

A New Land Surface Scheme for the JMA Global NWP Model: Validation Study using the CEOP In Situ Observation Data

Hiroto Kitagawa
Masayuki Hirai
Takuya Sakashita

(Numerical Prediction Division,
Japan Meteorological Agency)



Outline

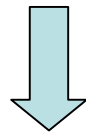
- Production of JMA's model output datasets for CEOP
- Evaluation of a new land surface scheme for JMA-GSM using the CEOP in-situ Observation
- Summary



Validation Study using the CEOP In Situ Observation Data

Preliminary verification of the JMA's model outputs using the CEOP in-situ Observation

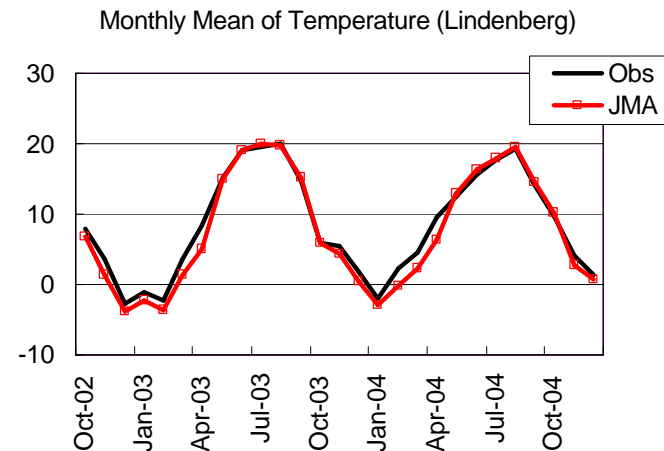
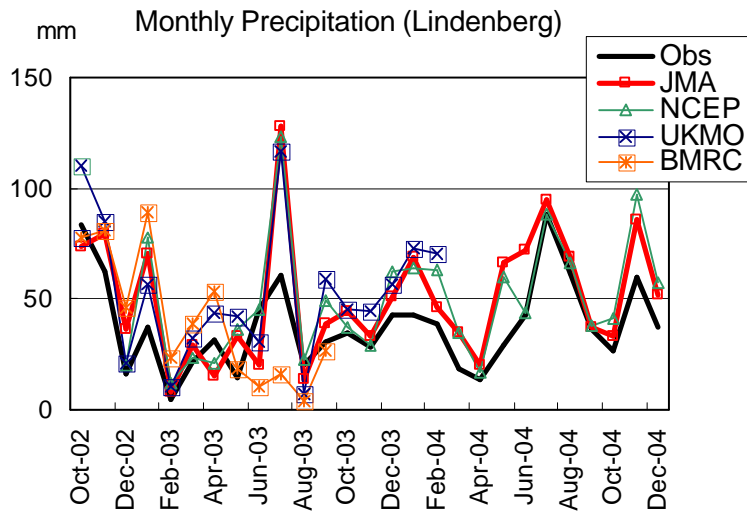
- JMA's dataset has been already released at the CEOP data archive center.



- JMA is going to evaluate quality on JMA's dataset using the CEOP in-situ observation.

Comparison between JMA's MOLTS and the CEOP in-situ observation

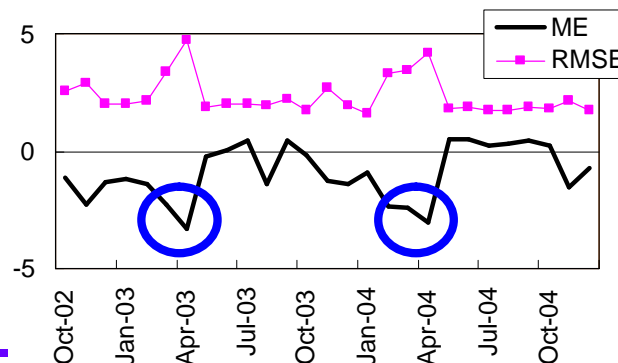
BALTEX/Lindenberg (only FALKENBERG sitation)



- Monthly precipitation is adequately analyzed in the JMA's MOLTS.

- A cooling bias of surface air temperature is appeared in the early spring due to overestimation of snow covered area in the daily snow cover analyses.

Error of surface air temperature (Lindenberg)



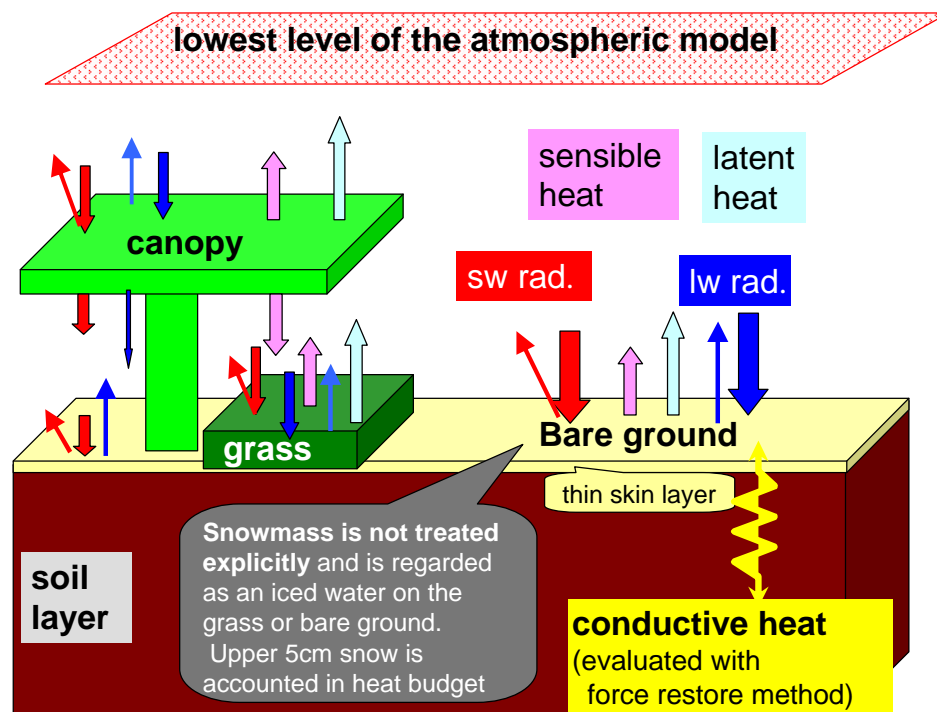
RMSE 2.4



Use the CEOP dataset for development of land surface model

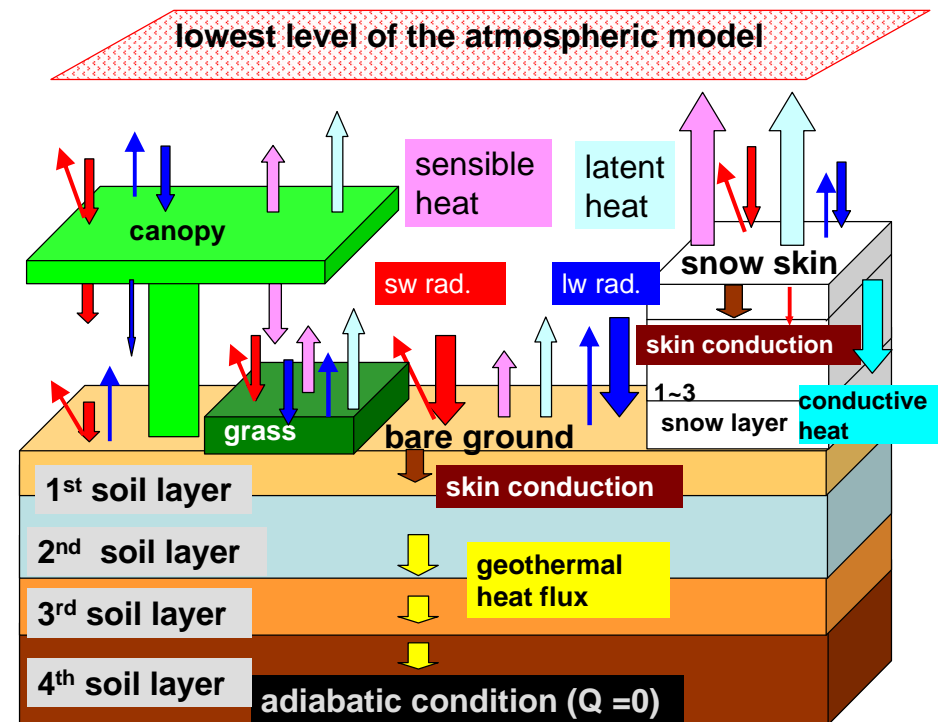
Op-SiB

(Current land surface model)

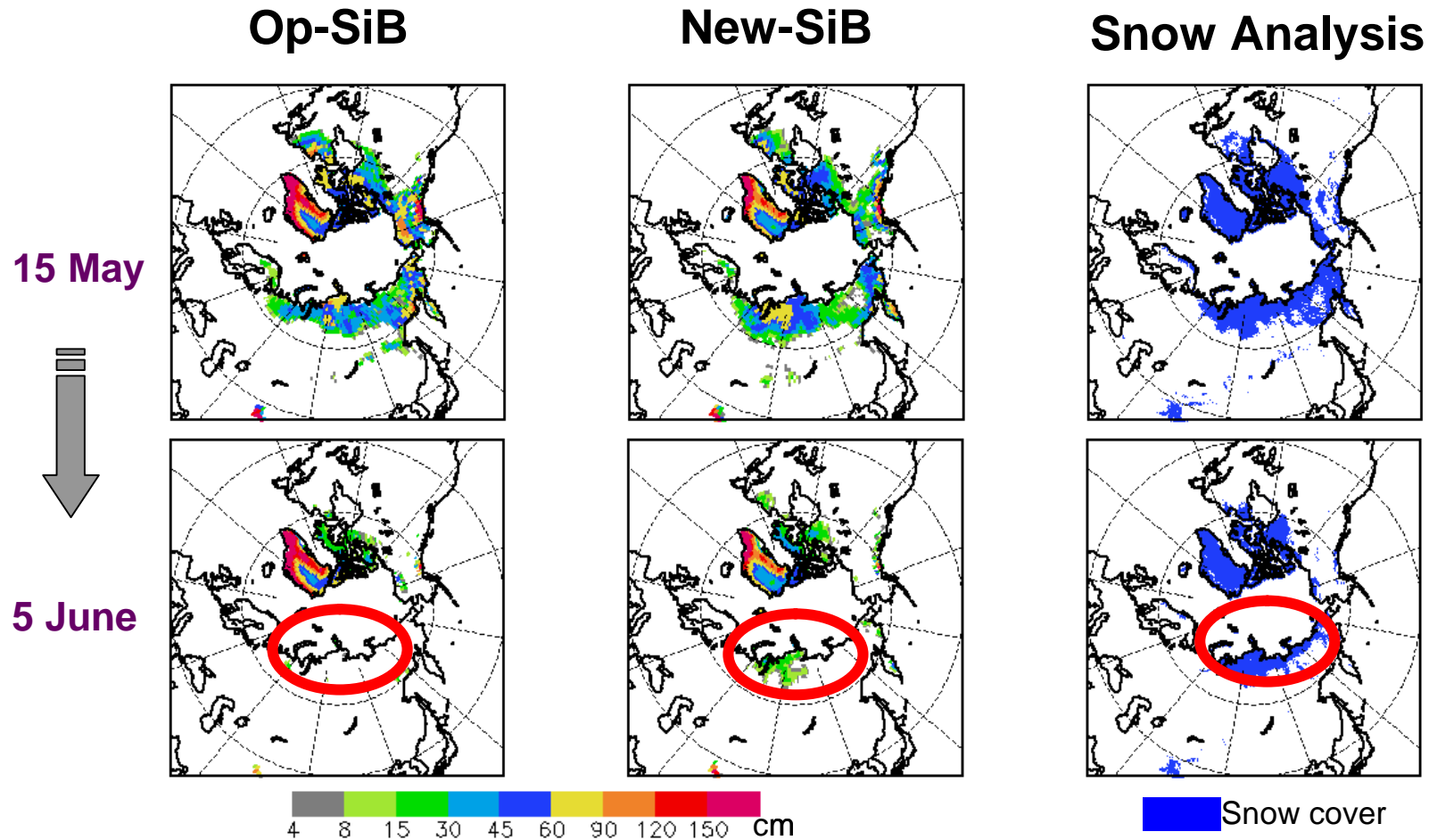


New-SiB

(A new land surface model)

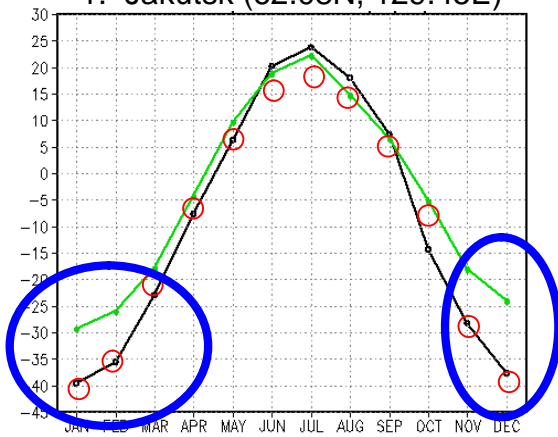


Improvement of snow melting forecasts using by New-SiB

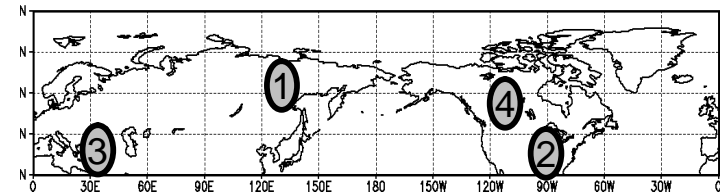
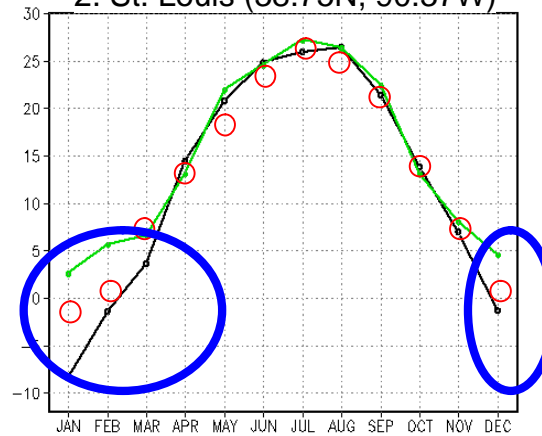


Monthly mean temperature

1. Yakutsk (62.08N, 129.45E)

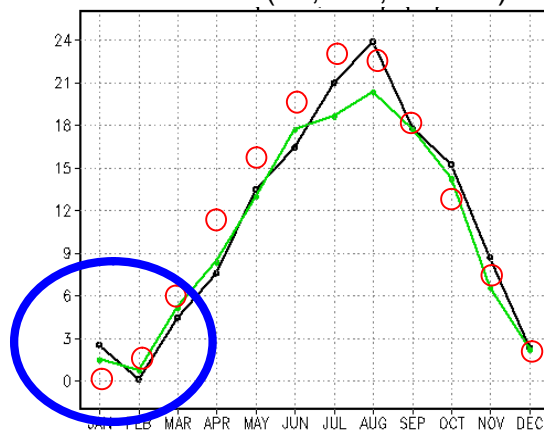


2. St. Louis (38.75N, 90.37W)

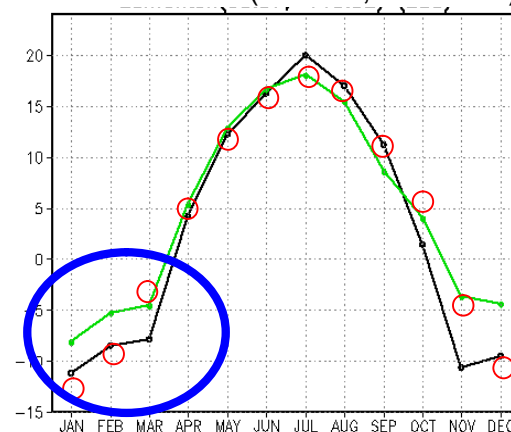


The New-SiB mitigates warming bias in the Op-SiB in winter.

3. Ankara (39.95N, 32.88E)



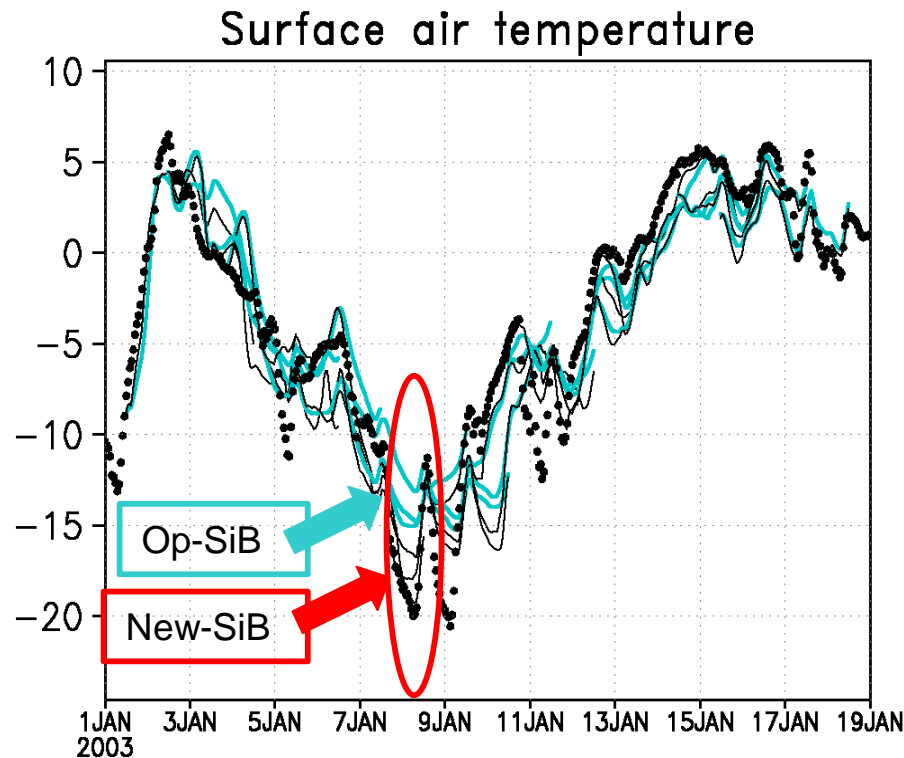
4. Edmonton (53.57N, 113.52W)



- Op-SiB
- New-SiB
- Climatology

Evaluation of the short-range forecasts using the CEOP EOP-3 Observation

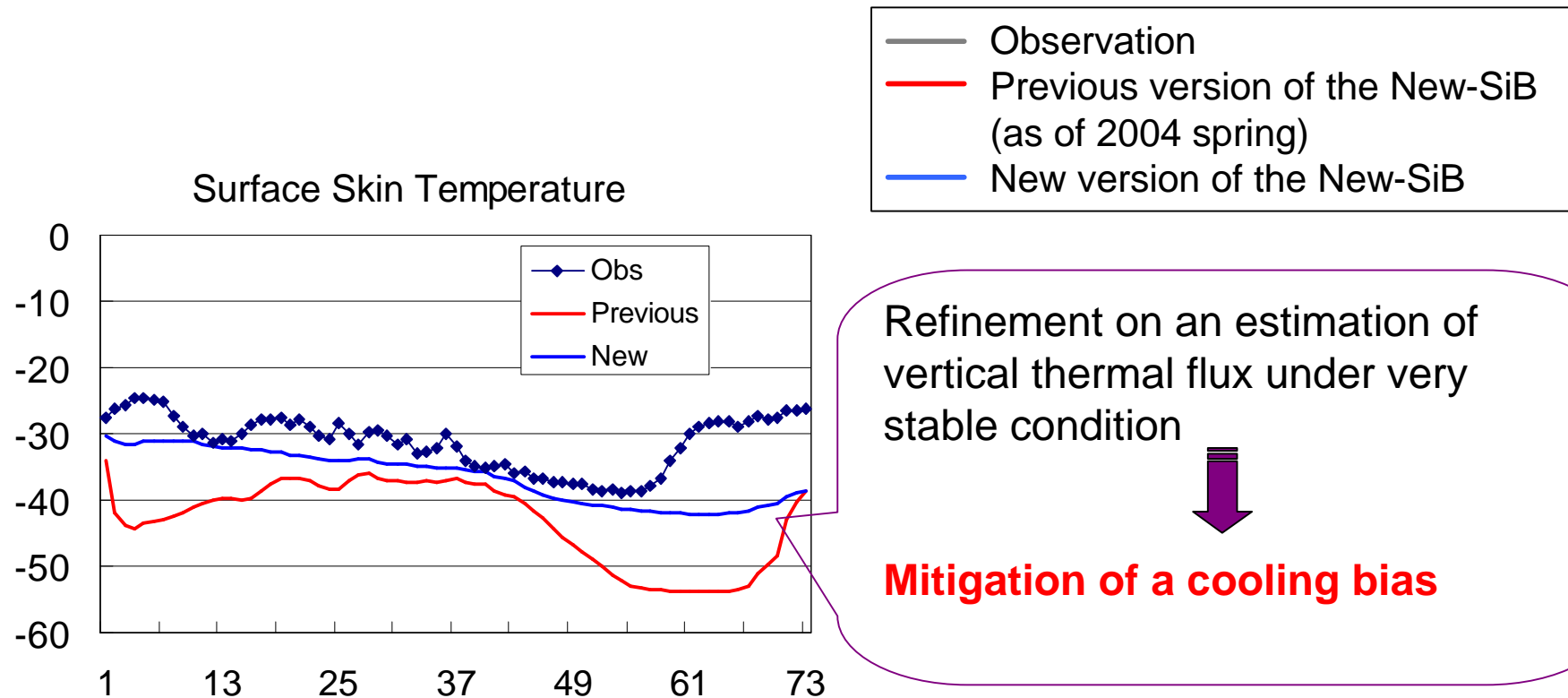
Low temperature case on 8-9 Jan 2003
at BALTEX/Lindenberg



- 3-days forecast (JMA-GSM, TL319L40) from the 30 initial conditions:
1, 2, ..., 15 Jan 2003 (Winter)
1 hourly outputs
- The predicted variables at the **grid point nearest** to the observation site are picked up from the model outputs without interpolation and then compared with the observations.

Mitigation of a cooling bias of near surface temperature under stable condition

3 days forecast of 2m temperature at ARM/Barrow
(initial time of 12UTC, 1 Jan 2003)



Summary

JMA's CEOP model output dataset

- JMA's dataset has been already released at the CEOP data archive center.
- JMA is going to make a material about quality information on JMA's dataset using the CEOP in-situ observation.

Development of a new land surface model for the JMA-GSM

- **New-SiB** - refines snow and soil processes
- **Longtime integration**
 - New-SiB improves snow cover reproducibility and monthly mean temperature in winter.
- Evaluation of the short-range forecasts using the CEOP EOP-3 Observation
 - Accuracy of near surface air temperature is improved over snow covered area by using the New-SiB.



Future Works

Development of the JMA-GSM using the CEOP dataset

- The CEOP datasets is valuable for an evaluation of not only a land surface modeling but also the other schemes (such as a atmospheric boundary layer and radiation processes.)

JMA's CEOP model output dataset

- JMA is going to make a material about quality information on JMA's dataset in CEOP phase-1 using the CEOP in-situ observation.
- We are going to consider the participation in the CEOP phase-2 model output.

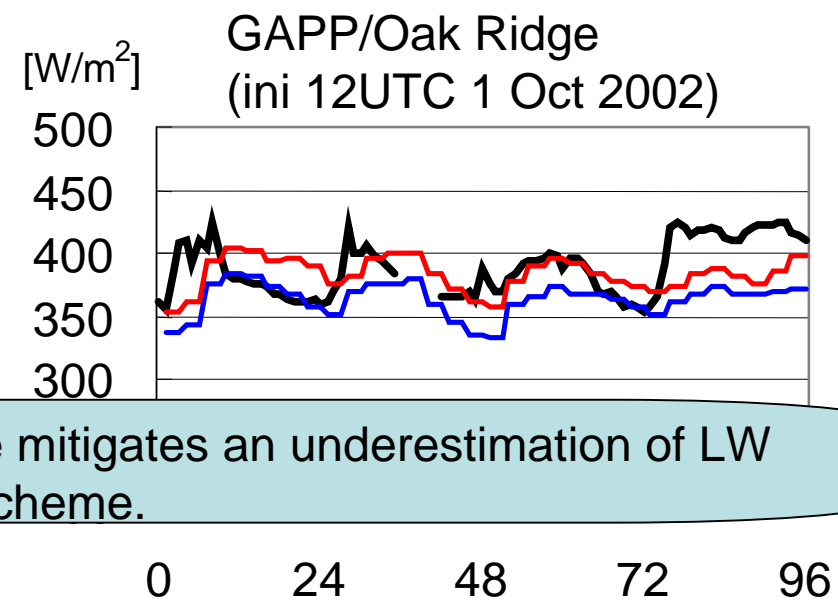
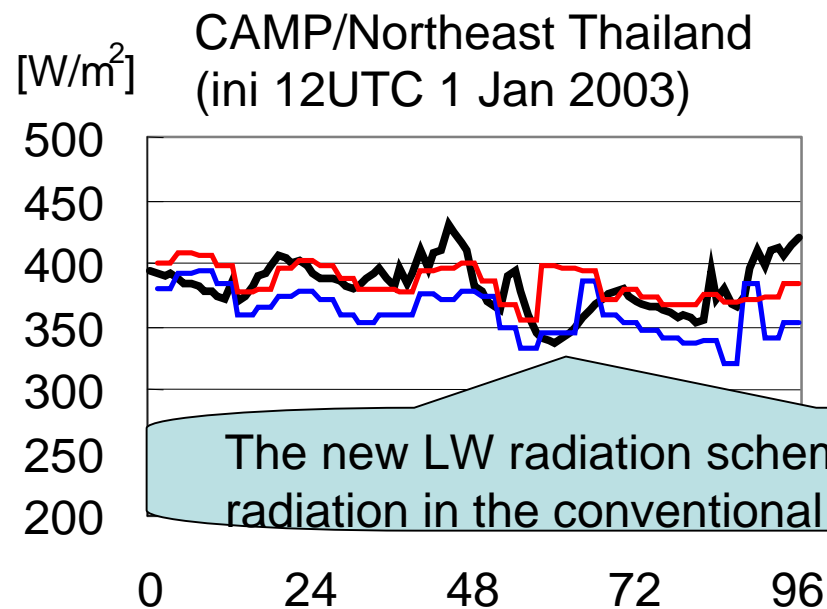
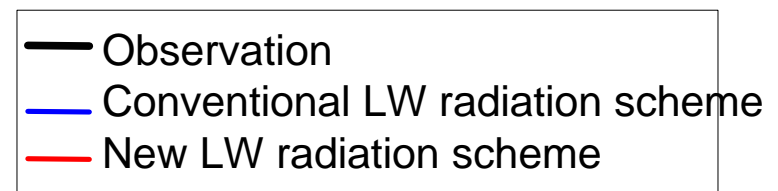


Improvement of a long-wave radiation scheme

(put into operation in Dec 2004)

CEOP dataset can evaluate not only a land surface scheme but also the other physical processes.

Downward LW radiation at surface

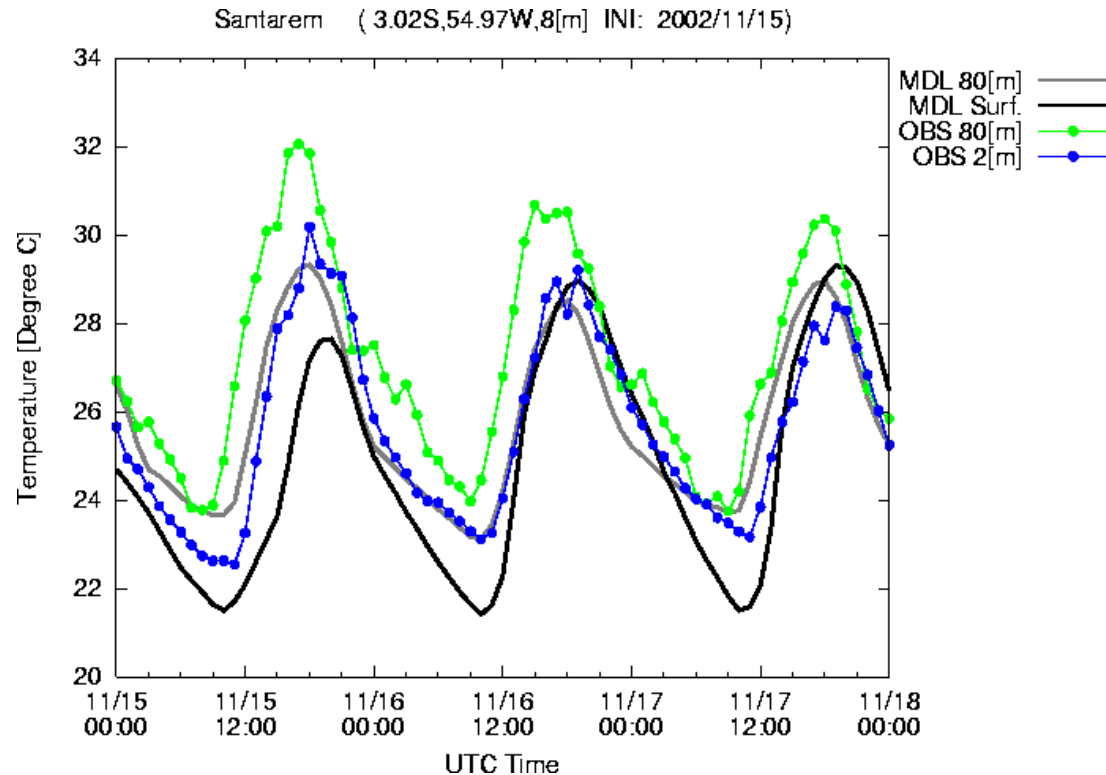


The new LW radiation scheme mitigates an underestimation of LW radiation in the conventional scheme.

Forecast Time [h]



Validation study of atmospheric boundary layer in the model



- Black/gray lines indicate model derived air temperature at 2m/80m heights.
- Colored lines correspond to in-situ observation at same heights derived from the tower data at Santarern.