Comparison of Monthly Mean Temperature between the Observational data and the Reanalysis data

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INTRODUCTION

In Onogi et al. (2007), monthly mean 2-meter air temperature of JRA-25 is compared with observational data (CRUTEM2v) in global scale. To examine the possibility of applying JRA-25 to operational monitoring of global and regional climatic variability, monthly mean 2-meter air temperature of JRA-25 were compared with the observational data in continental scale.

DATA

In this research, following data were used:

* JRA-25: Air temperature at 2m high
* CLIMAT: Monthly mean temperature data observed at land stations around the world
* Temporal coverage: 1979.1 – 2007.12

Monthly mean temperature data at land stations were derived from the Global Historical Climate Network (GHCN) of the NCDC/NOAA for the term of January 1979 – May 1982 and from CLIMAT report archived at JMA for the term of June 1982 – December 2007.

In calculating the temperature anomaly value of each 5°x5° grid-box, anomalies of CLIMAT data at all stations within the grid are averaged simply.

JRA-25 data also averaged in the same grid-box by using weighted average method in which the extent of the grid is considered. For example, in calculating the temperature anomaly of the grid-box (longitude: 0-5°, latitude: 0-5°), GPV at (2.5°, 2.5°) is weighted 1, GPV at (0, 2.5°), (2.5°, 0), (5°, 2.5°), (2.5°, 5°) are weighted 0.5 and GPV at (0°, 0°), (0°, 5°)(5°, 0°)(5°, 5°) are weighted 0.25.

The term of normal of both data is the same, 1979-2007.

COMPARISON METHOD

Regional averaged temperature anomalies in continental areas are calculated by using JRA-25 and CLIMAT explained above. Areas used for regional averages in this research are indicated in Figure 1. In calculating global mean temperature anomaly, all of grid boxes on land indicated in Figure 1 are used (i.e. SST data are not used). Then, these two kinds of temperature anomalies in each area are compared each other.

The comparison was in global scale and 12-month running mean in Onogi et al. (2007), while it is in continental scale as well as global scale and month-to-month in this research.

Additionally, since it is expected that the data coverage ratio of CLIMAT may influence the difference between JRA-25 and CLIMAT, the data coverage ratio in each month and region is calculated by mean of dividing the number of grid boxes in the region by that of grid boxes with CLIMAT data.

RESULT

Figure 2 indicates the comparison of monthly mean temperature anomaly of JRA-25 and CLIMAT in regional and global scale (top), the difference between them (middle), and the data coverage ratio of CLIMAT data (bottom). For Antarctica region, the CLIMAT data coverage ratio is so small (around 0.05) that the comparison is not made.

As with the result of Onogi et al. (2007), the two time-series of CLIMAT and JRA-25 are almost identical with respect to interannual variability. For example, in Figure 2, both of them are correlated well each other in the extreme warming that seemed to be related to an El-nino event around 1998 in Southeast Asia, South America and Australia.

The route mean square difference (RMSD) between JRA-25 and CLIMAT is about 0.17℃ in global scale. In regional results, RMSD is about 0.18℃ (ex. Southeast Asia, South Asia), 0.45℃ (ex. Siberia, West Asia).

From the trend of the difference, the trend of JRA-25 seems to be smaller than that of CLIMAT in global, Africa and South Asia.

Regarding the Global in Figure 2, CLIMAT coverage ratio seems to be less influential to the difference between both kinds of data in case that coverage ratio is 0.4 or more. But the regional difference seems to be affected when CLIMAT coverage ratio in the respective area is less than 0.4, considering the cases, such as West Asia before 1985 or South America from early to mid 1990s.

In some cases such as East Asian data for 1986 shown in Figure 2, there seems to be erroneous data in CLIMAT data, and then CLIMAT data requires more quality checks. Also, for the purposes of comparing temperature data on both land and sea surface, it is hoped that SST will be introduced for the comparison in the next step.

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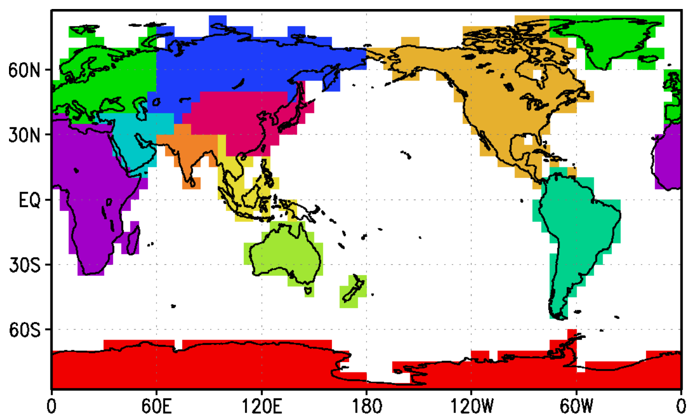

Figure 1　Region map used in this research

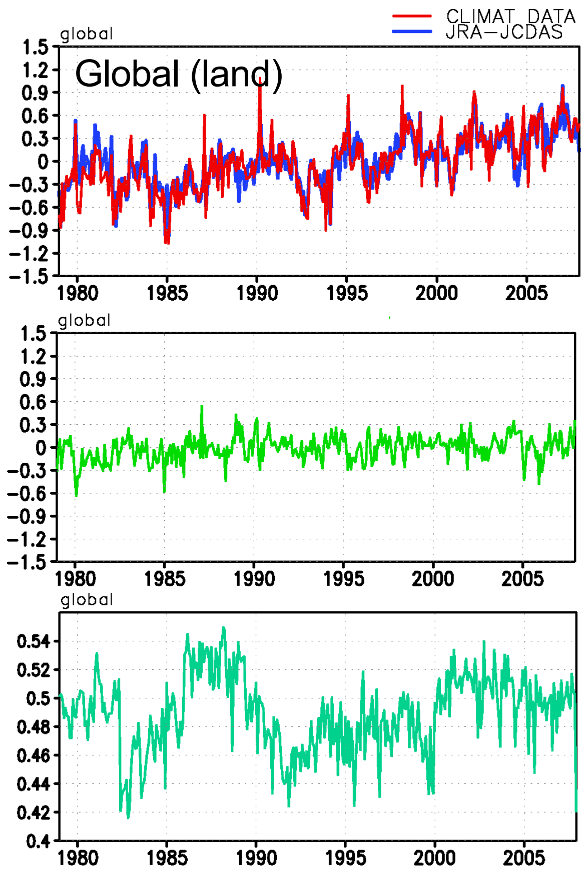

Figure 2　Time series of monthly mean temperature anomaly of JRA-25 and CLIMAT in global scale (top), the difference between them (middle), and the data coverage ratio of CLIMAT data (bottom).

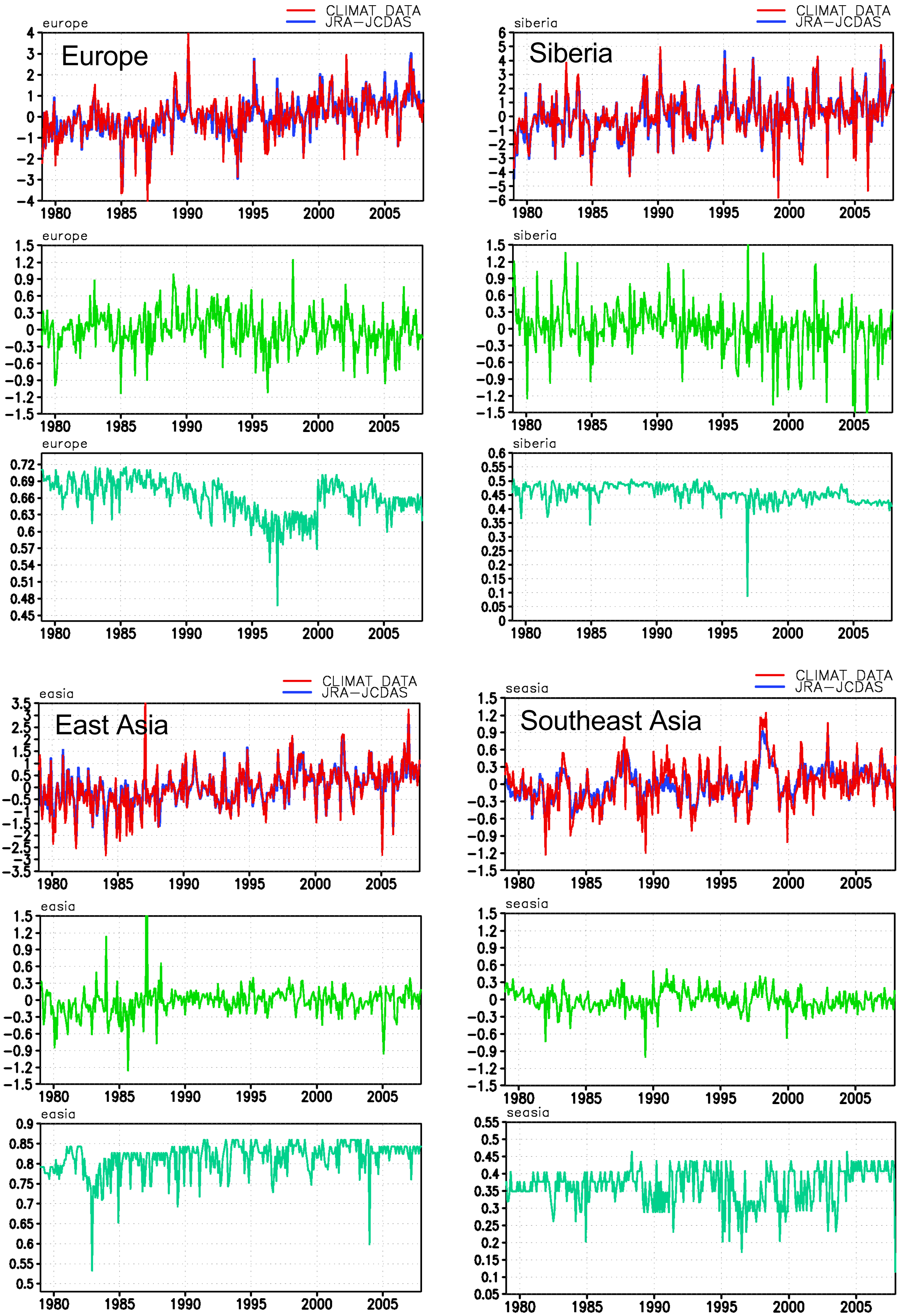

Figure 2 continued except for region of Europe, Siberia, East Asia and Southeast Asia

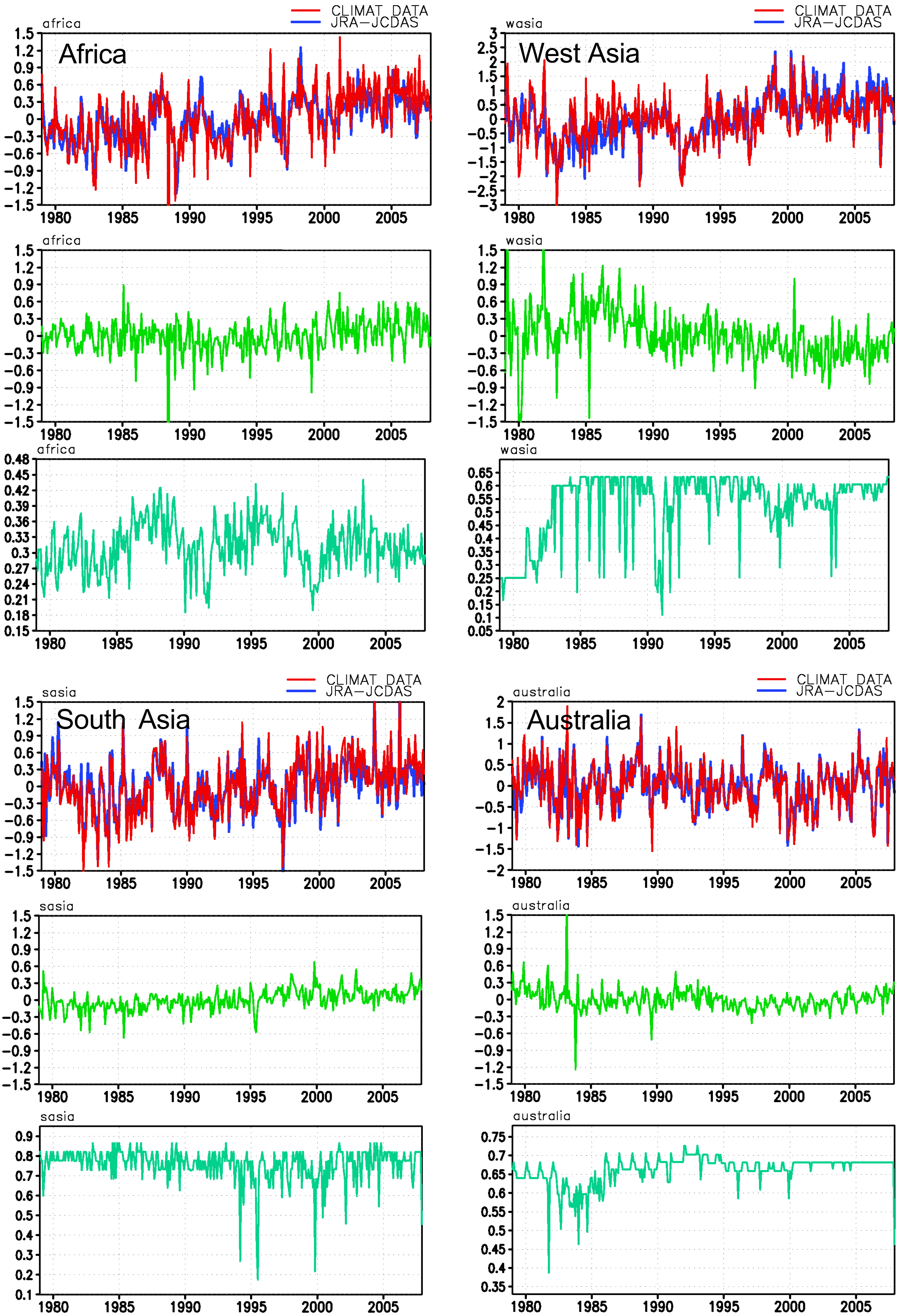

Figure 2 continued except for region of Africa, West Asia, South Asia and Australia

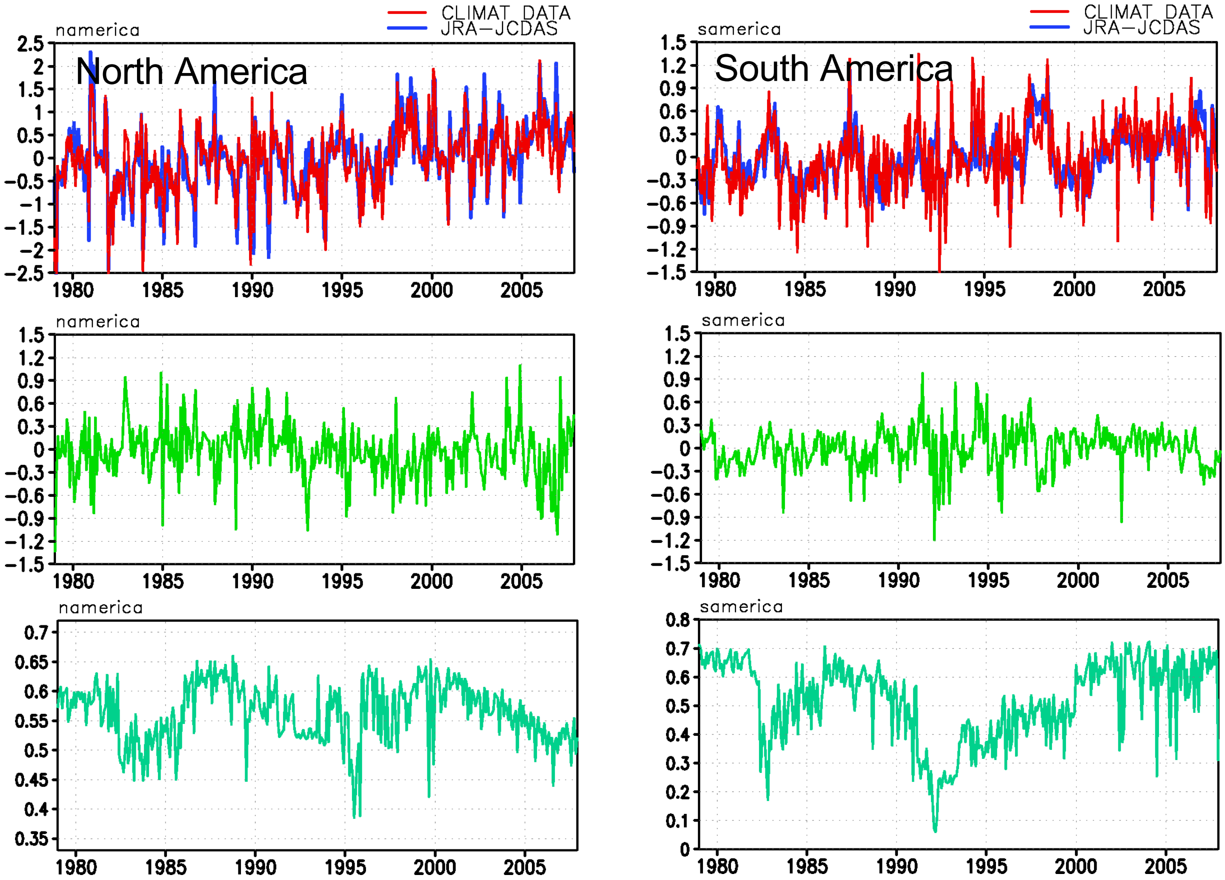

Figure 2 continued except for region of North America and South America