OUTLINE
In response to the success of JRA-25, JMA conducted the second Japanese global reanalysis, called JRA-55. The project involved comprehensive global atmospheric reanalysis based on four-dimensional variational analysis (4D-Var) for the last half of the 20th century (1958 onward). As a result, the two major biases found in JRA-25 have been significantly alleviated and the temporal consistency of temperature analysis is also better than that of previous analysis products. The high-quality and long-term JRA-55 data produced are suitable for studies on climate change and multi-decadal variability as well as for the monitoring of current climate systems.

DATA ASSIMILATION SYSTEM
The data assimilation system is based on JMA’s operational model as of December 2009, and improves on JRA-25 in many ways. Enhancements include a revision of the radiation scheme and the introduction of 4D-Var and variational bias correction (VarBC) for satellite radiances. These upgrades significantly reduce model biases, enhance the dynamical consistency of analysis fields and advance the handling of satellite radiances.

DATA
The observational data adopted for JRA-55 were primarily those used in ERA-40 in addition to information archived by JMA. The ERA-40 observational dataset was supplied to JMA by ECMWF for use in JRA-25. Observations for the period from 1979 onward are basically the same as those used in JRA-25. Newly available observational datasets were also collected and used whenever possible.

Major data source
The ERA-40 observational dataset supplied by ECMWF Homogenization
Reprocessed satellite observations
GMS, GOES-9 and MTSAT-1R (MSC/JMA), METEOSAT (EUMETSAT), TMI (NASA, JAXA), AMSR-E (JAXA), QuikSCAT(NASA/PO.DAAC), AMI(ESA), GNSS-RO (UCAR)

<table>
<thead>
<tr>
<th>Short wave radiation</th>
<th>Absorptions by H₂O: Briegleb (1992)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozone</td>
<td>Until 1978; Climatology</td>
</tr>
<tr>
<td>Greenhouse gases</td>
<td>CO₂, CH₄, N₂O, CFC-11, CFC-12, HCFC-22 (historical concentrations)</td>
</tr>
</tbody>
</table>

Resolution & levels: TL319 (~ 55 km), 60 levels up to 0.1 hPa
Advection scheme: Semi-Lagrangian
Assimilation: 4D-Var, 6h time window, T106 inner model
Satellite radiance bias correction: VarBC (Dee and Uppala 2009)
Radiative transfer model for satellite: RTTOV-9.3 (Saunders et al. 2008)
Long wave radiation scheme: Line absorptions; Pre-computed Transmittance Tables and k-distribution (Chou et al. 2001)
Water vapor continuum (e-type and p-type); Zhong and Haigh (1995) with MK, CKD V1.0 Radiatively active gases; H₂O, O₃, CO₂, CH₄, N₂O, CFC-11, CFC-12, HCFC-22
RESULTS

Thanks to a state-of-the-art assimilation system and sophisticated observational data handling incorporating QC, the JRA-55 datasets generally show better quality than other products.

RMS errors are significantly reduced in JRA-55 thanks to the application of the latest JMA data assimilation system.

Fig: Time-series representation of RMS errors in 48-hour forecasts for geopotential height (gpm) at 500 hPa verified against own analysis.

JRA-55 shows a higher spatial correlation for daily precipitation against TRMM observational data than JRA-25 and ERA-Int.

JRA-55 FAMILY

JRA-55C (conventional) and JRA-55AMIP are provided as unique extra JRA-55 products to highlight the impacts of observational systems and model biases. JRA-55C is suitable for studies of climate change and multi-decadal variability because it is a homogeneous dataset covering an extended period.

JRA-55: Full observing system reanalysis
JRA-55C: Fixed observing system reanalysis
JRA-55AMIP: AMIP-type run without observation assimilation

REMARKS

JRA-55 FAMILY

JRA-55: Full observing system reanalysis
JRA-55C: Fixed observing system reanalysis
JRA-55AMIP: AMIP-type run without observation assimilation

REFERENCES


PRODUCT AVAILABILITY

JRA-55 can be downloaded free from the website shown below. Near-real-time data are updated daily on JDDS. JRA-55 provides data on a variety of physical elements in GRIB format. Basic JRA-55C and JRA-55AMIP products are scheduled for release in the future.

For more details, see the JRA-55 website

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JRA-55 – the Japanese 55-year Reanalysis