Introduction and Early Results of JRA-55C: Subset of JRA-55

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As a subset of the second Japanese global atmospheric reanalysis project named the Japanese 55-year Reanalysis (JRA-55, Ebita et al, 2011), the Meteorological Research Institute (MRI) started a global atmospheric reanalysis subproject which assimilates only conventional surface and upper air observations, without satellite observations, using the same assimilation system as JRA-55. The subproject, named JRA-55C, aims to produce a more homogeneous dataset for a longer period being free from changes of satellite observing systems. This makes the product suitable dataset for studies of climate change or multi-decadal variability. Although the subproject will provide atmospheric reanalysis data from 1973, the JRA-55C covers 55 years from 1958 to 2012 by the addition of the product of JRA-55 from 1958 to 1972 which is the period corresponding to the pre-satellite era. In addition, JRA-55AMIP, which is the AGCM experiment, is used to examine the effect of surface and upper air observations. In the AGCM, the same model and the same boundary such as the observed SST and sea-ice, greenhouse gases, ozone and aerosols as in the JRA-55C, are utilized. By comparing these three datasets, JRA-55, JRA-55C and JRA-55AMIP, it is expected to clarify how and why the meteorological variables change for the last 55 years.

Since the production of JRA-55C started in 2011, the computations for only 2 years have been completed so far. Early results of JRA-55C will be presented and discussed in this presentation.

The main early results are as follows.

- Seasonal mean zonally averaged precipitation rate over extra-tropics show a better agreement with GPCP in JRA-55C, although that over Tropics is overestimated compared to GPCP, in particular the area at 7N in JJA where corresponding to ITCZ indicate 5mm/day lager than that in GPCP. The precipitation rate of JRA-55C around ITCZ in JJA and that around SPCZ in DJF were overestimated compered to precipitation rate of Japanese 25-years Reanalysis (JRA-25, Onogi et al, 2007). The seasonal mean zonally averaged precipitation is similar between JRA-55 and JRA-55C.

- The seasonal mean meridional stream function, which indicates Hadley circulation, is compared. Stachnik and Schumacherer (2011) indicates JRA-25 have higher circulation center (pressure level around 450hPa) than the other reanalyses (pressure level around 700hPa). In JRA-55C, the circulation center is located around 700hPa, this is lower than in JRA-25. In JJA, the minimum stream function value in JRA-55C is smaller than that in JRA-25, which indicates JRA-55C have strong overturning for the southern cell compared to JRA-25. The result is consistent with the zonal mean precipitation rate in JRA-55C which is overestimated compared to JRA-25 around ITCZ in JJA. The features of the meridional stream functions are similar between JRA-55 and JRA-55C.

- Seasonal mean zonally averaged U-wind and Temperature are similar between JRA-55 and JRA-55C in the troposphere and lower stratosphere except for the southern extra-tropics. In JJA, JRA-55C has cold bias in southern polar region and warm bias in the mid-latitudes of the upper stratosphere, because the southern polar night Jet axis in JRA-55C is not tilted to the equator with height, which is a difference from JRA-55. In

DJF, JRA-55C has a cold bias in the northern polar region of the upper stratosphere. The cold bias is found in the period before stratospheric sudden warming occurrence.

- QBO is properly represented in JRA-55C, which is not appeared in JRA55AMIP.

We cannot yet confirm the homogeneity of the reanalysis at present stage. However, the entire JRA-55C will contribute to the understanding of the impact of observation changes on the representation of climate trends and variability in JRA-55.

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