

Text S1. The calculations of the MSE and the EWMSE.

The calculations of the MSE and the EWMSE are as follows:

$$\text{MSE} = \frac{1}{N \times M} \sum_i^N \sum_j^M (\hat{y}_{i,j} - y_{i,j})^2 \quad (\text{S1})$$

where N and M are the dimensions of echo data (here both equal 700), $\hat{y}_{i,j}$ and $y_{i,j}$ denote the reconstructed result and the label at the grid (i, j) , respectively.

$$\text{EWMSE} = \frac{1}{N \times M} \sum_i^N \sum_j^M w(y_{i,j}) (\hat{y}_{i,j} - y_{i,j})^2 \quad (\text{S2})$$

where $w(y_{i,j})$ denotes the weight arranged at the grid (i, j) and other symbols keep the same as those in equation (S1). Thresholds for echo reflectivity y and corresponding weights $w(y)$ are [20, 30, 40, 50] (dBZ) and [1, 2, 5, 10, 30] respectively. The specific arrangement is shown in equation (S3):

$$w(y) = \begin{cases} 1, & y < 20 \\ 2, & 20 \leq y < 30 \\ 5, & 30 \leq y < 40 \\ 10, & 40 \leq y < 50 \\ 30, & y \geq 50 \end{cases} \quad (\text{S3})$$

Text S2. The calculations of the evaluation indices.

The evaluation indices are calculated as follows:

$$\text{RMSE} = \sqrt{\frac{1}{T \times N \times M} \sum_t^T \sum_i^N \sum_j^M (\text{Reconstruction}_t^{(i,j)} - \text{Ground Truth}_t^{(i,j)})^2} \quad (\text{S4})$$

$$\text{ME} = \frac{1}{T \times N \times M} \sum_t^T \sum_i^N \sum_j^M (\text{Reconstruction}_t^{(i,j)} - \text{Ground Truth}_t^{(i,j)}) \quad (\text{S5})$$

where T denotes the number of data groups in the test set (here is 260), N and M are the dimensions of echo data (here both equal 700), $\text{Reconstruction}_t^{(i,j)}$ and $\text{Ground Truth}_t^{(i,j)}$ denote reconstruction and ground truth at grid (i, j) of the t_{th} data group, respectively.

$$\text{CSI} = \frac{\text{Hit}}{\text{Hit} + \text{Miss} + \text{False alarm}} \quad (\text{S6})$$

$$\text{FAR} = \frac{\text{False alarm}}{\text{Hit} + \text{False alarm}} \quad (\text{S7})$$

$$\text{POD} = \frac{\text{Hit}}{\text{Hit} + \text{Miss}} \quad (\text{S8})$$

where *Hit*, *Miss*, *False alarm* denote positive model output along with positive ground truth, negative reconstruction along with positive ground truth, positive reconstruction along with negative ground truth respectively, with an echo reflectivity threshold added to each grid (here is 20 dBZ).

$$\text{SSIM} = \frac{(2\mu_x\mu_y + c_1)(2\sigma_{xy} + c_2)}{(\mu_x^2 + \mu_y^2 + c_1)(\sigma_x^2 + \sigma_y^2 + c_2)} \quad (\text{S9})$$

where μ_x and μ_y denote mean value of reconstruction and ground truth, σ_x^2 , σ_y^2 and σ_{xy} denotes variance of model output, variance of ground truth and covariance of reconstruction and ground truth, respectively. c_1 and c_2 equal $(k_1L)^2$ and $(k_2L)^2$ in order to avoid division by 0, where L is the maximum of reconstruction and ground truth, k_1 and k_2 are by default 0.01 and 0.03, respectively.