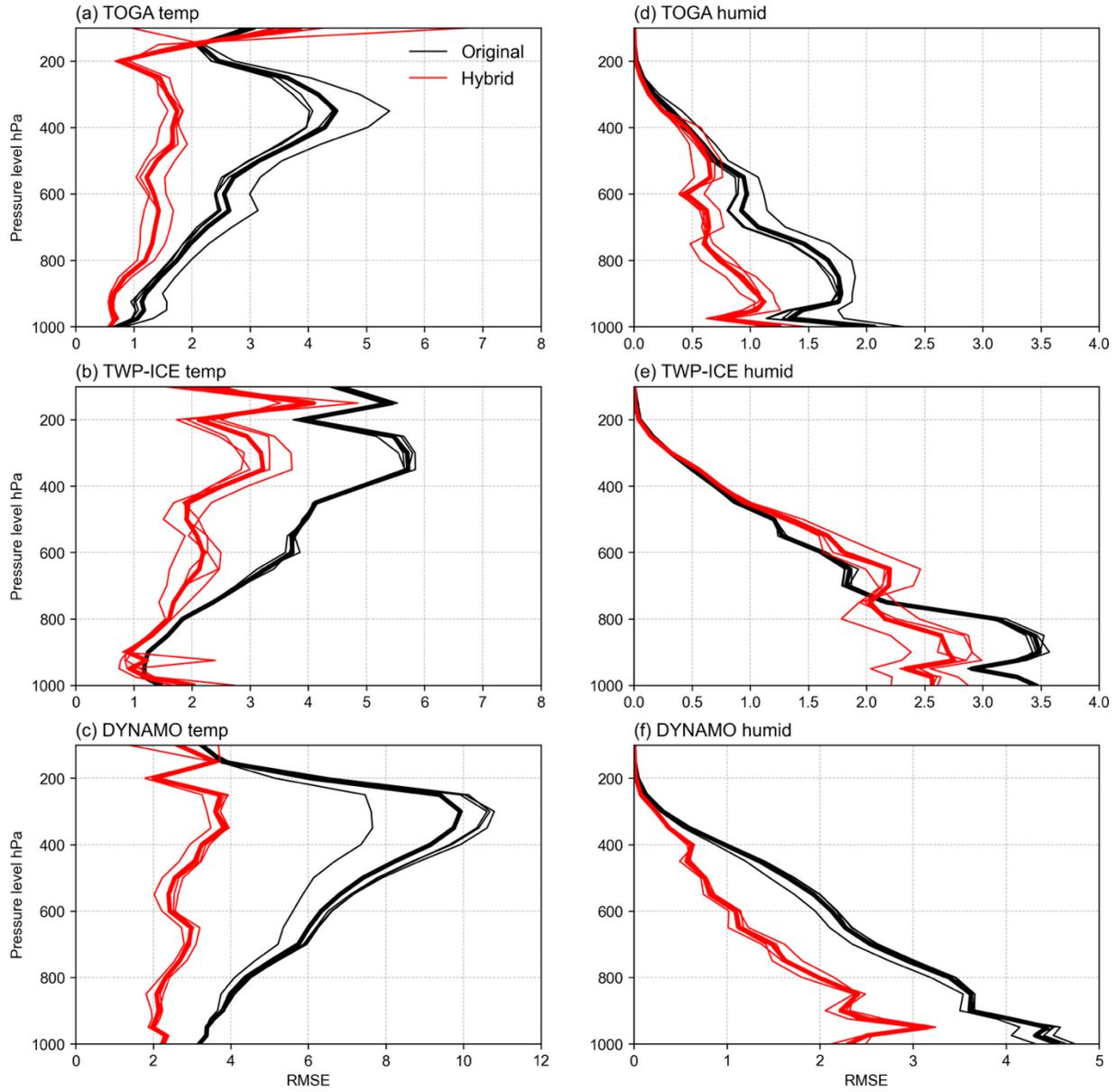


Figure 2: Vertical profiles of root mean square error (RMSE) for (a)-(c) temperature (K) and (d)-(f) humidity (g kg^{-1}) in the tropical cases. The black thin lines indicate the results of ensemble members (thick line is ensemble mean). In addition, the red thin lines indicate results of the hybrid model using different training data from a different year (thick line is a mean of these results).

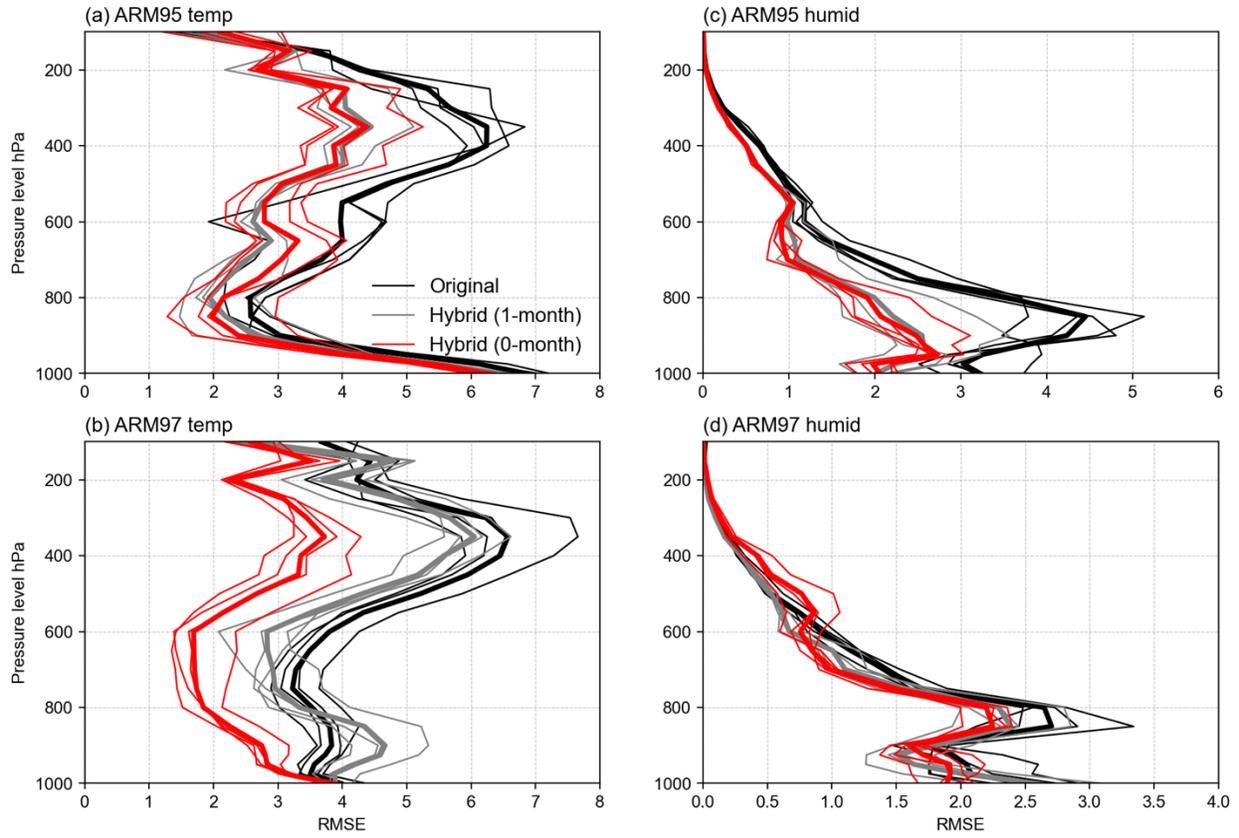


Figure 4: As Fig. 2 but for midlatitude cases. The black lines indicate original model results, and red and grey lines indicate hybrid model results, but their training data are different. The grey and red lines are hybrid model results using unshifted and 1-month shifted training data, respectively. The thick red and grey lines indicate means of respective results using the hybrid models with different training data.

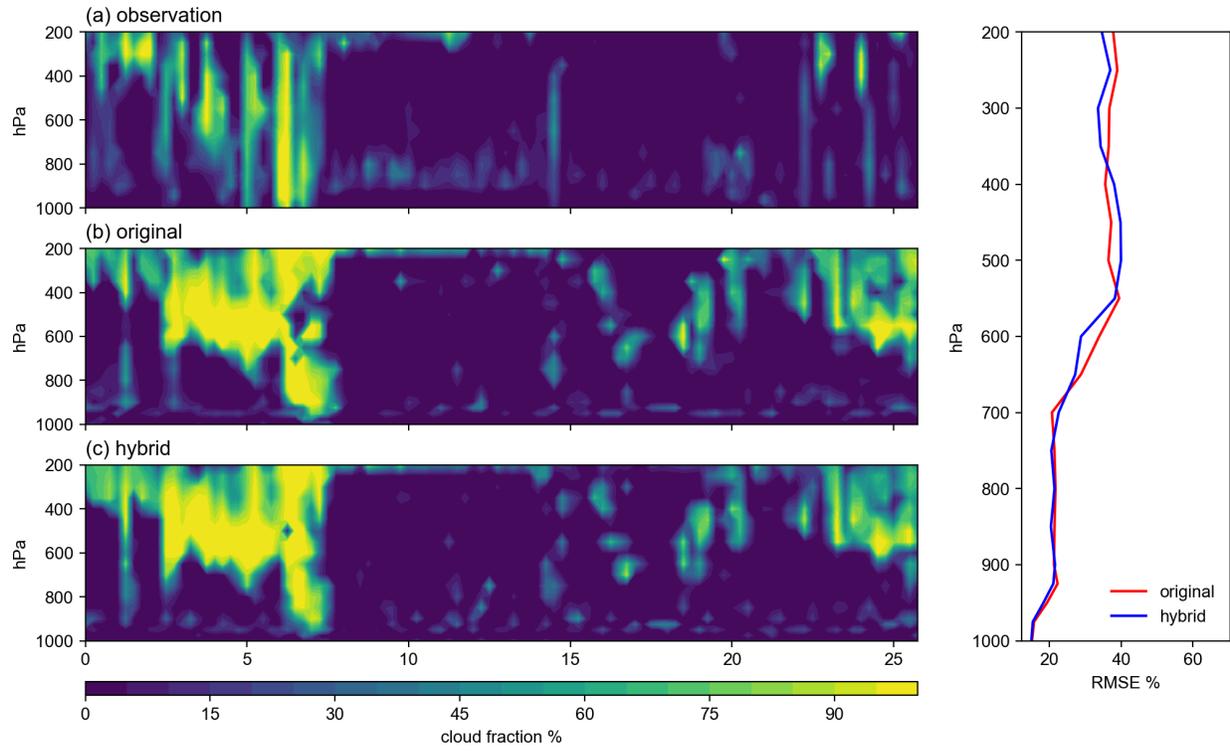


Figure 16: Comparison of time varying vertical profiles of cloud fraction % (left) and their RMSE (right) in TWP-ICE.