Inoue, T., T. T. Sekiyama, and A. Kudo, 2024: Development of a Temperature Prediction Method Combining Deep Neural Networks and a Kalman Filter. *J. Meteor. Soc. Japan*, **102**, http://doi.org/10.2151/jmsj.2024-020

Plain Language Summary: This study combined the bias correction scheme of deep convolutional neural networks (CNNs) and the Japan Meteorological Agency's (JMA's) operational Kalman filter (KF) algorithm for surface temperature forecast. Verification results indicated that the proposed method outperformed both the CNN and the KF alone. Case studies showed that the CNN corrected the large horizontal structure of NWP models and the KF corrected small spatiotemporal errors.

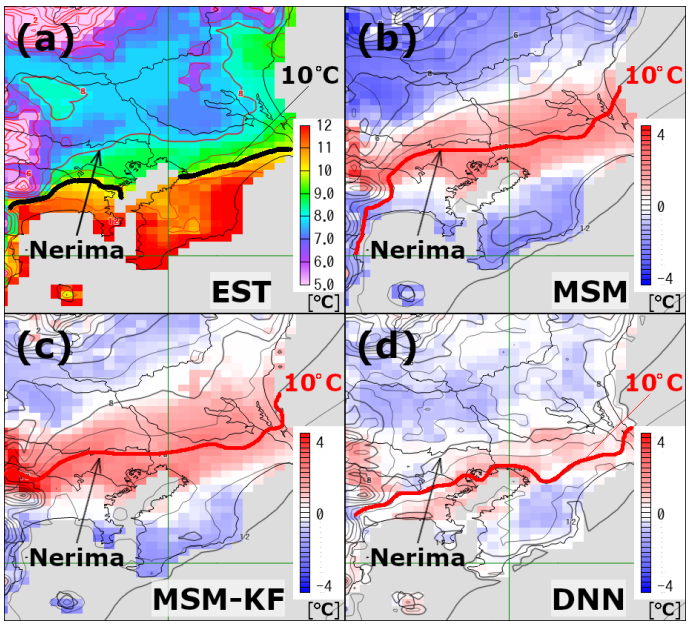

Figure 1. A case of temperature forecast associated with a coastal front at 15 LST on 29 December 2021. (a) The estimated surface temperature (EST) distribution provided by the JMA (contours and color shading). (b), (c), (d) The temperature forecasts (contours) for the operational meso-scale model (MSM), the operational gridded temperature guidance (MSM-KF), and the CNN model (DNN) initialized at 21 LST on 28 December 2021, and their differences from the EST (color shading).

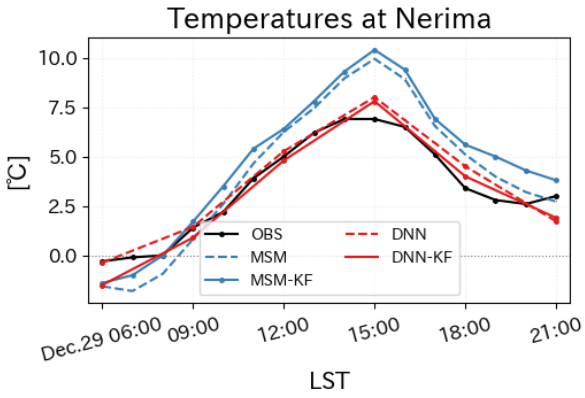

Figure 2. Time series of temperatures for in-situ observations (OBS), the interpolated MSM forecast, the operational point-like temperature guidance forecast (MSM-KF), the interpolated DNN forecast, and the DNN-based point-like temperature guidance forecast (DNN-KF) at Nerima, initiated at 21 LST on December 28, 2021.

- This study combined the CNN-based bias correction scheme with the JMA's operational KF algorithm.
- Verification results showed that our method outperformed both the DNN and the JMA's operational temperature guidance forecast.
- The KF has advantages of online learning that the DNN does not have. The verification demonstrated that the KF was able to follow the bias changes for NWP model updates.