

Impact of assimilation of a new set of IASI channels on the UM precipitation forecast over East Asia

Young-Chan Noh¹, Byung-Ju Sohn¹, Jihoon Ryu¹, and Yoonjae Kim²

¹Seoul National University, Seoul, Korea

²Numerical Modeling Center, Korea Meteorological Administration, Korea



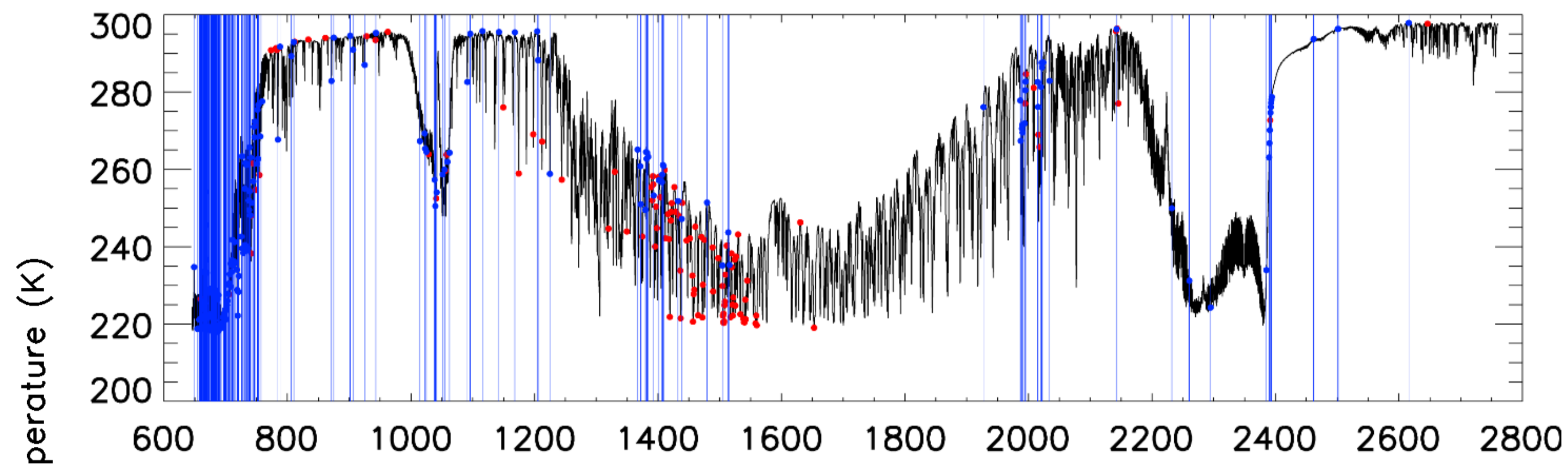
Seoul National University

1. Introduction

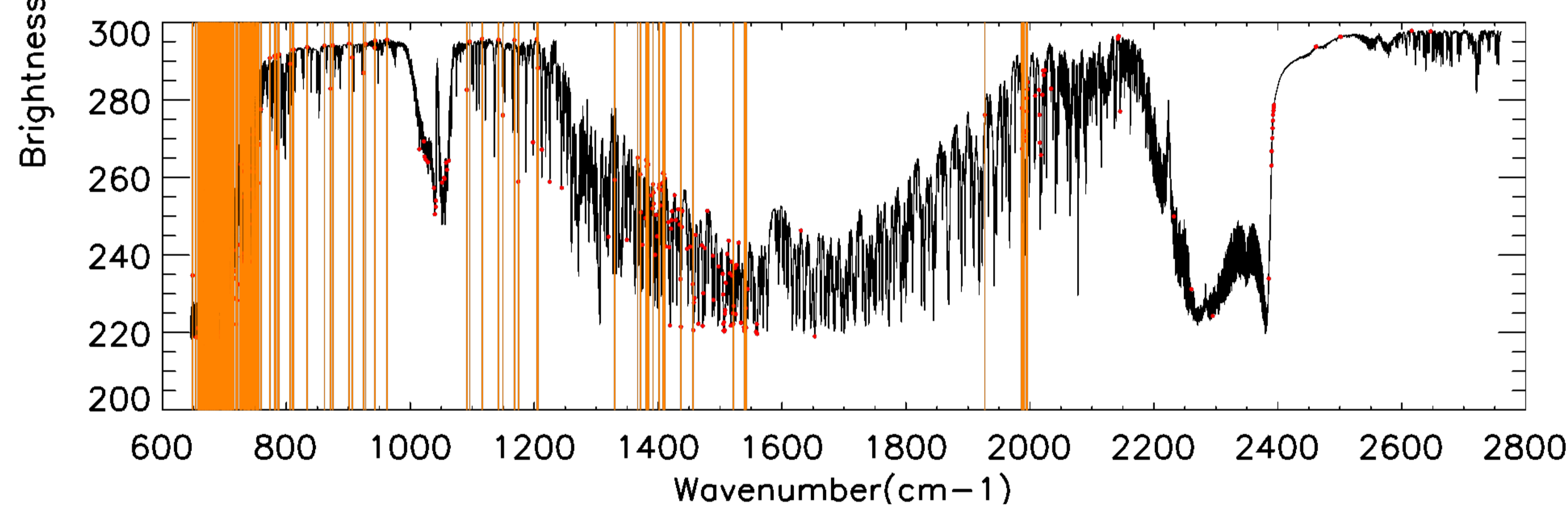
- In Noh *et al.* (2017), the new IASI channels were selected using new approach based on one-dimensional variational analysis (1D-Var).
- In the trial experiment using the UM system, upper-tropospheric moist biases shown in the control run were significantly reduced in the experiment run with newly selected IASI channels.
- In this study, we tried to assess the impact of improved moisture field by new IASI channels on the precipitation forecast over East Asia for the summer period.

2. New IASI channels

a. Newly selected IASI channels (#200)

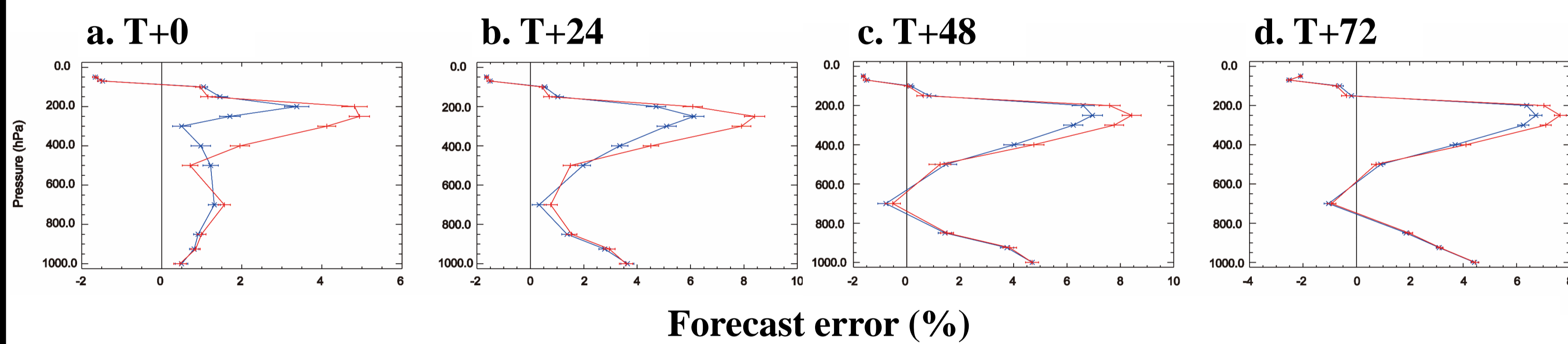


b. Operational IASI channels (#183)



3. Impact on global forecasting

RH bias (%) in the Northern Hemisphere



- The new channels had an overall neutral impact in terms of improvement in forecasts, as compared with results from the operational channels.
- However, upper-tropospheric moist biases shown in the control run were significantly reduced in the experimental trial with the newly selected channels.

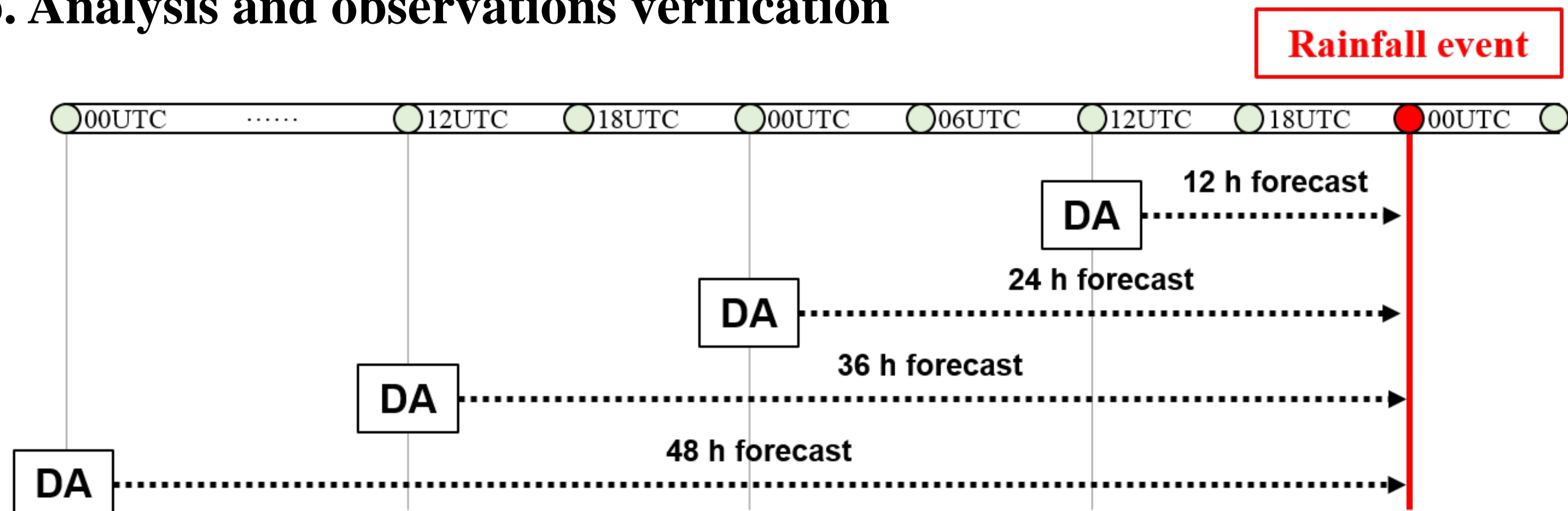
4. Trial experiment using KMA UM system

a. System description

- KMA global Unified Model with 4D-Var (N320, 40km)
- Control run** with operational IASI channels
- Experiment run** with newly selected IASI channels
- Period: 15 Jun – 31 July 2015 (45 days)



b. Analysis and observations verification



Analysis/observation* verification

a. Threat score (TS)

$$TS = \frac{\text{Hits}}{\text{Hits} + \text{Misses} + \text{False alarms}}$$

b. Bias

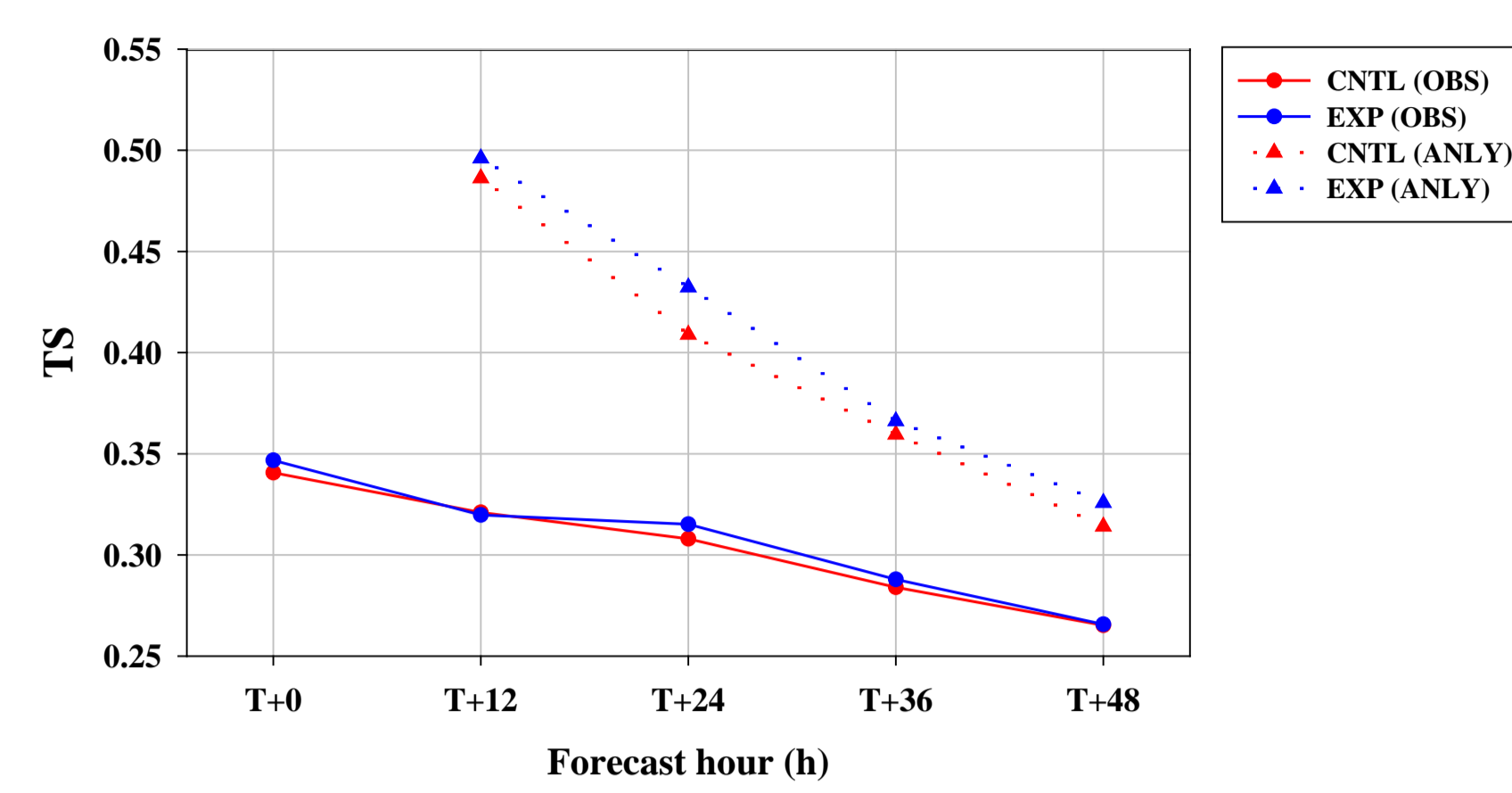
$$\text{Bias} = \frac{\text{Hits} + \text{False alarms}}{\text{Hits} + \text{Misses}}$$

		Reference	
		yes	no
Forecast	yes	Hits	False alarms
	no	Misses	Correct negatives

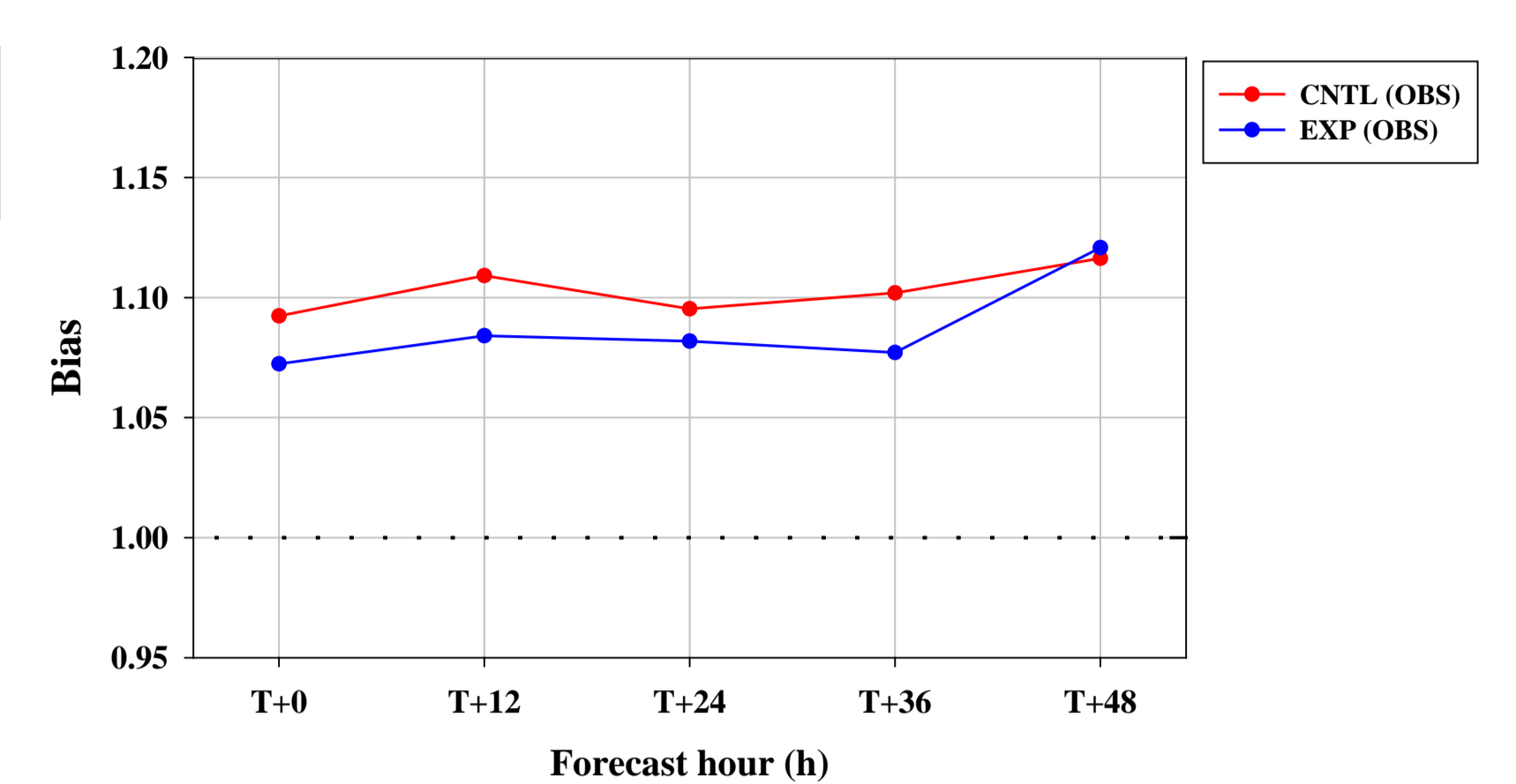
* Observation data: Satellite-retrieved rain rate (mm/hour) from Integrated Multi-satellite Retrievals for GPM (IMERG).

5. Impact on precipitation forecast over East Asia

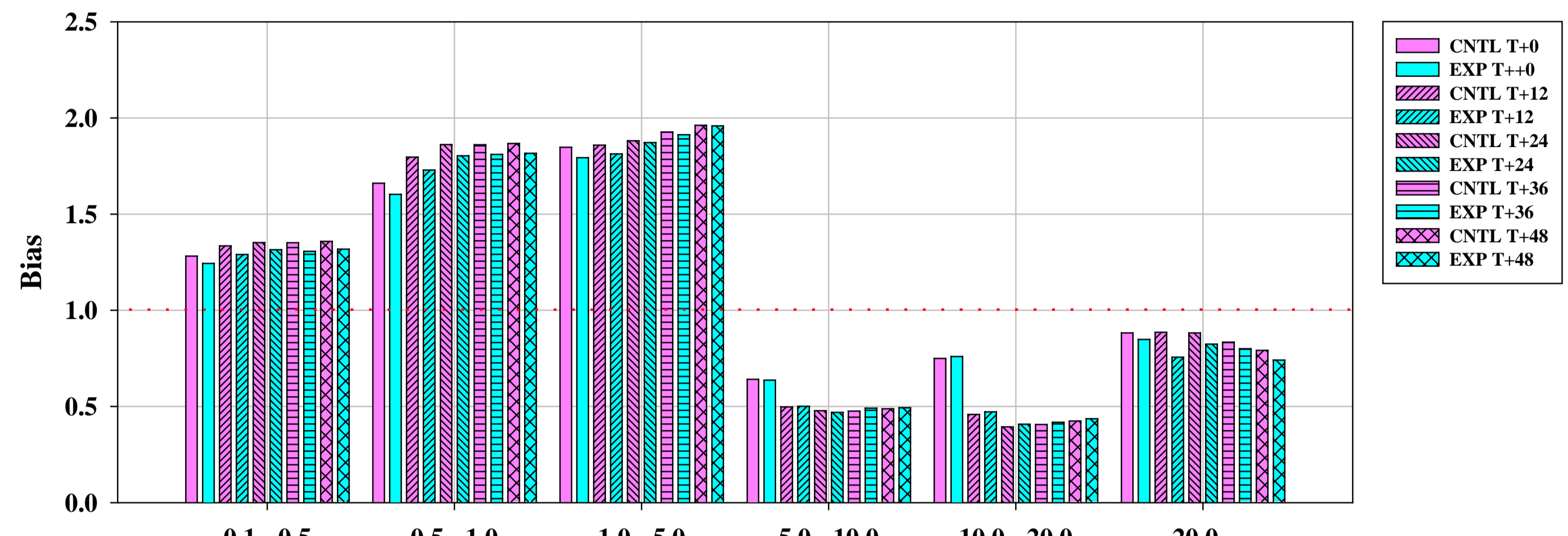
a. Threat Score (TS)



b. Bias



c. Bias depending on rain rate (mm/hour)

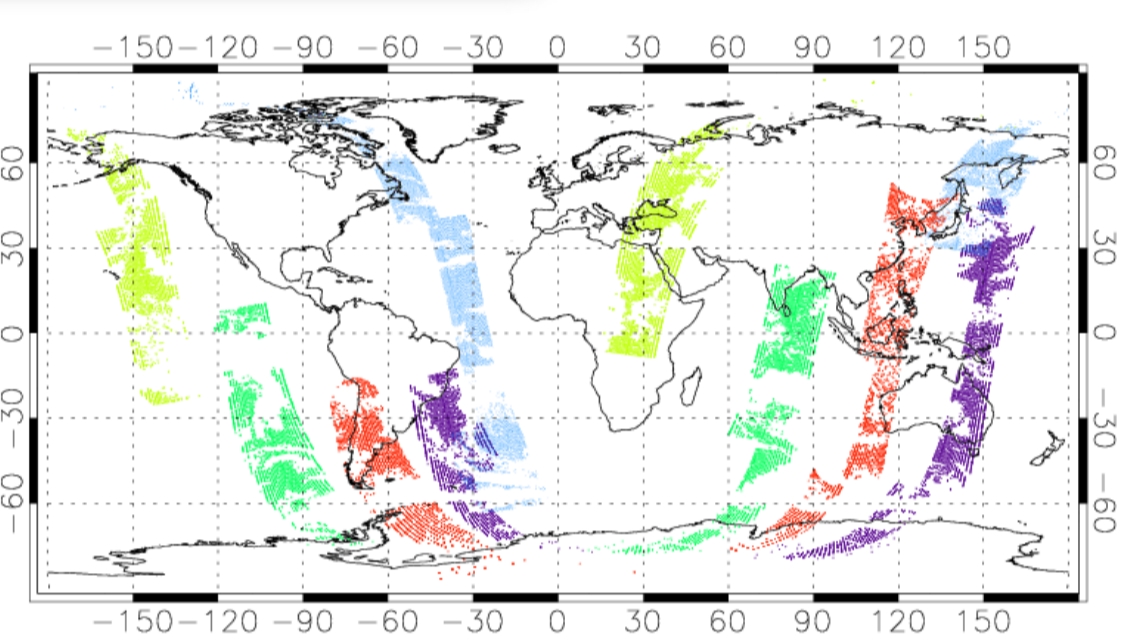


- Assuming that the water vapor amount eventually becomes precipitation, the bias reduction seems to be related to the reduced amount of moisture in the model analysis.

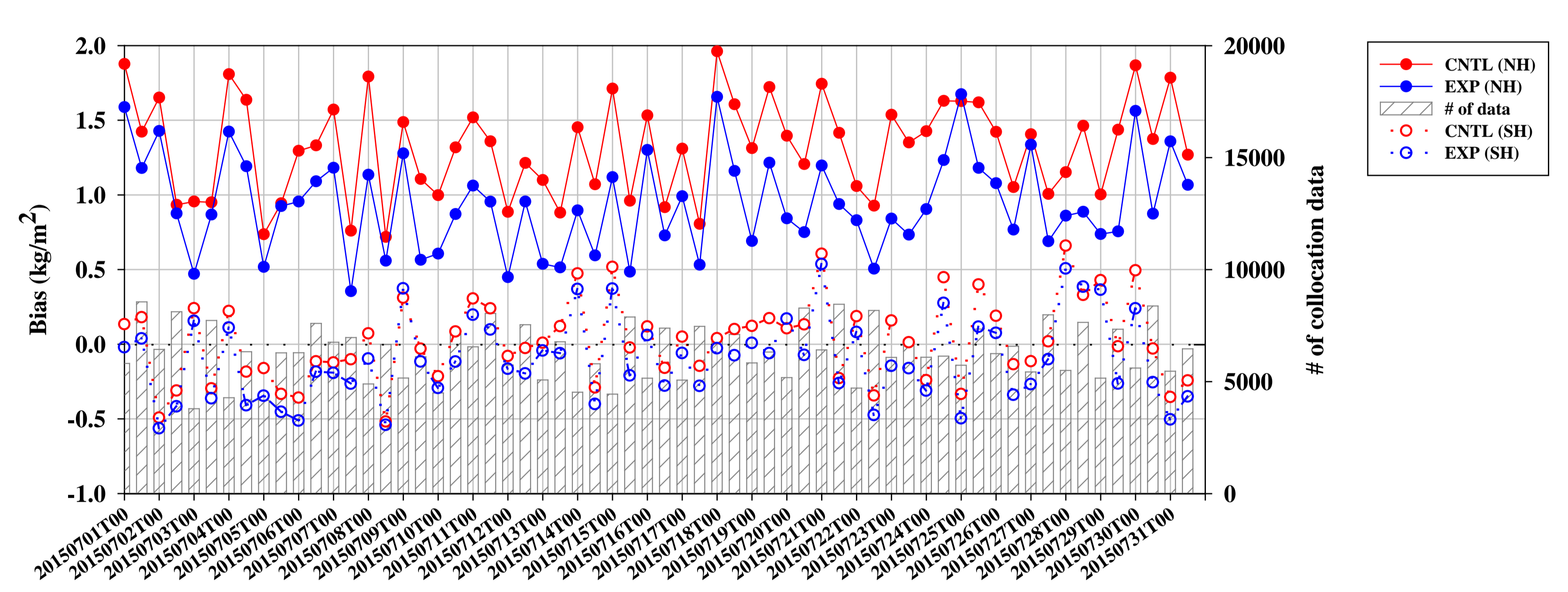
6. Validation of model TPW using MiRS

a. Satellite-based TPW product

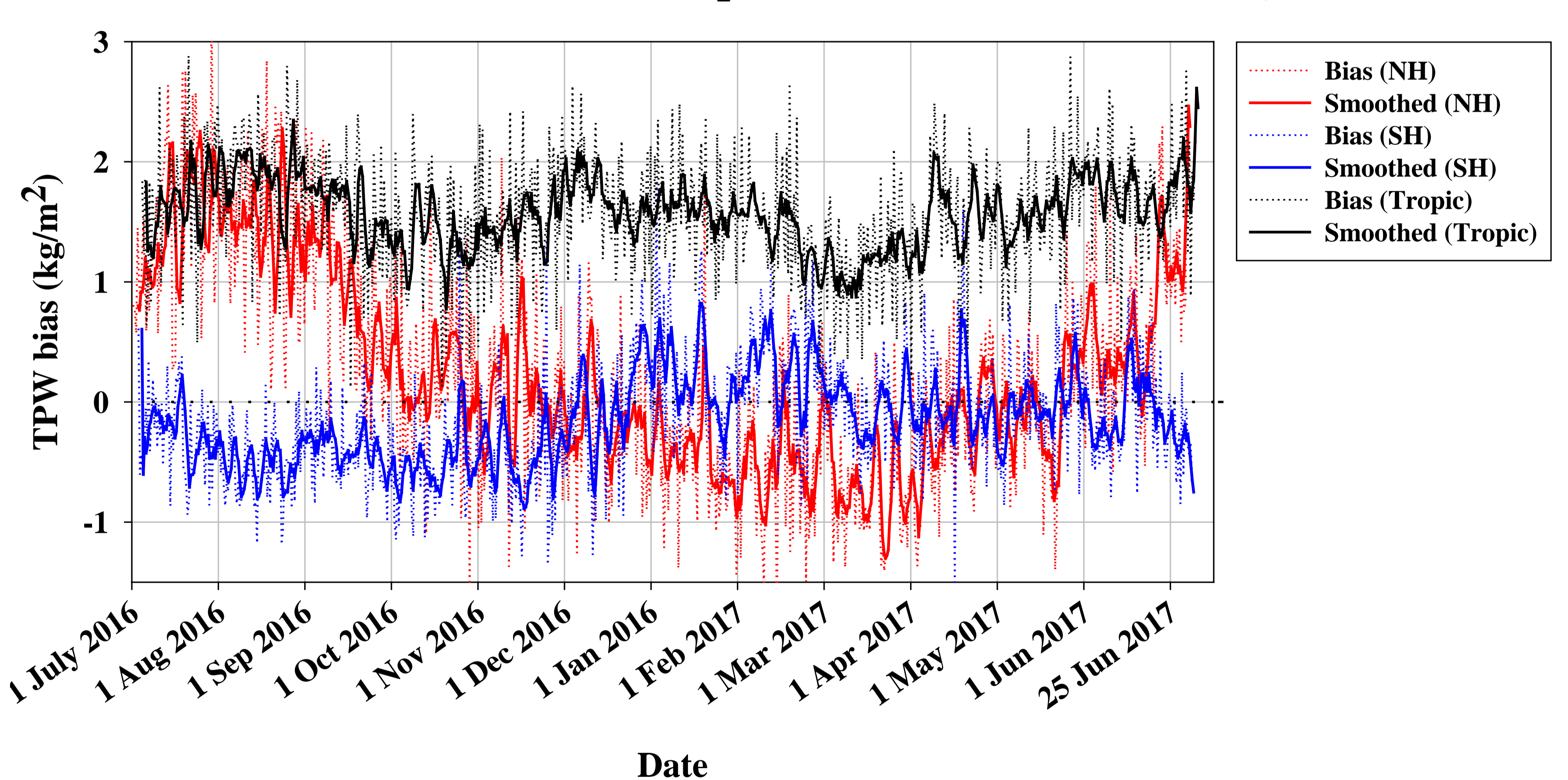
- Microwave Integrated Retrieval System (MiRS) by NOAA
- Sensors: AMSU-B, MHS, and SSMI/S
- Period: 1 July – 31 July 2015



b. Time series of TPW bias for CNTL and EXP runs



c. Time series of TPW bias from operational KMA UM (N768, 17km)



7. Summary

- In the trial experiment, the new IASI channels had a neutral impact on precipitation forecast in terms of accuracy in location (based on "TS" results).
- However, the overestimated size of forecasted precipitation area shown in the control run was reduced for the experiment run (based on "Bias" results).
- The "Bias" improvement for the experiment run seems to be due to the reduction of humid bias shown in the control run, assuming that the water vapor amount finally becomes precipitation.

8. Reference

- Noh, Y.-C., B. J. Sohn, Y. Kim, S. Joo, W. Bell, and R. Saunders, 2017: A New Infrared Atmospheric Sounding Interferometer Channel Selection and Assessment of Its Impact on Met Office NWP Forecasts. *Adv. Atmos. Sci.*, **34**, 1265-1281.