Commencement of Utilization of JRA-3Q in diagnosis products and iTacs

Reanalysis has been playing a crucial role in JMA's climate services and related activities, such as climate monitoring, seasonal forecast modelling and climate research underpinning them, by providing long-term, high-quality climate data. To further improve the quality of reanalysis data, JMA has developed the Japanese Reanalysis for Three Quarters of a Century (JRA-3Q), in which many of the deficiencies of the former JRA-55 are alleviated. JRA-3Q provides a high-quality homogeneous reanalysis dataset that covers the period from September 1947 onward, extending the current period of data coverage.

1. Outline of JRA-3Q (Table 4-1)

JMA has completed the third Japanese global reanalysis, known formally as JRA-3Q, to provide a comprehensive atmospheric dataset suitable for the study of climate change and multi-decadal variability (Kobayashi et al., 2021). The data cover the period from September 1947 onward to extend current period of data coverage. The data assimilation system for JRA-3Q is based on JMA's operational data assimilation system (as of December 2018), which has been extensively improved since the JRA-55 (Kobayashi et al. 2015) dataset was produced. The SST specified as the lower boundary condition of the forecast model is the Merged Satellite and In-Situ Data Global Daily Sea Surface Temperature (MGDSST; Kurihara et al. 2006) based on observations since June 1985 and the Centennial In Situ Observation-based Estimates of the Variability of SSTs and Marine Meteorological Variables Version 2 (COBE-SST2; Hirahara et al. 2014) until May 1985. For details of JRA-3Q, see the JRA-3Q comprehensive report (submitted to the Journal of the Meteorological Society of Japan).

	JRA-55	JRA-3Q
Version	Operational as of December 2009	Operational as of December 2018
Resolution	TL319 L60(~55km); top layer at 0.1hPa	TL479 L100(~40km); top layer at 0.01hPa
Analysis scheme	4D-Var with the T106 inner resolution	4D-Var with the TL319 resolution
SST and sea ice	COBE-SST (1-degree)	Until May 1985: COBE-SST2 (1-degree) From June 1985 onward: MGDSST (0.25-degree)

Table 4-1 Comparison of JRA-55 and JRA-3Q data assimilation systems

2. Basic performance of the data assimilation system (Figure 4-1)

Figure 4-1 shows time series of root mean square (RMS) errors of two-day forecasts of the geopotential height at 500 hPa averaged over the extratropical northern and southern hemispheres. The increase of the forecast scores from JRA-25 (Onogi et al. 2007) to JRA-55 to JRA-3Q shown in Figure 4-1 indicates that there was a steady improvement in the performance of the JMA data assimilation systems. Scores of JRA-3Q for the Northern Hemisphere are particularly stable, indicating high temporal consistency in the region (Figure 4-1(a)). In addition, the RMS errors of the geopotential height at 500 hPa estimated in JRA-3Q were reduced significantly in the extratropical southern hemisphere during the 1990s (Figure 4-1(b)).

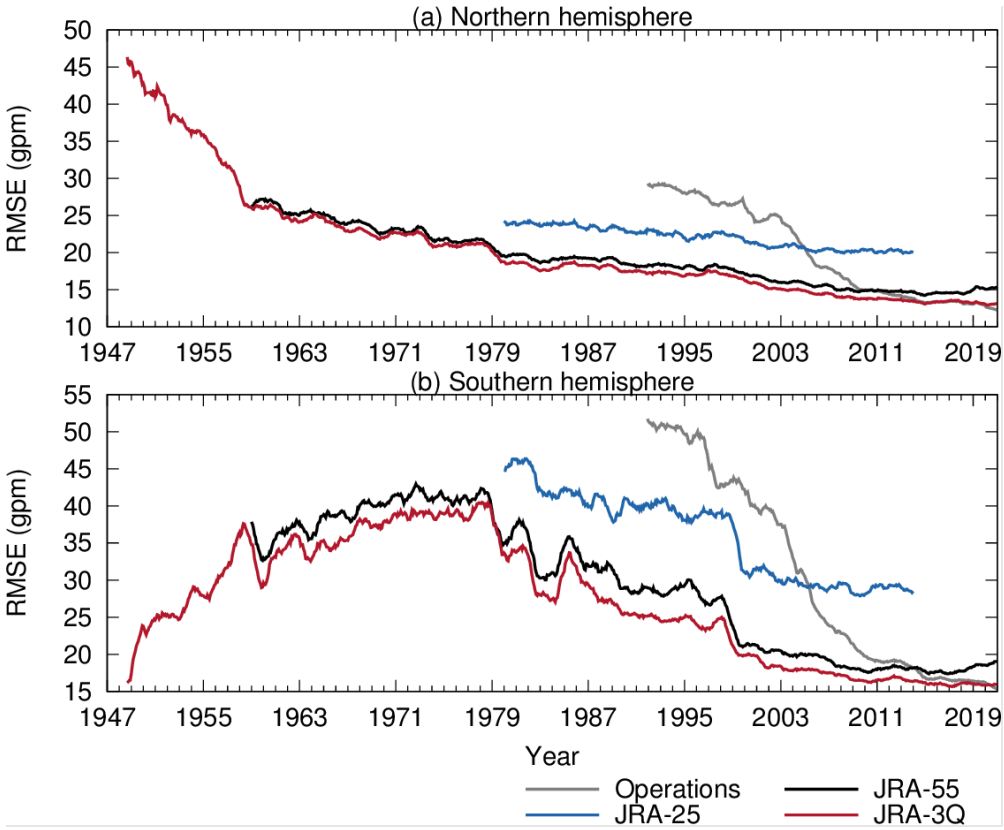

Figure 4-1 Time-series representation of RMS errors in two-day forecasts of 500-hPa geopotential height verified against their own analyses in the extratropical (a) northern and (b) southern hemispheres.

3. Update status on the TCC website and tool

Figures and tables for climate monitoring in the Climate Monitoring System and El Niño monitoring pages on the TCC website were replaced with data based on JRA-3Q and MGDSST/COBE-SST2 at the end of May 2023. There are no major differences in the characteristics of atmospheric circulation fields and sea surface temperature, but there is a slight difference in the duration of El Niño and La Niña events as defined by JMA. Contents of the Impacts of El Niño/La Niña and Indian Ocean Dipole events on the Global Climate page has been also replaced with new statistics based on JRA-3Q and indices on MGDSST/COBE-SST2. TCC has updated interactive Tool for Analysis of the Climate System (iTacs), regarding the utilization of JRA-3Q and MGDSST/COBE-SST2. iTacs users can now access the new datasets.

4. Product availability

The JRA-3Q product is available for non-commercial purposes from the Data Integration & Analysis System (DIAS; https://jra.kishou.go.jp/JRA-3Q/index_en.html#MIRROR).

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