Kazutoshi ONOGI (JMA)

2006.6.19 ECMWF reanalysis WS

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JRA-25 Overview

- Joint research project of JMA and CRIEPI
- Years : 1979.1 - 2004.12

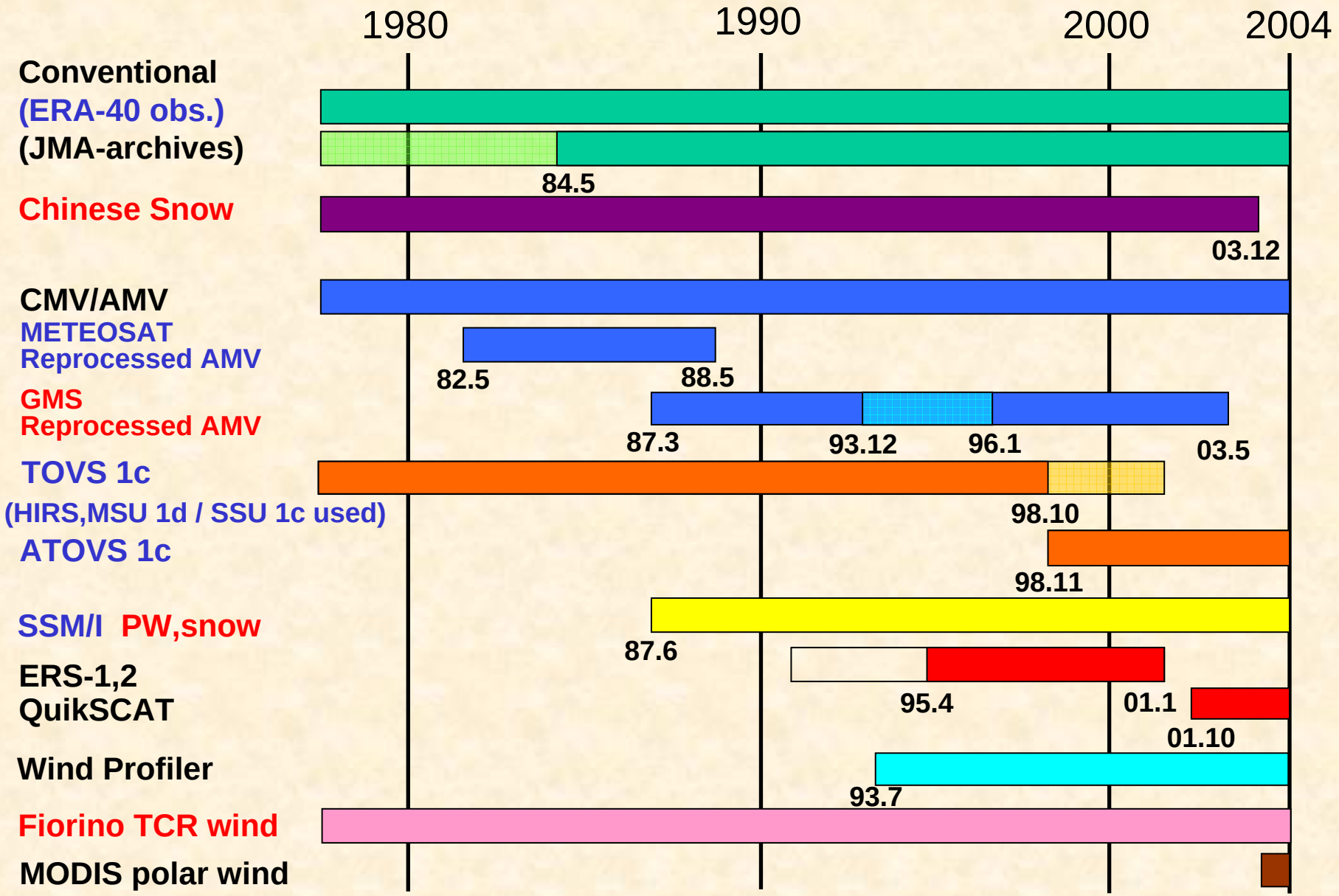
  transitioned to JMA-CDAS (JCDAS) for after 2005
- Resolution : T106L40 with top level at 0.4hPa
- 3D-Var
- Version : JMA operational system as of April 2004

  In addition, SSM/I PW, TOVS radiance level 1c(SSU) and 1d(HIRS, MSU) were assimilated.
- JRA-25 original/firstly used observational data

  TCR, SSM/I snow coverage, digitized Chinese snow depth data, reprocessed GMS-AMV
- JRA-25 original boundary/forcing data

  Daily COBE SST and sea ice (Ishii 2005, IJC), daily 3D-ozone profile

Observation availability in JRA-25



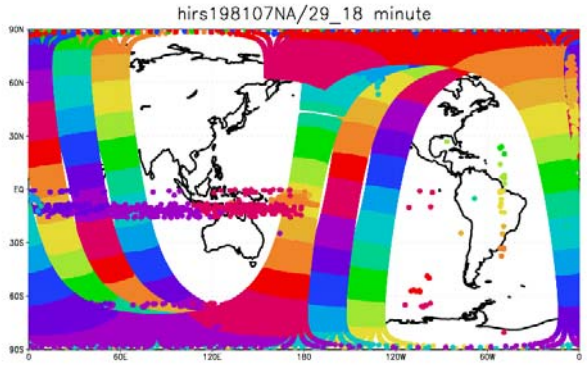
Translucent : available but not used
White : not in JMA

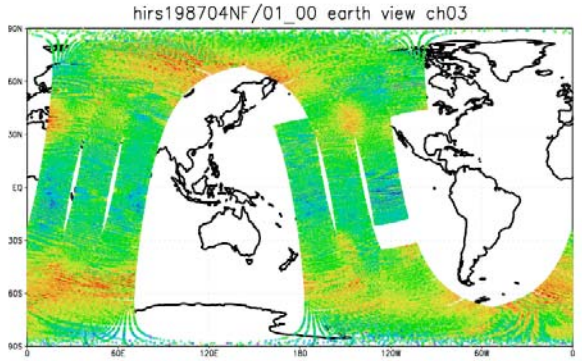
Quality monitoring of TOVS data

Typical examples of poor quality data

Bad earth location(1)

Out of orbit

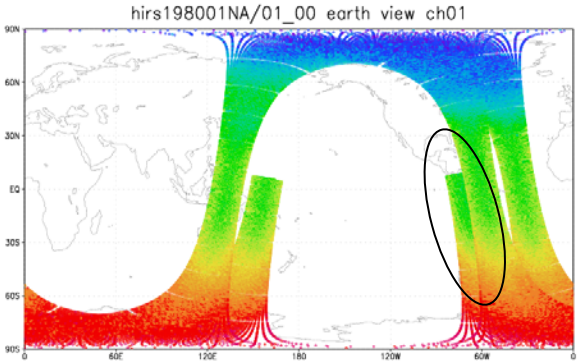


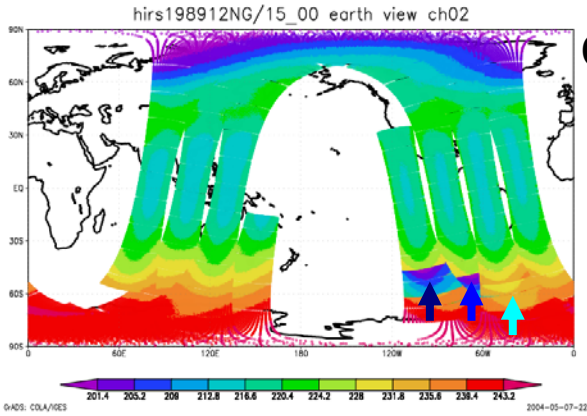


Noisy data

Bad earth location(2)

Error of time

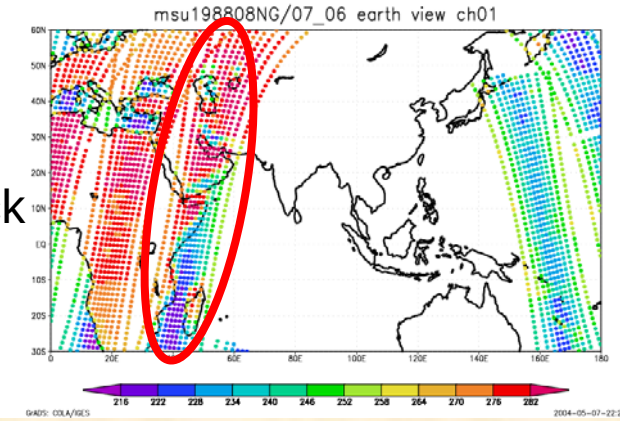




Calibration error

Bad earth location(3)

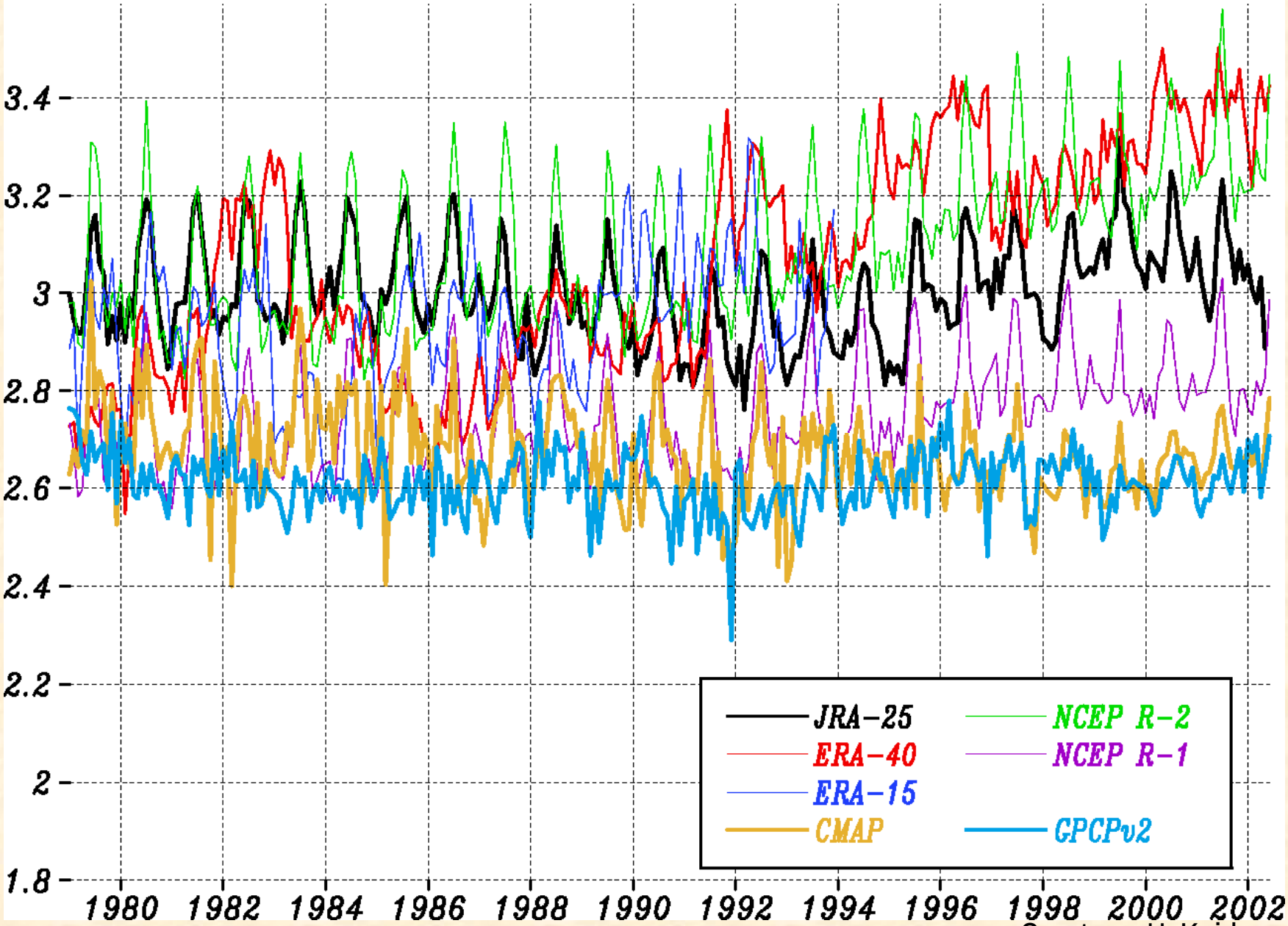
Slip along track



To detect these types of error, we developed systematic detecting method.

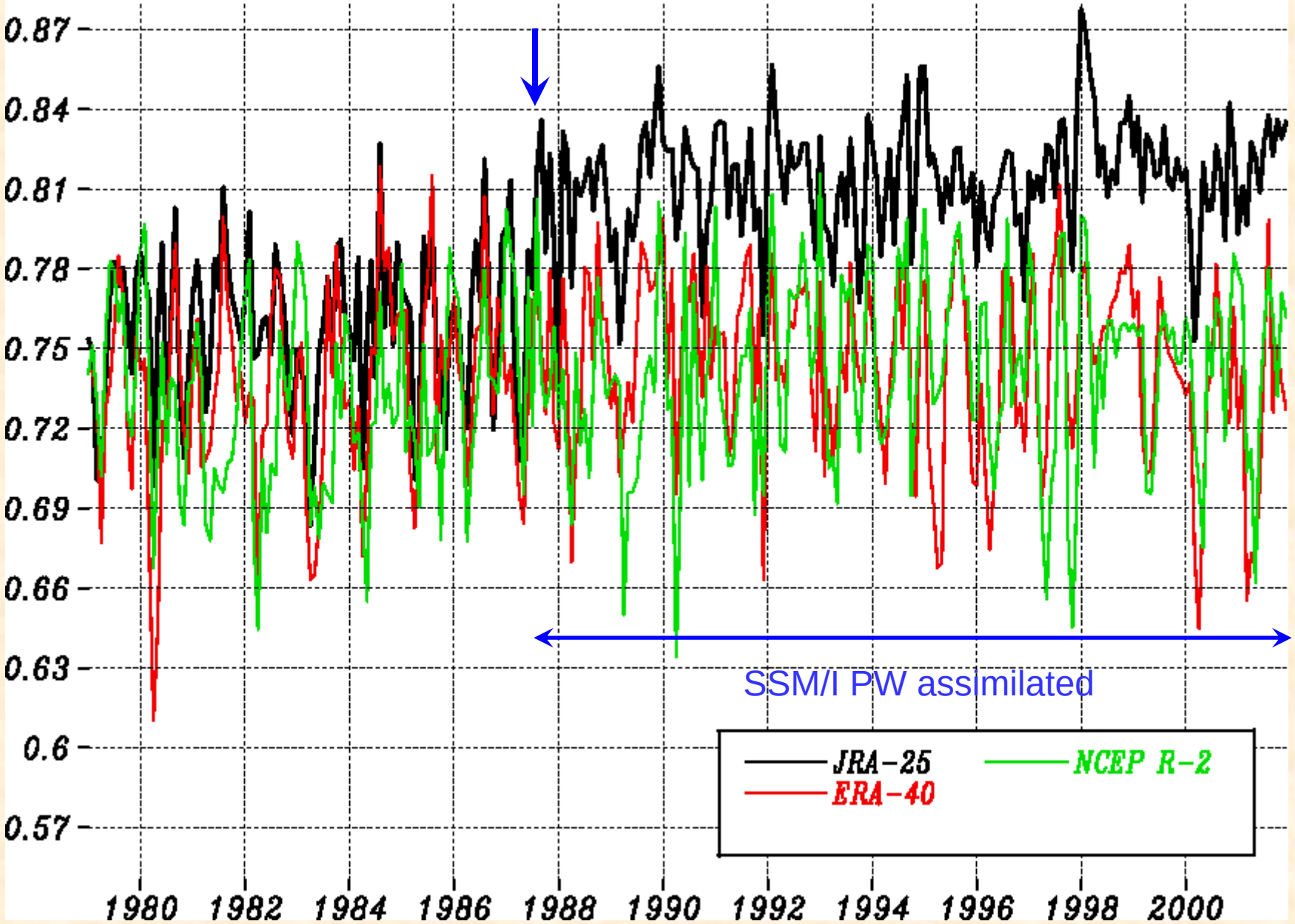
Courtesy: S. Kobayashi

Globally-averaged Monthly Precipitation



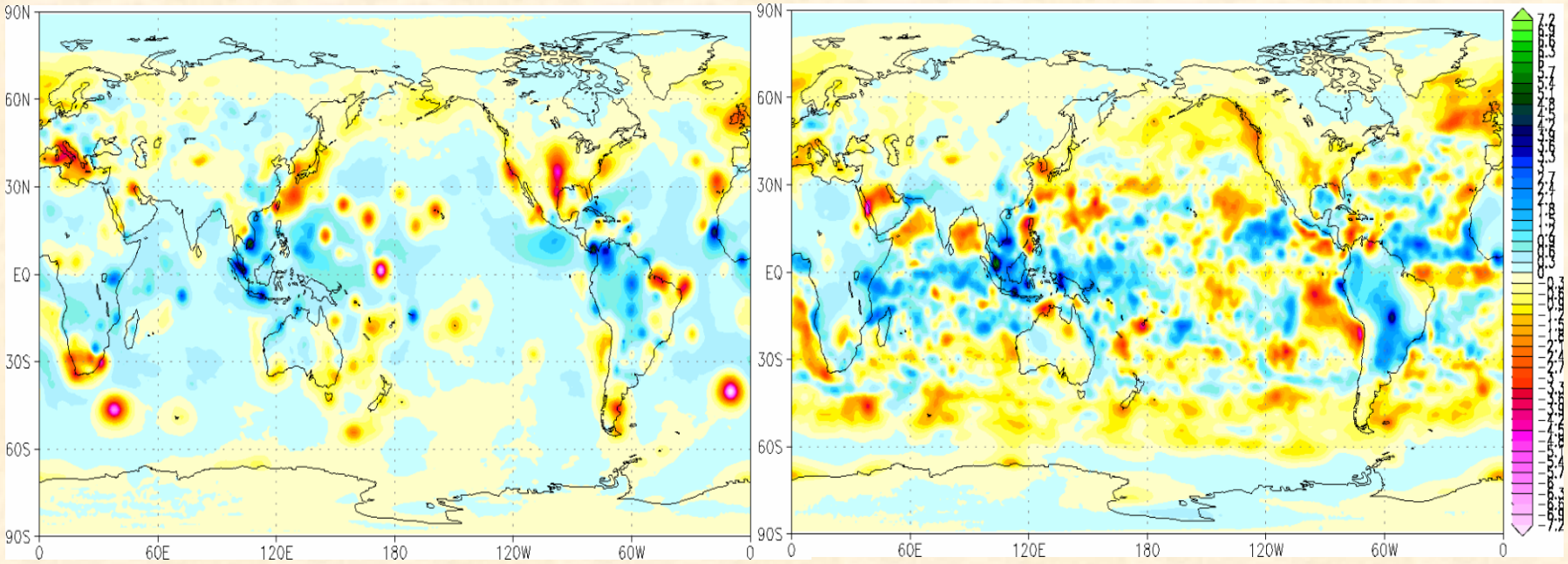
Courtesy: H. Koide

Correlation of Monthly Precipitation with GPCPv2



Courtesy: H. Koide

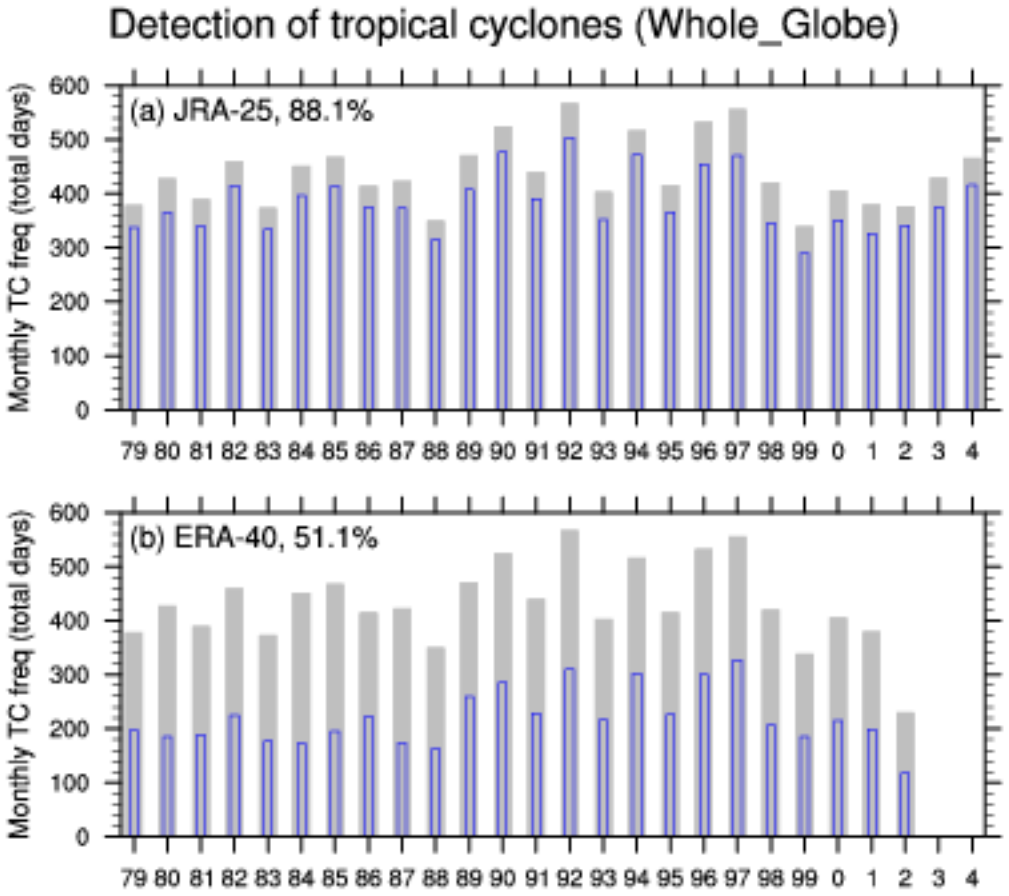
Monthly-averaged increment of total column water vapor



Left：Dec.1983 (without SSM/I PW)，Right：Dec.1991 (with SSM/I PW).
Blue colors indicate moistening area by the assimilation.

Courtesy: H. Koide

Global Detection rate of Tropical Cyclones



Grey : Observed TC (Best track)

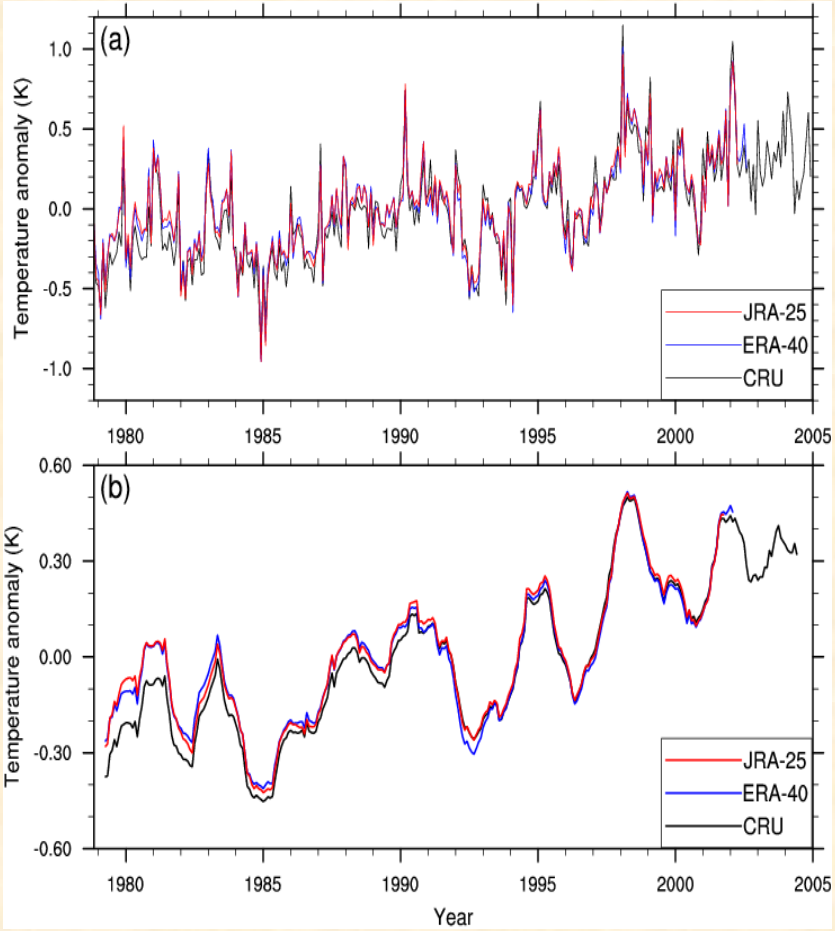
Blue : Detected TC

The detecting method is based on relative vorticity, sea level pressure (SLP) and middle to upper tropospheric thickness.

Courtesy: H. Hatsushika

Surface temperature Trend

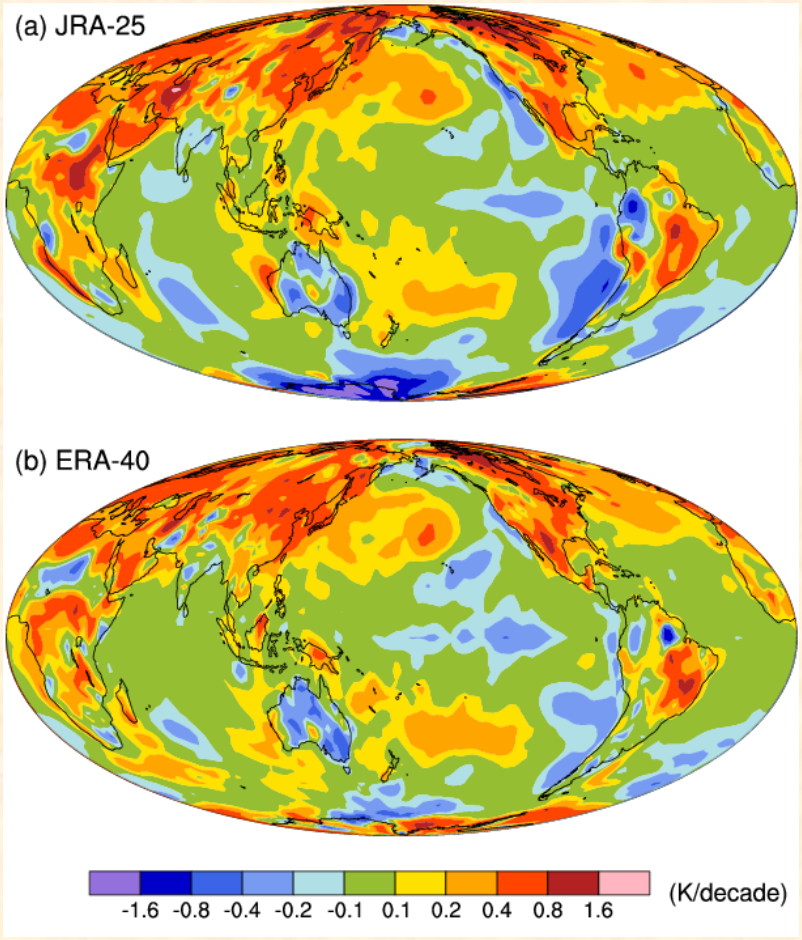
JRA-25 and ERA-40



Global Temperature Anomaly

JRA-25, ERA-40, CRU(Jones)

Top : monthly mean, Bottom : 5-year moving avarage

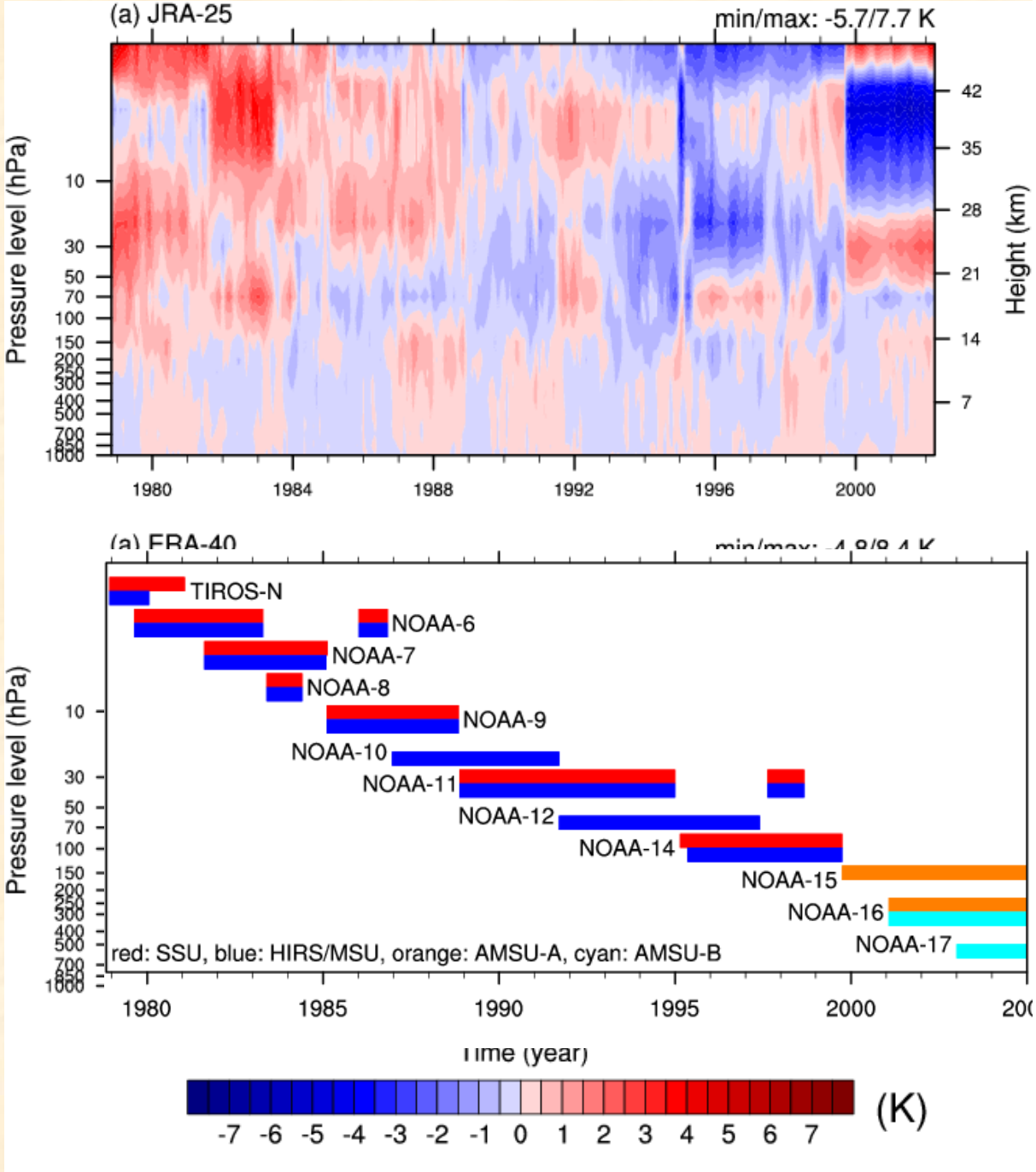


Distribution of tendency (K/decade)

Courtesy: J. Tsutsui

Global Temperature Anomaly

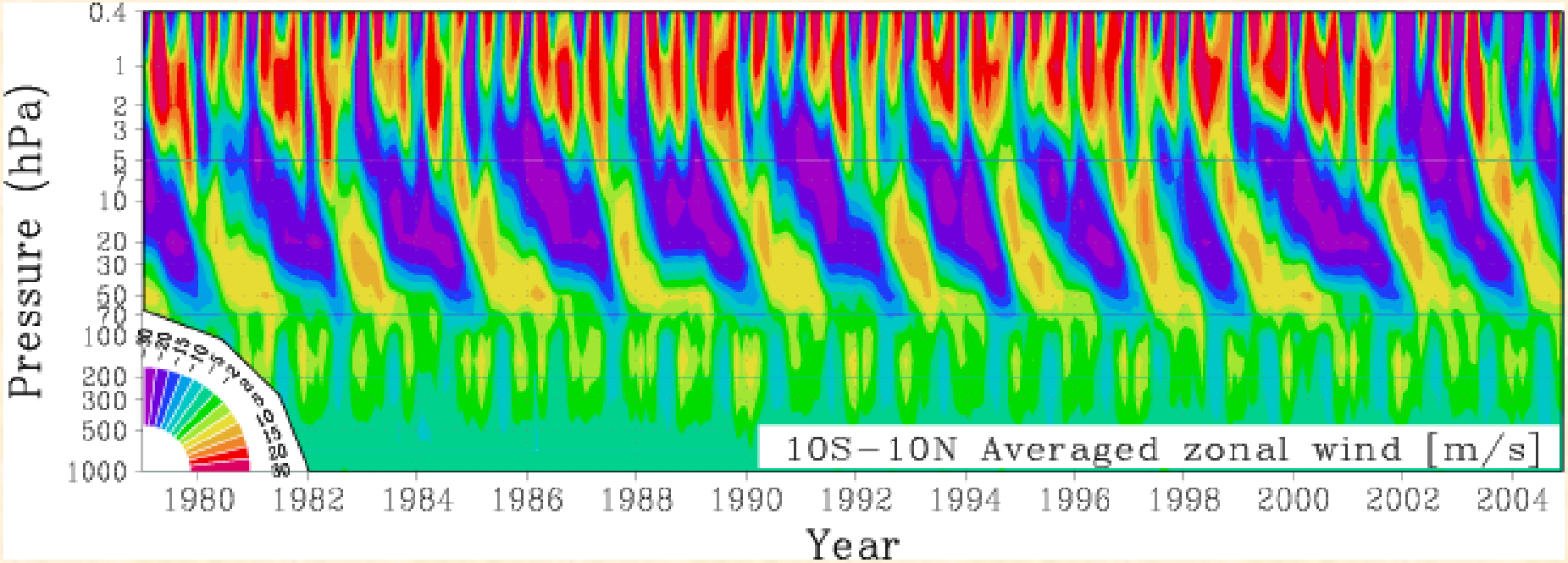
Anomaly from averaged temperature of each level for each reanalysis



Courtesy: J. Tsutsui and M. Sakamoto

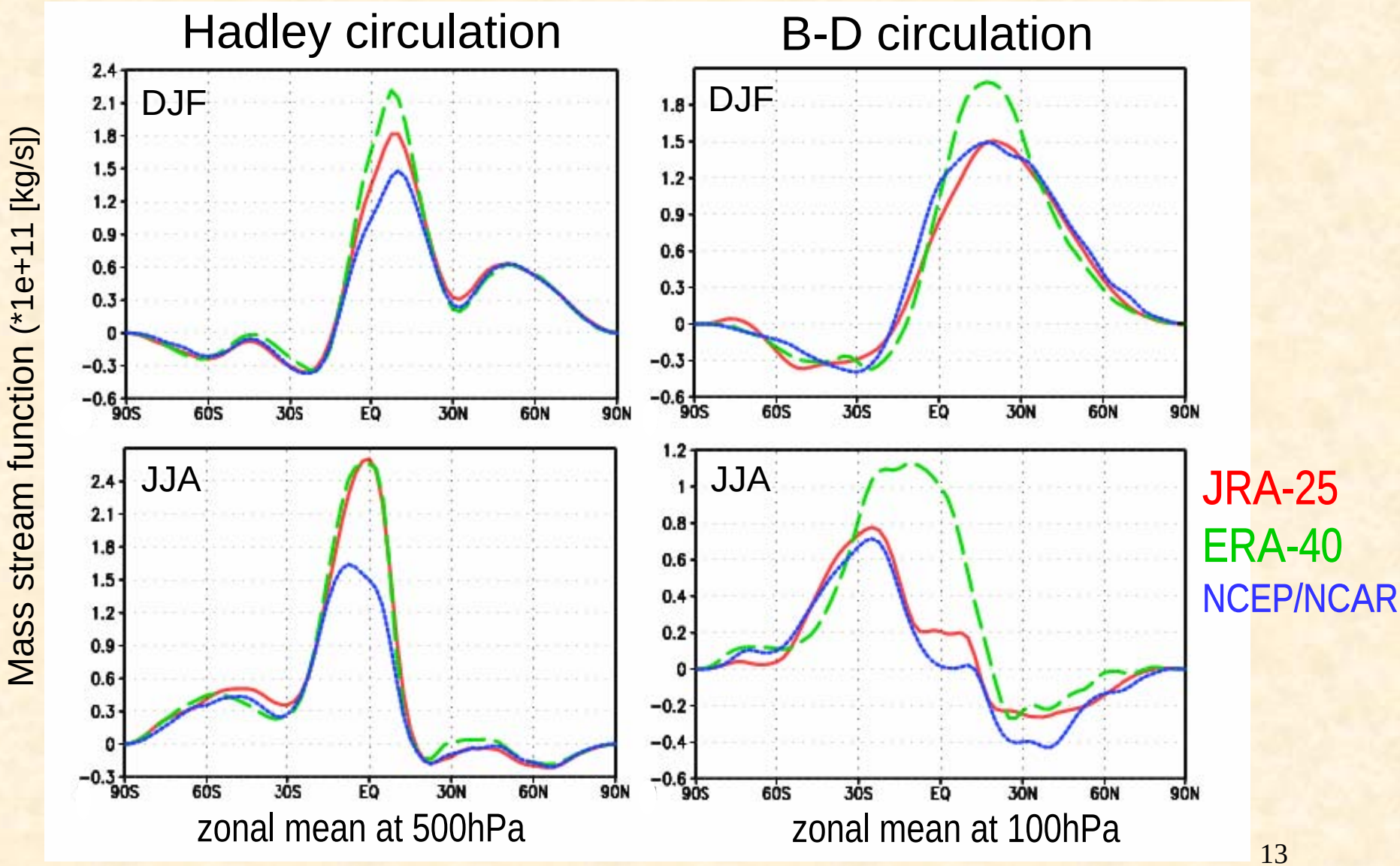
QBO and SAO

10S-10N averaged zonal wind cross section



Courtesy: H. Hatsushika

Meridional circulation



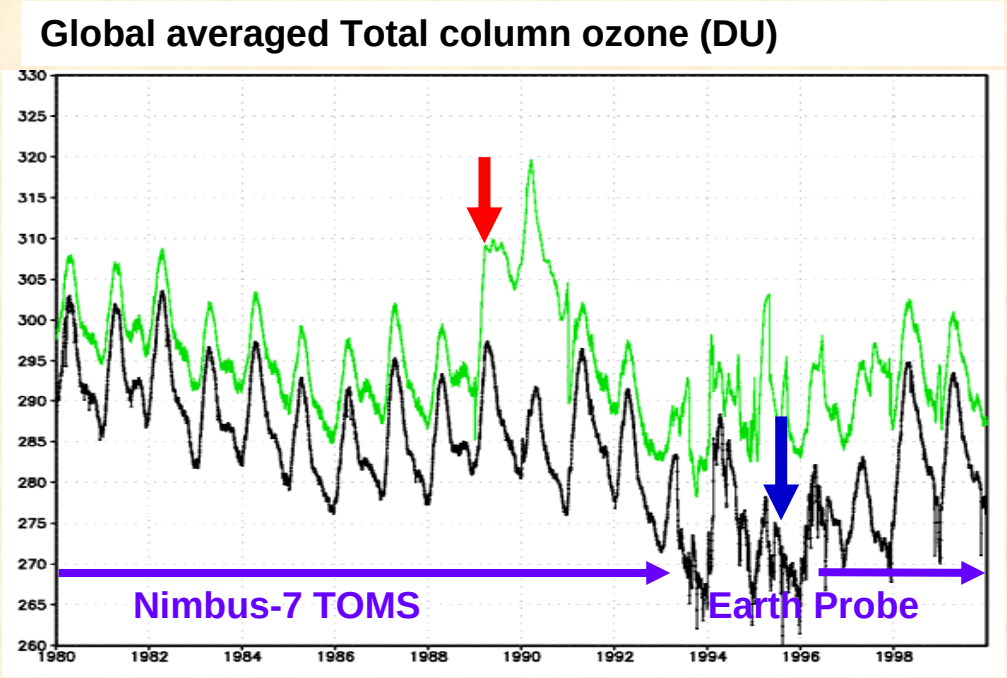
Courtesy: H. Hamada & T. Iwasaki (Tohoku Univ.)

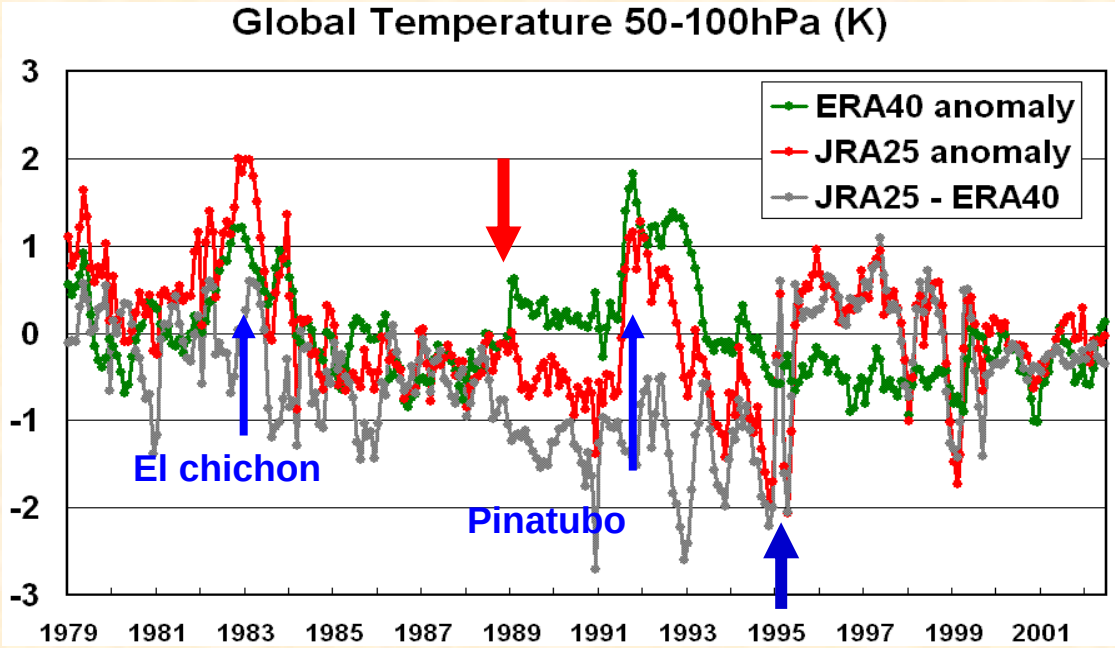
Comparison of ozone and temperature of JRA-25 and ERA-40

Ozone density is dominant for climate in the stratosphere.

Sudden increase from 1989 to 1991 in ERA-40

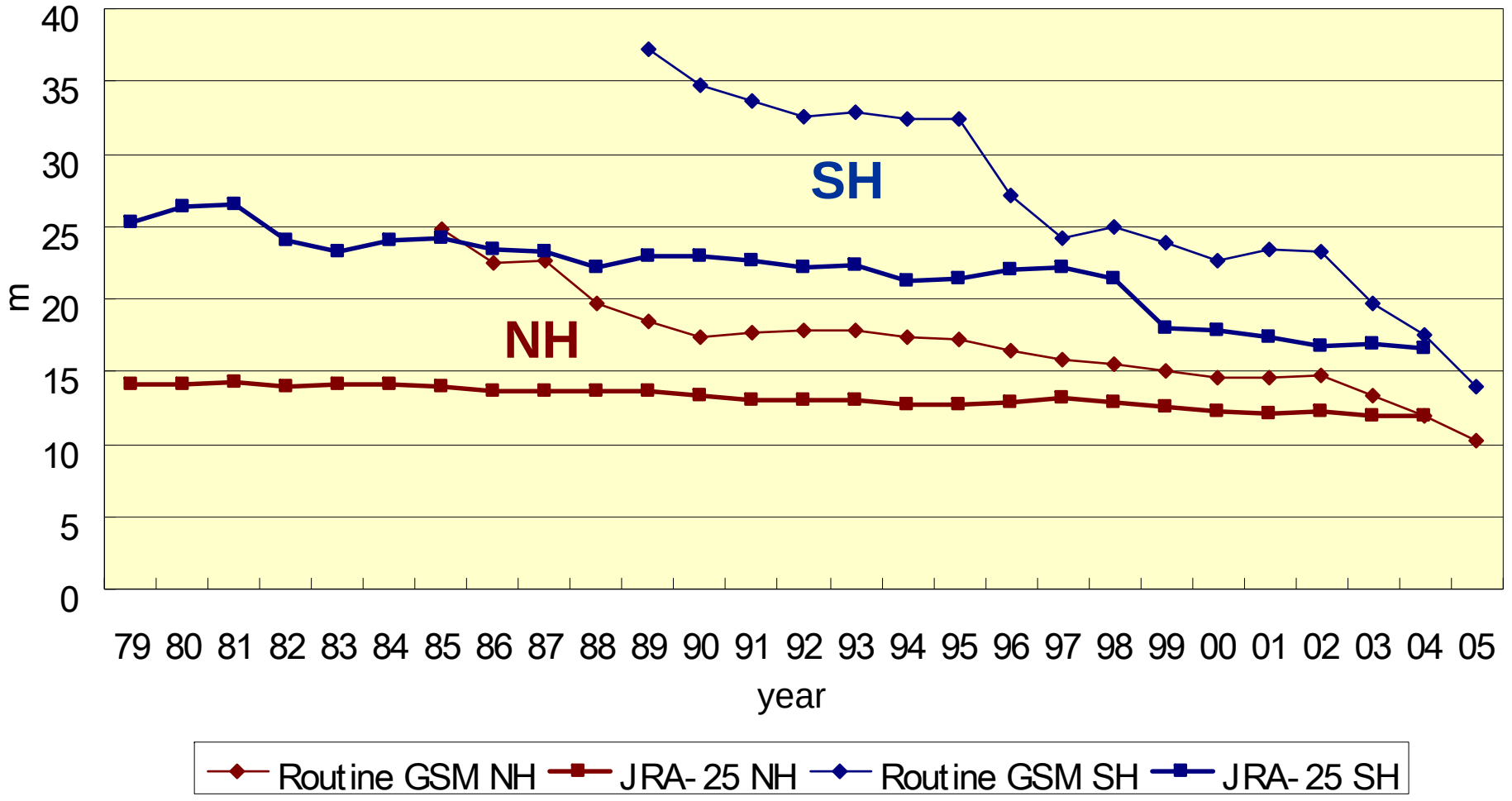
Ozone in JRA-25 is unstable for the period without TOMS data from May 1993 to July 1996





Courtesy: M. Sakamoto

Forecast Score (Z500 FT=24 RMSE)

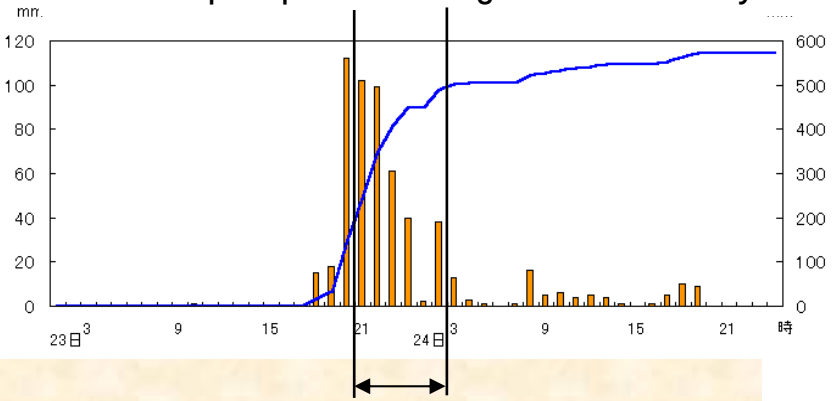


Heavy Rain event
- Nagasaki Gou -
1982. 7.24. 03JST

Surface Weather Chart

Synoptic fields are properly analyzed, while resolution is not sufficient.

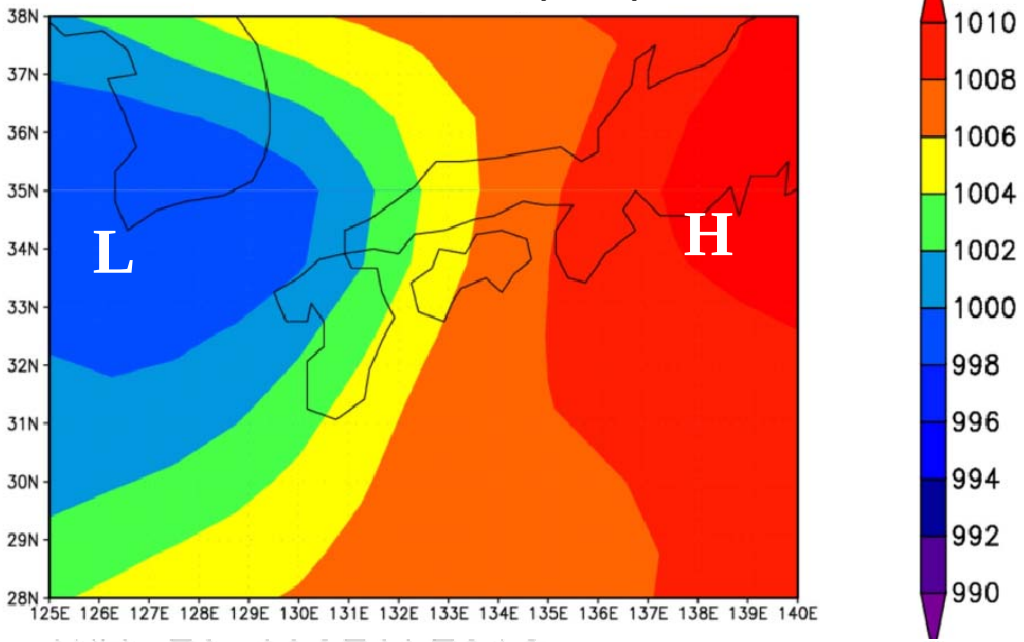
Observed precipitation at Nagasaki observatory



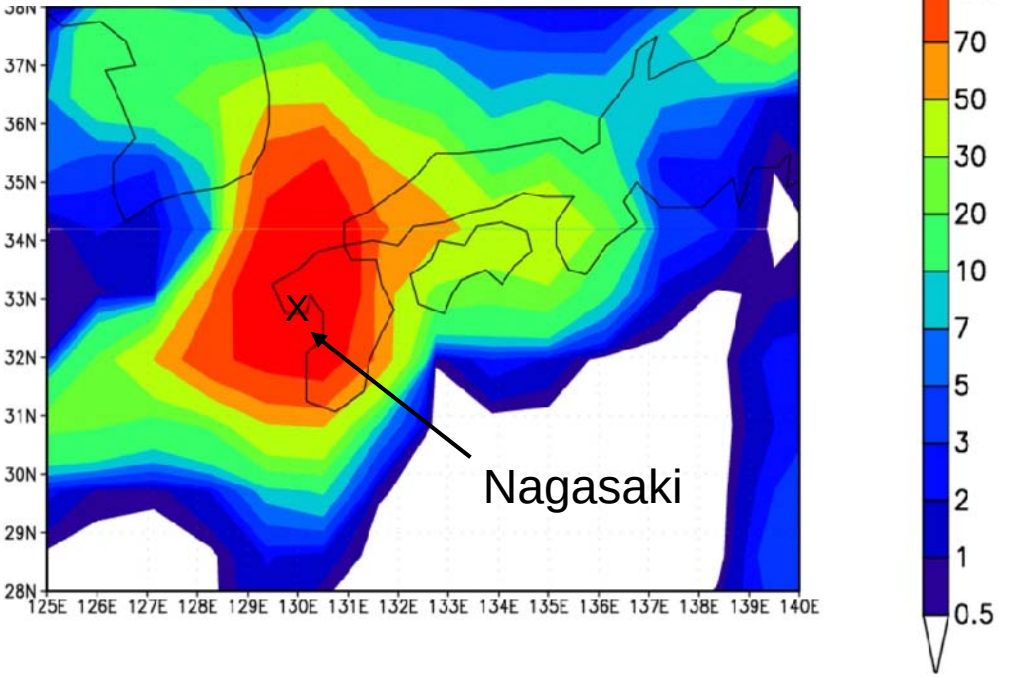
hourly precip. total precip.

299 persons died.

JRA-25 MSLP (hPa)



JRA-25 6hour precip. (232100 - 240300JST) (unit:mm/day)



Application of JRA-25 for operation and research

Extreme Event / Seasonal Forecast

Monitoring worldwide extreme events and climate system

Atmospheric, terrestrial and oceanic initial and verification data for seasonal prediction model, El Nino prediction model

Forcing data for ocean models

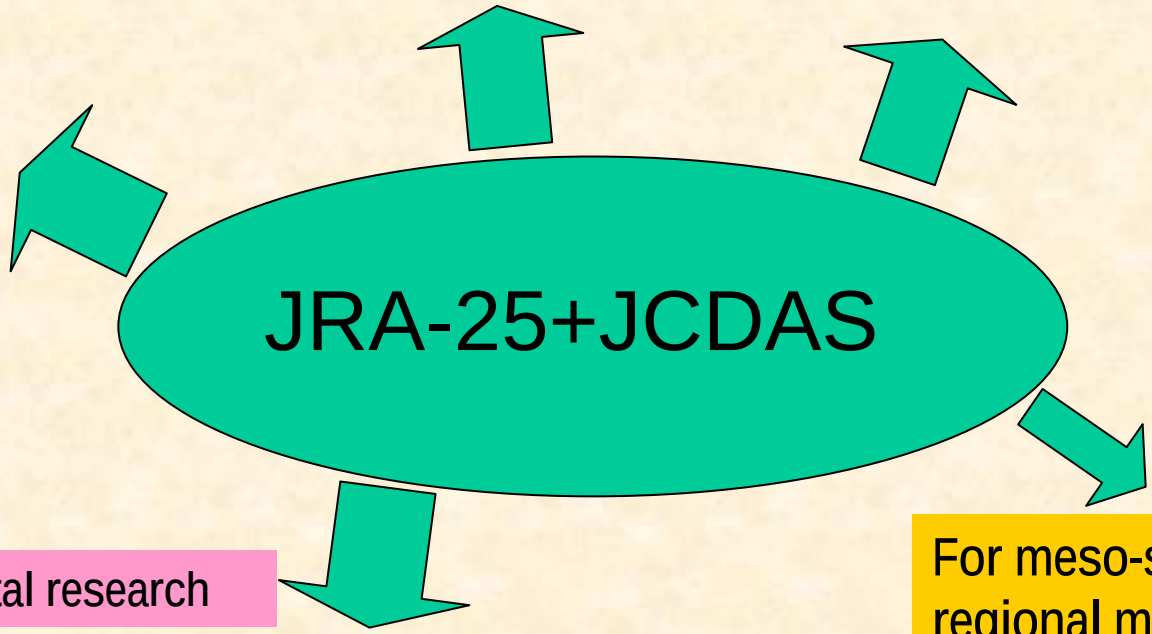
Earth Environment

Carbon cycle, reference data for ozone analysis

Forcing data for a chemical transport model

Climate information

- Time series of a point
- JRA-25 Atlas



Climate and environmental research

Extreme events, climate change, development and improvement of seasonal prediction model

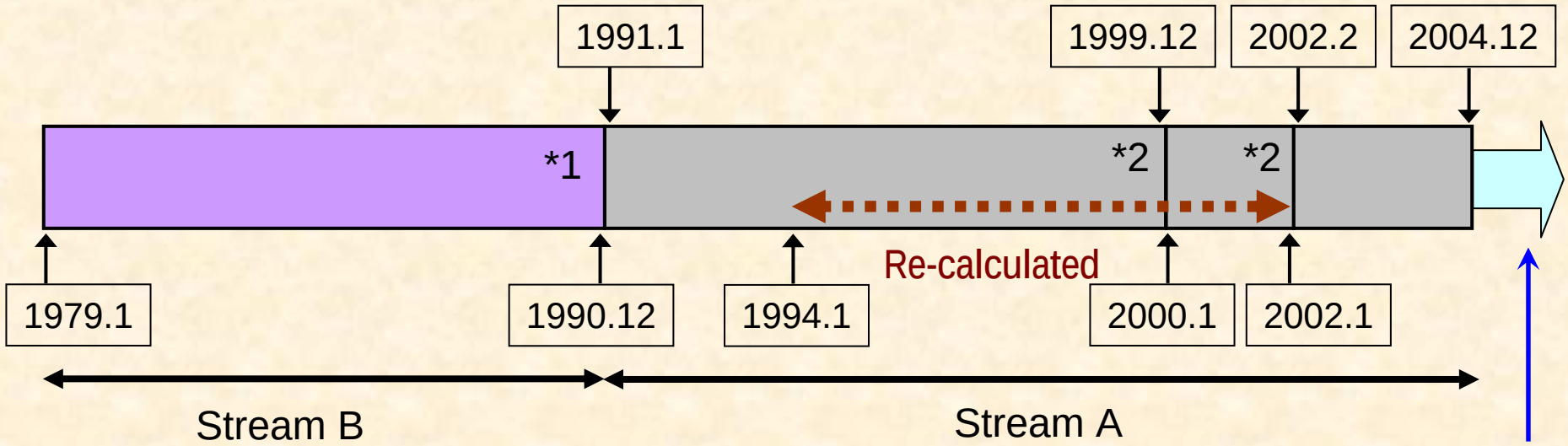
Analysis of Energy and water cycle, for any research

For meso-scale regional models

To provide proper initial and boundary data to perform numerical experiments for severe events in the past.

JRA-25 & JCDAS data are available for research use via internet.

JRA-25 Final Streams



*1:discontinuities
*2:small discontinuities

JRA-25 is transitioned to JMA-CDAS (JCDAS) for after 2005.

Re-calculation

1994.1 to 1999.12 : Large number of low quality GMS-AMV data were unexpectedly assimilated.

2000.1 to 2002.1 : TCR data were not assimilated due to Y2K problem. (Lower quality of TC analysis)

1982.1, 1992.1,2 and 11 : no TCR data were given around the date line (with little influence) .

Supplying data for the evaluation group is going to be terminated.
Data from 1994.1 to 2002.1 and of the 4 months are replaced in the JRA-25 official data.

Reminder to use JRA-25 data

- Discontinuity at the stream change from STB to STA (1990.12 to 1991.1)
  - Temperature and height above 200hPa, specific humidity above 150hPa, soil wetness, snow depth, ….
- Surface parameters except pressure were assimilated with 2D-OI, separately from 3D-Var for upper air. Hence, inconsistency between the parameters can exist.
- Jumps in time series (temperature …) are often found mainly in the stratosphere due to changes of satellites in the biased model background.
- Snow depth in Siberia is less before the winter 1981-82 than after, because part of SYNOP snow data were not assimilated by mistake.
- Problem of the land surface process:

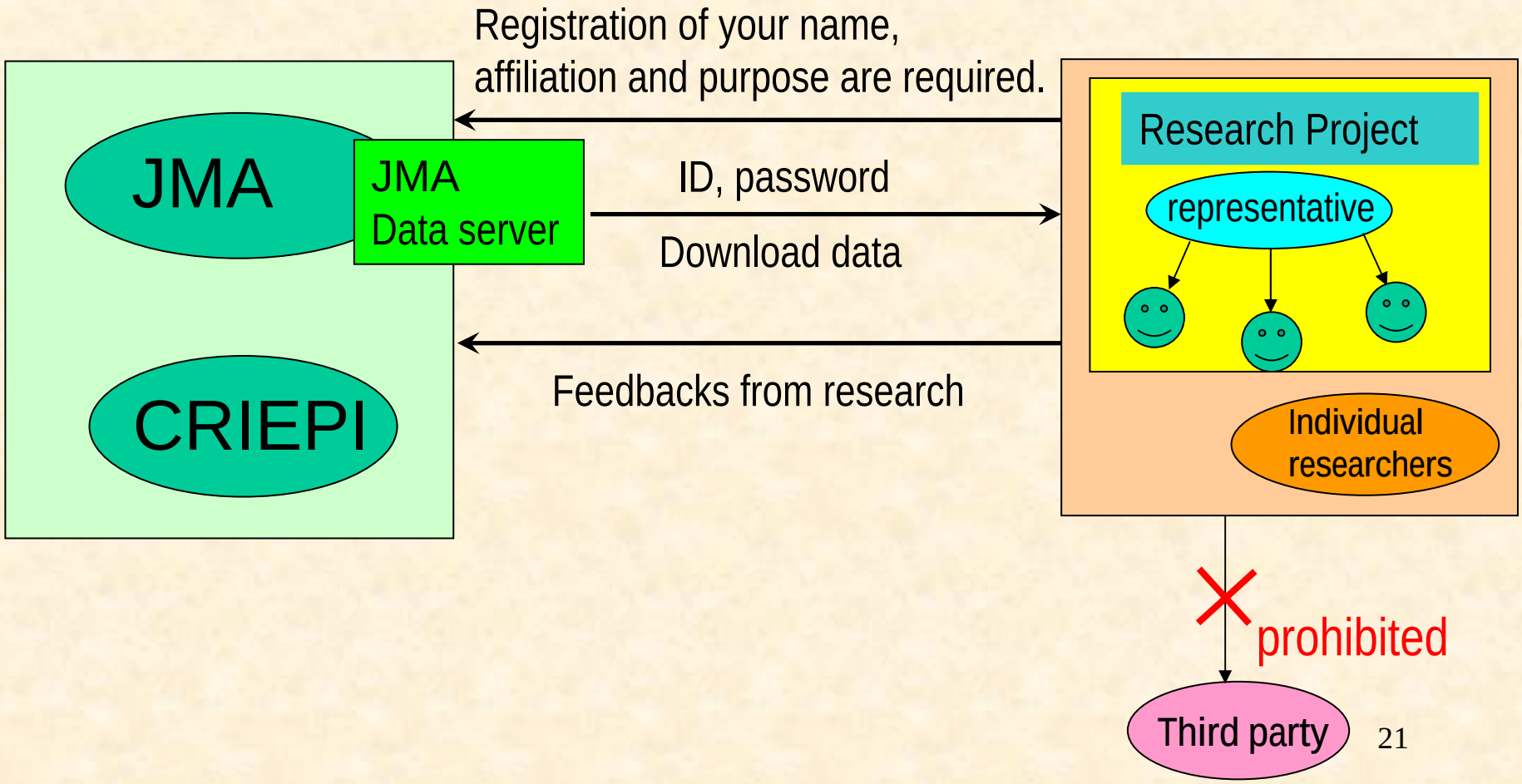
  less precipitation in Amazon basin than the other reanalyses.

JRA-25 official data

- Data from 1979 to 2004
- Under construction (to be released in July)
- Replacement of the evaluation data which were supplied to the members of “JRA-25 evaluation group” for the project period.
- Data for the re-calculated period are replaced.
- The official data is going to be supplied from a new JMA data server.
- JMA-CDAS (JCDAS) data will be released after the release of the JRA-25 official data.

JRA-25 data available via internet

For research use only



JRA-25 paper / report

- **The JRA-25 Reanalysis**

  Submitted to **JMSJ** (Journal of Meteorological Society of Japan)

  K. Onogi, J. Tsusui, H. Koide, M. Sakamoto, S. Kobayashi, H. Hatsushika, T. Matsumoto, N. Yamazaki, H. Kamahori, K. Takahashi, S. Kadokura, K. Wada, K. Kato, R. Oyama, T. Ose, N. Mannoji and R. Taira

- JRA-25 : Japanese 25-year Reanalysis

  – progress and status –

  Onogi et al., QJRMS special issue of the WMO 4th DA workshop (April 2005), in press

Next reanalysis plan

After full verification of JRA-25 and developments

- To detect exact changes of observations with using JMA's feedback data (CDA).
- Detailed evaluation of model features (bias etc..)
- Development for assimilation of past satellite data
- Estimation and examination of possibilities to introduce new developments

Provisional plan (not determined yet)

- JRA-50 (1958 to 2010) ?
- Start from late 2008?
- 4DVAR, TL319L60, VarQC, VarBC?
- Refined blacklists
- Change of greenhouse gases should be taken into account (adaptable physical schemes required)

VarBC

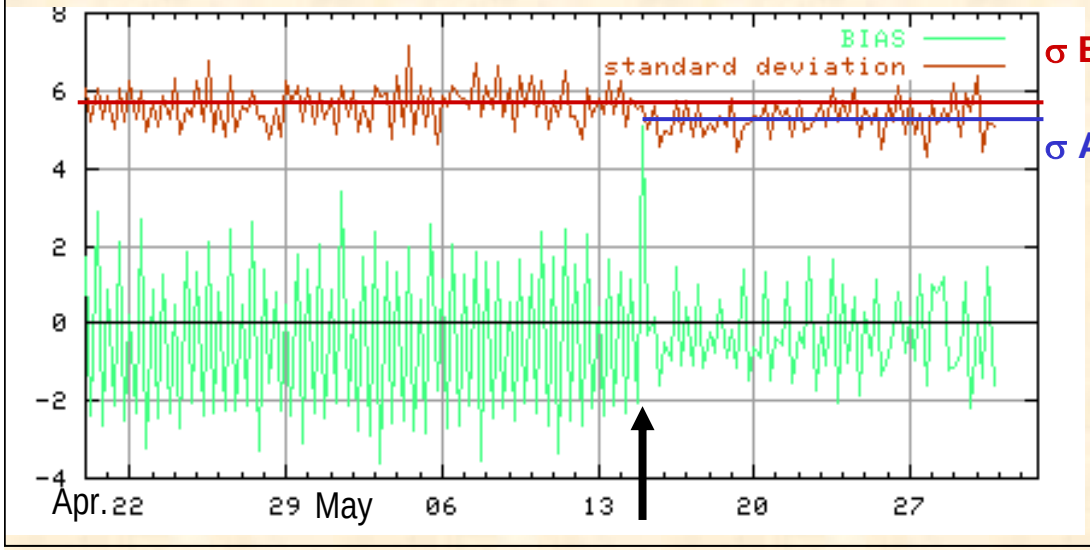
Variational Bias Correction (VarBC) was implemented to the JMA operational Global 4D-var on 15th May 2006.

Predictor	Sensor		
	AMSU-A	AMSU-B	MWRT
Ingegrated Weighted Lapse Rate	O		
Total Column Precipitable Water		O	O
Surfece Temp	O	O	O
Surface Temp ** 2	O	O	O
Surface Wind Speed	O	O	O
1 / cos (Satellite Zenith Angle)	O	O	O
Constant (1)	O	O	O

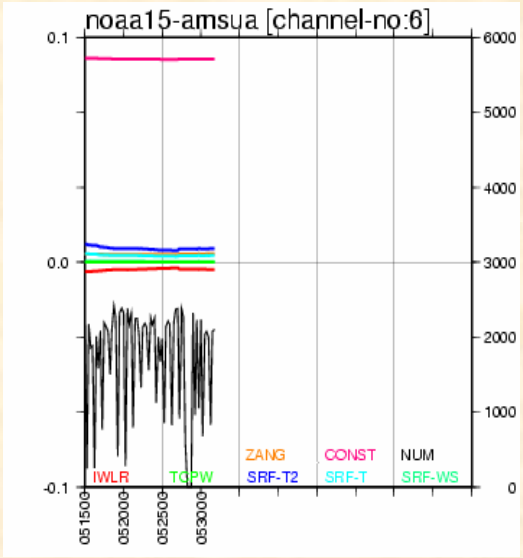
MWRT: SSM/I, TMI, AMSR-E

The averaged increment jumped in the first analysis, after then, amplitude got smaller than before.

Analysis Increment Sequence of Z250

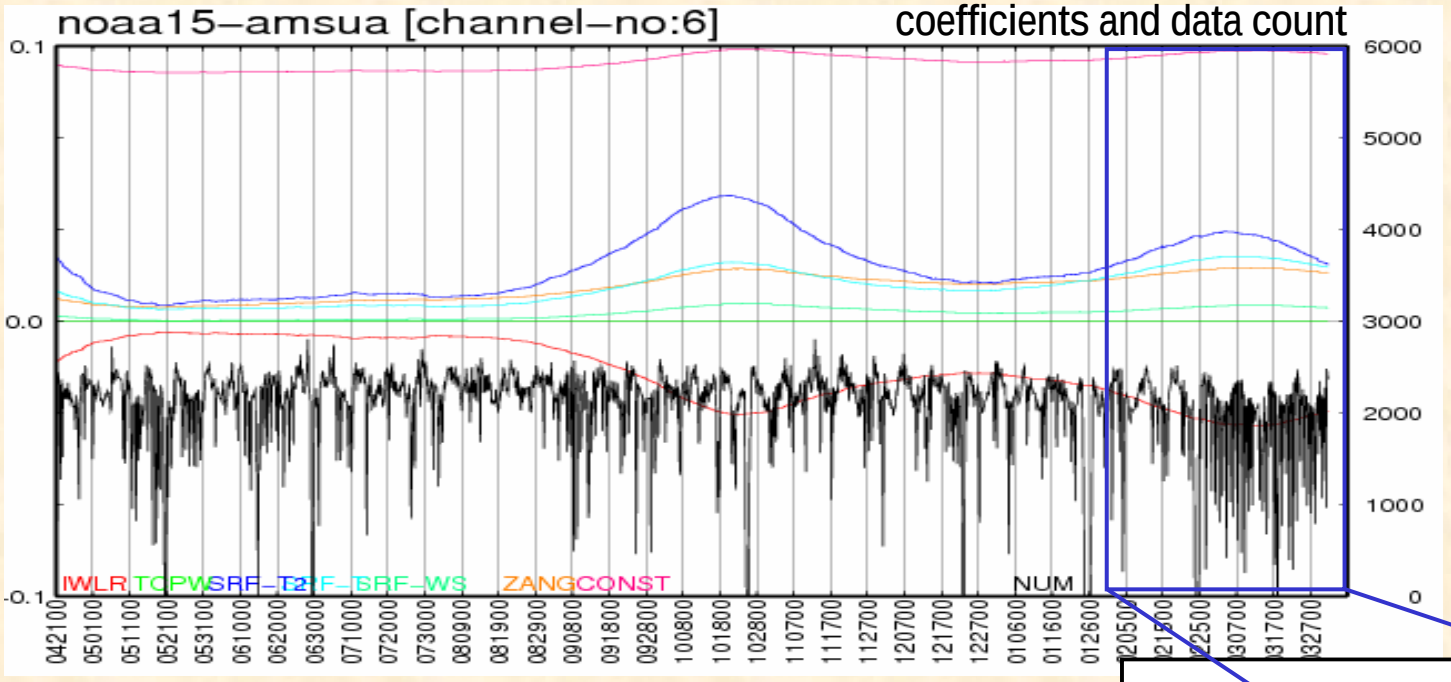


The VarBC coefficients are almost stable on AMSU-A



VarBC implemented

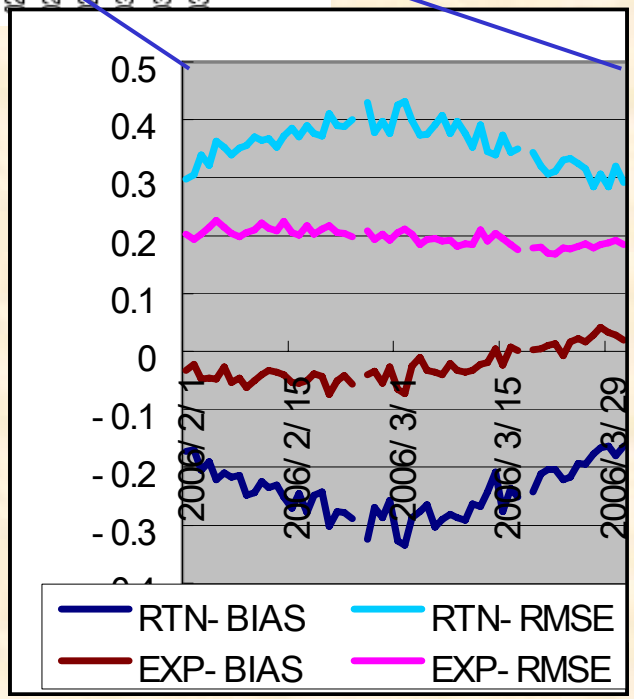
Courtesy : Yoshiaki Sato



2005.4
- 2006.3

VarBC one-year OSE

The right panel shows sequences of the TB BIAS and RMSE of Rtn (w/o VarBC) and Exp (with VarBC) against each first guess.
Rtn shows larger variation of BIAS and RMSE than Exp in this period.
The VarBC worked well to absorb the change of TB data performance.



Courtesy : Yoshiaki Sato

Announcement

The 3rd WCRP Reanalysis Conference

To be held in Tokyo in autumn 2007