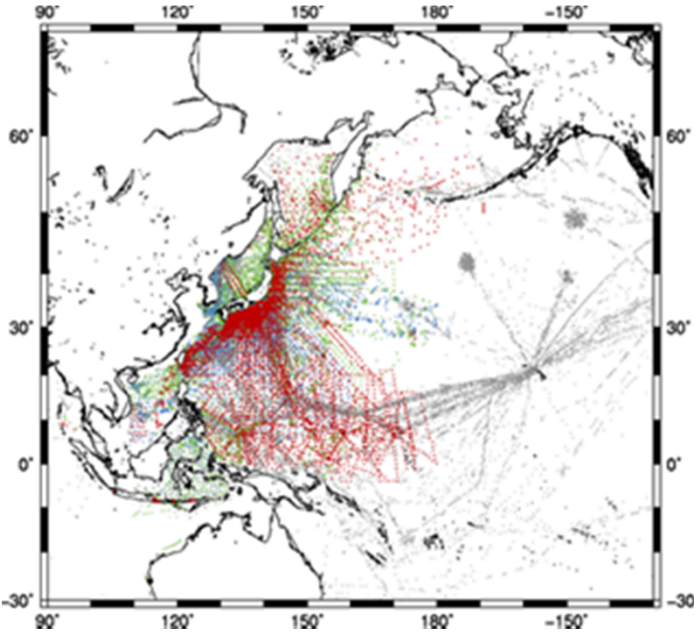
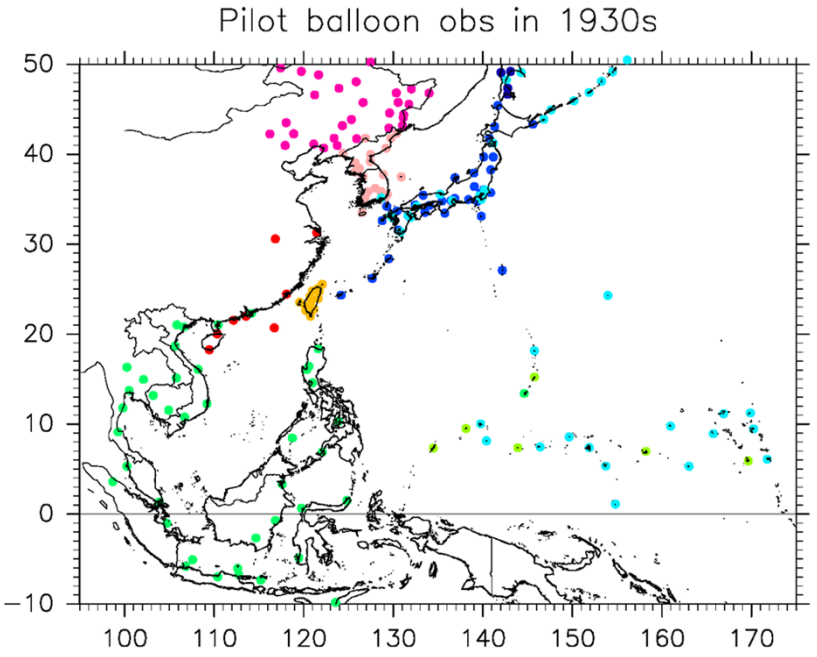
Japanese Data Rescue Activities and Related Topics

ISHII, M (MRI/JMA)

Data Rescue in Japan



Maritime observations of Japanese Imperial Navy (1903-1944) by MRI



balloon observation during 1920s-1940s, by Univ. Tokyo and MRI

Meteorological Surface Observations at Lighthouses (1877-1953) by Teikyo Univ. and Seikei Univ.)

- The Environment Research and Technology Development Fund by the Ministry of Environment (MRI/JMA)
- Program for Risk Information on Climate Change (SOUSEI) 2012-2016 (Univ. of Tokyo)
- Grant-in-Aid for Scientific Research (KAKENHI) by Japan Society for the Promotion of Science (Tokyo Metropolitan Univ.)

X_{BT} Japan

IQuOD

MRI, MIRC, JAMSTEC, Tohoku Univ, JMA, JODC,
TSK, Univ. of Tokyo, NRIFS/FRA, Kochi Univ.

Working Group for Recompilation of Historical XBT Database (2012~)
of Subgroups of Experts
for Ocean Data and Information (Chair: Prof. Michida) &
for Ocean Observation and Climate Change (Chair: Prof. Suga)
under the Japan Group of Experts to Advance IOC Programs

Financially supported by the Ministry of Environment:
The Environment Research and Technology Development Fund [2-1506]

環境省
Ministry of the Environment
http://www.env.go.jp/en

ERTDF【2-1506】
Improving Database of Historical Ocean Subsurface Temperature Observations and its Climatological Evaluation

Recompiling oceanographic database for monitoring Global Warming with high accuracy and providing them to users in various climate-related studies incl. environmental issues.

RT-1
Analysis and Application to Climate studies

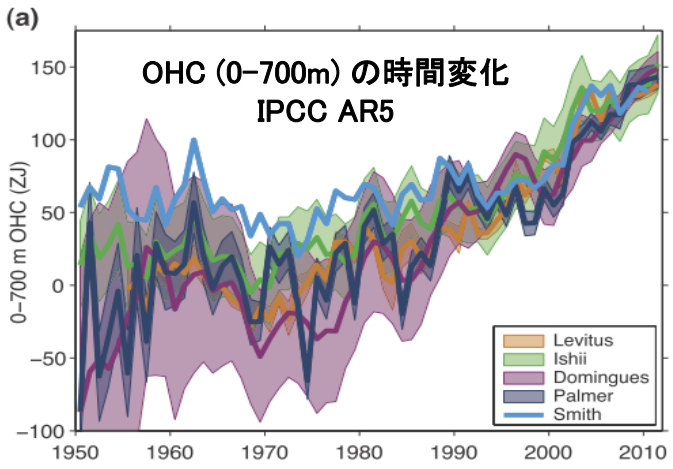
JMA, NRIFS/FRA, Tohoku Univ., MSA

RT-2
Recompilation of Database and quality evaluation

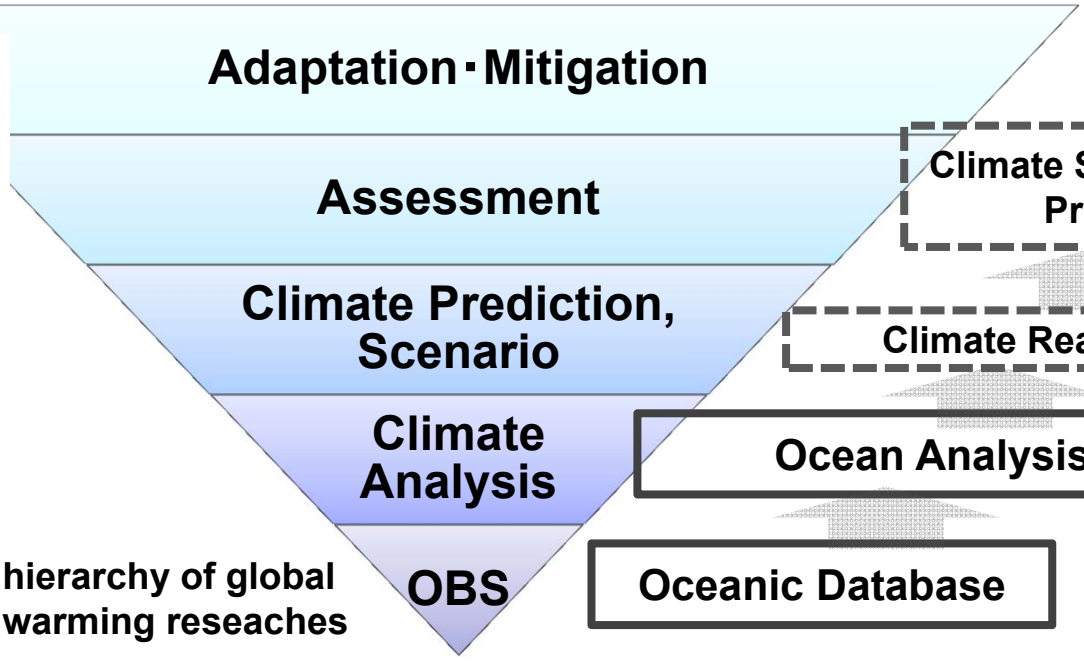
NRIFS/FRA, Tohoku Univ., TSK, MSA, JMA, Others

RT-3
Use and Improvement of Ocean Database

MSA, MIRC, JODC, JMA



Reduce the uncertainty in OHC estimation for the next IPCC.



hierarchy of global warming reseaches

By other domestic research program

Climate Simulation and Prediction

Climate Reanalysis

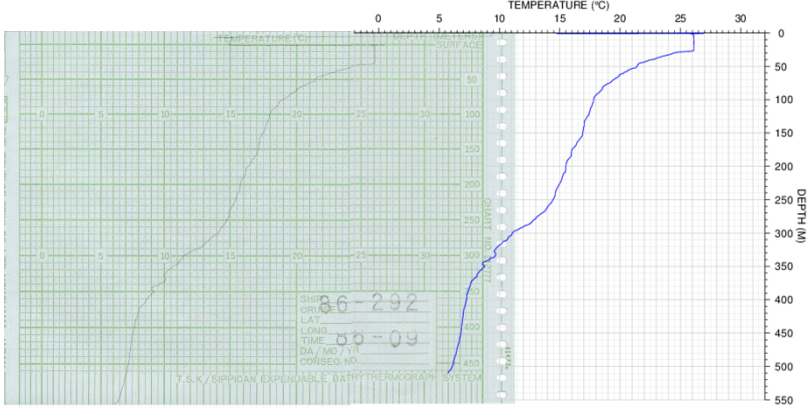
Ocean Analysis

Oceanic Database

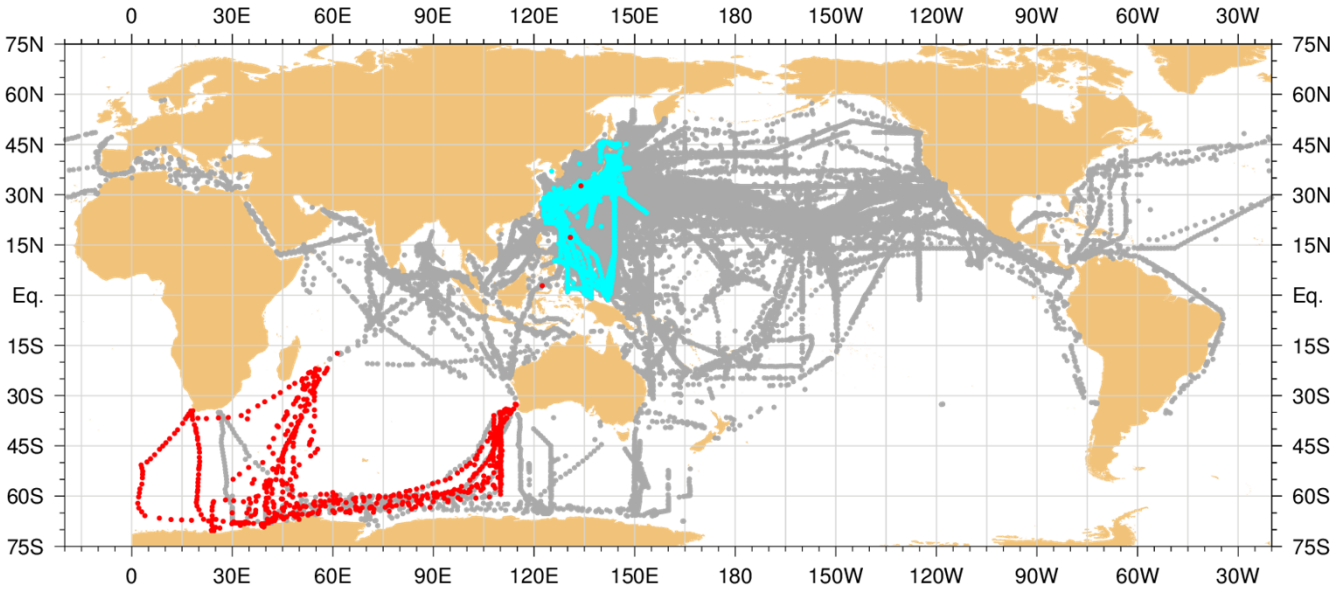
By this study

RT-2: Recompilation of Database and quality evaluation

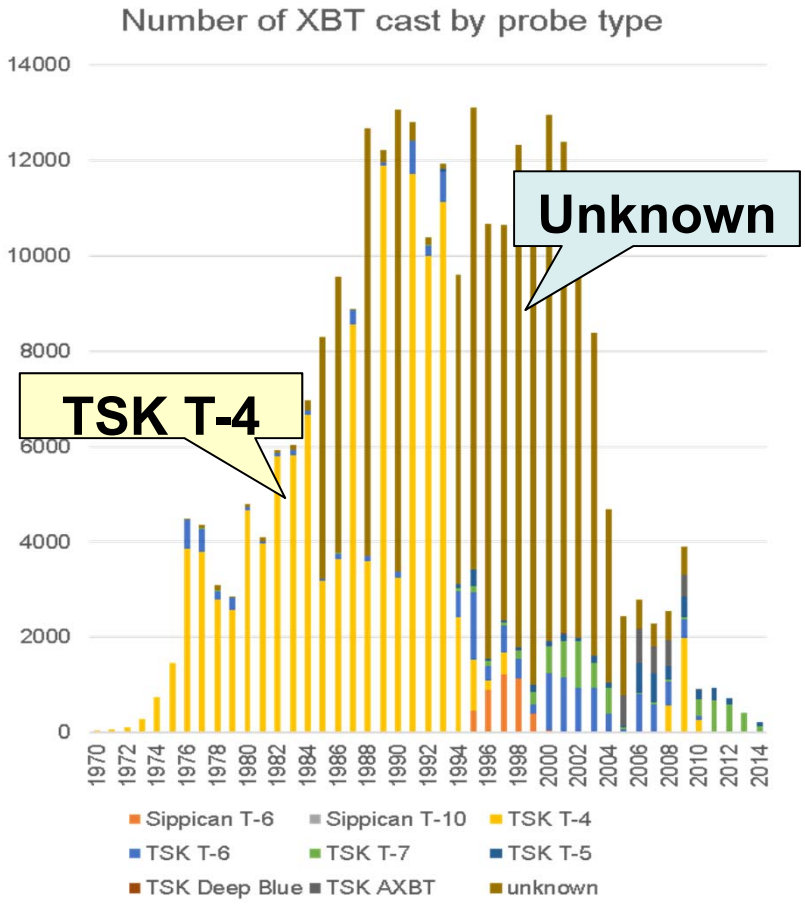
- Digitizing XBT data of 1-meter pitch from record on graph paper
- Collecting XBT meta data (probe & recorder types, release height, and etc)
- Quality control for all temperature observations



XBT data digitization (4189 points)



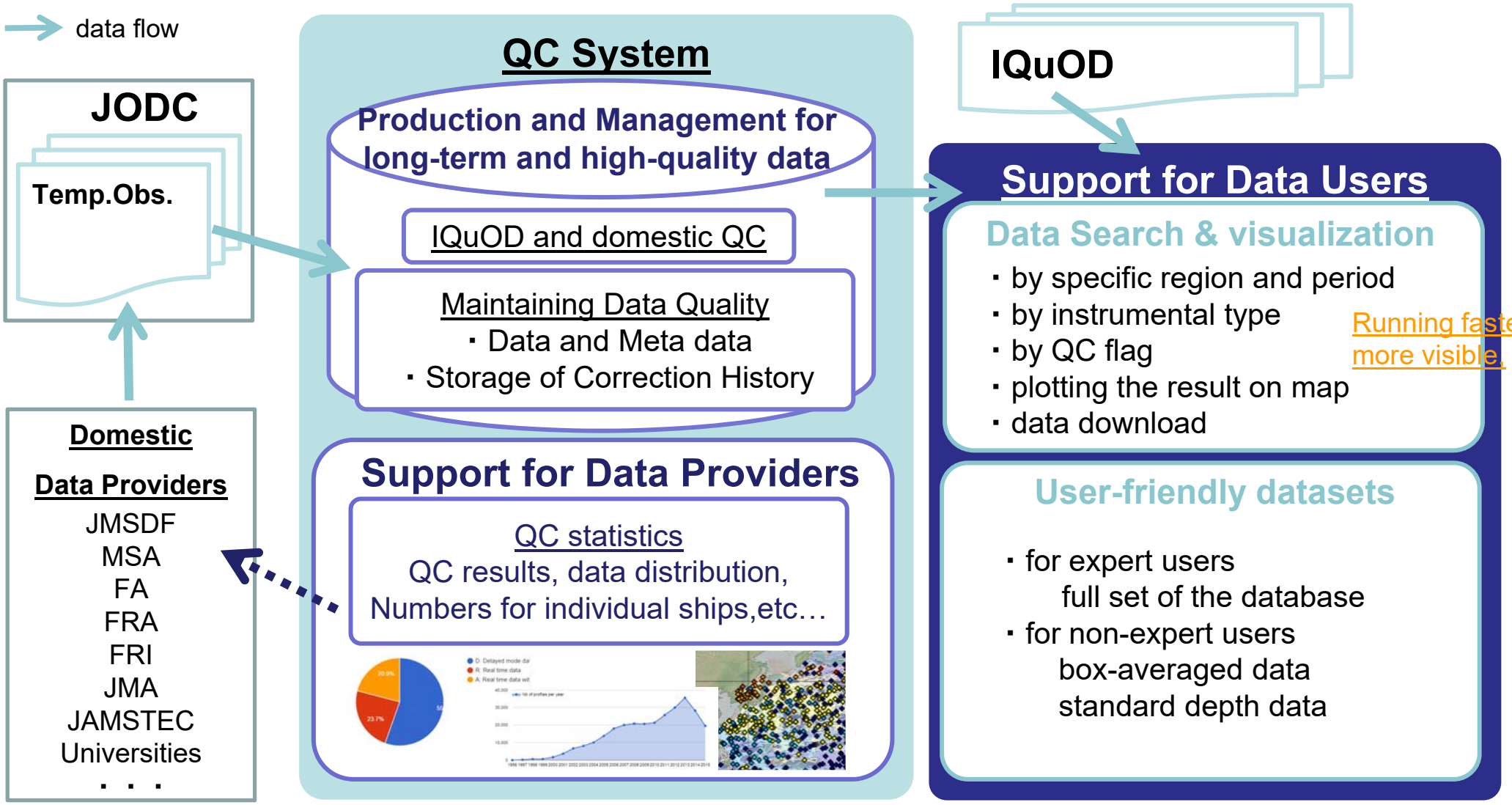
XBT Data distribution (**ALL in JODC**, **Digitized this time**、**Rescued and Digitized** (Icebreakers FUJI & SHIRASE 1976-1985)



Annual number of XBT probe type

RT-3: Use and Improvement of Ocean Database

Constructing systems for quality control and for supporting data users and data providers, collaborating with JODC.

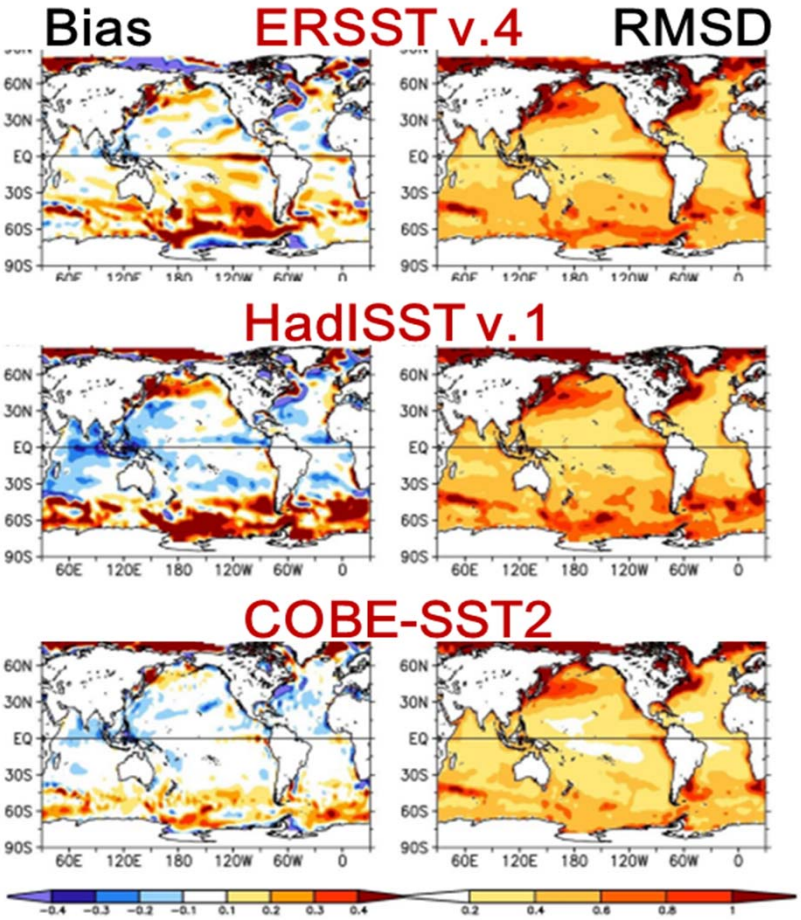


Keeping quality of future observed data high by the QC system and communication among data users, providers, and mangers.

RT-1: Analysis and Application to Climate studies

- Updating the ocean analysis for smaller uncertainty and for longer time series.
- Introducing the new approach used in SST analysis COBE-SST2 (Hirahara et al. 2014)
- Understanding long-term oceanic variations around Japan, and impacts on climate predictions.

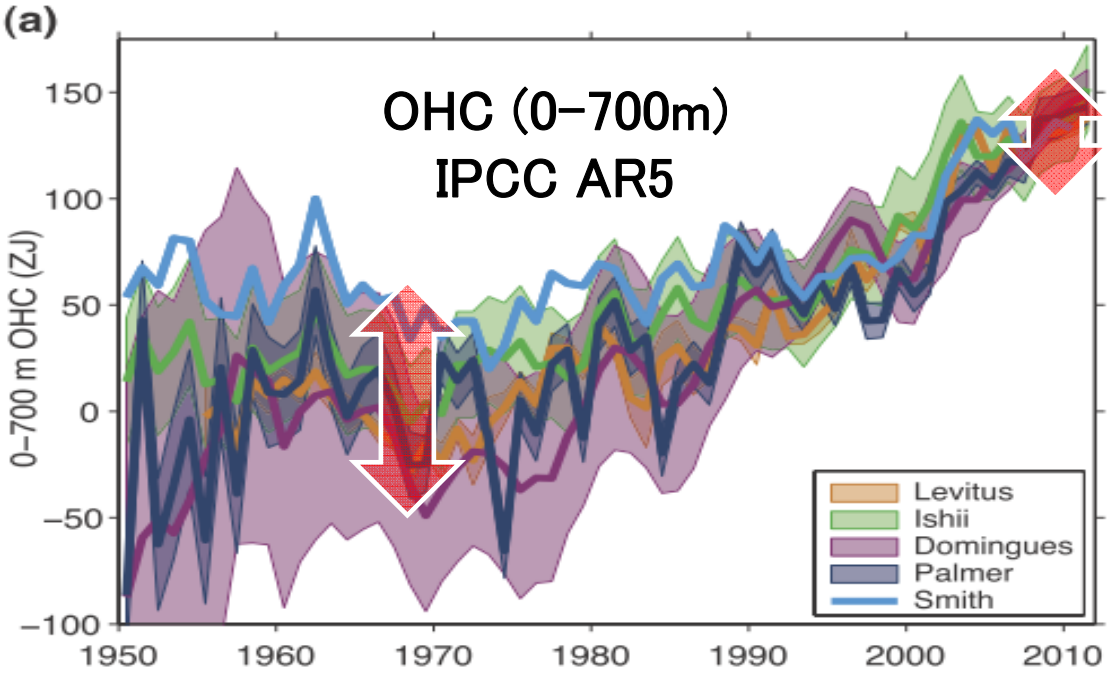
COBE-SST2 (1850～)



(Huang et al. 2015)

With more data by use of a new version of ICOADS

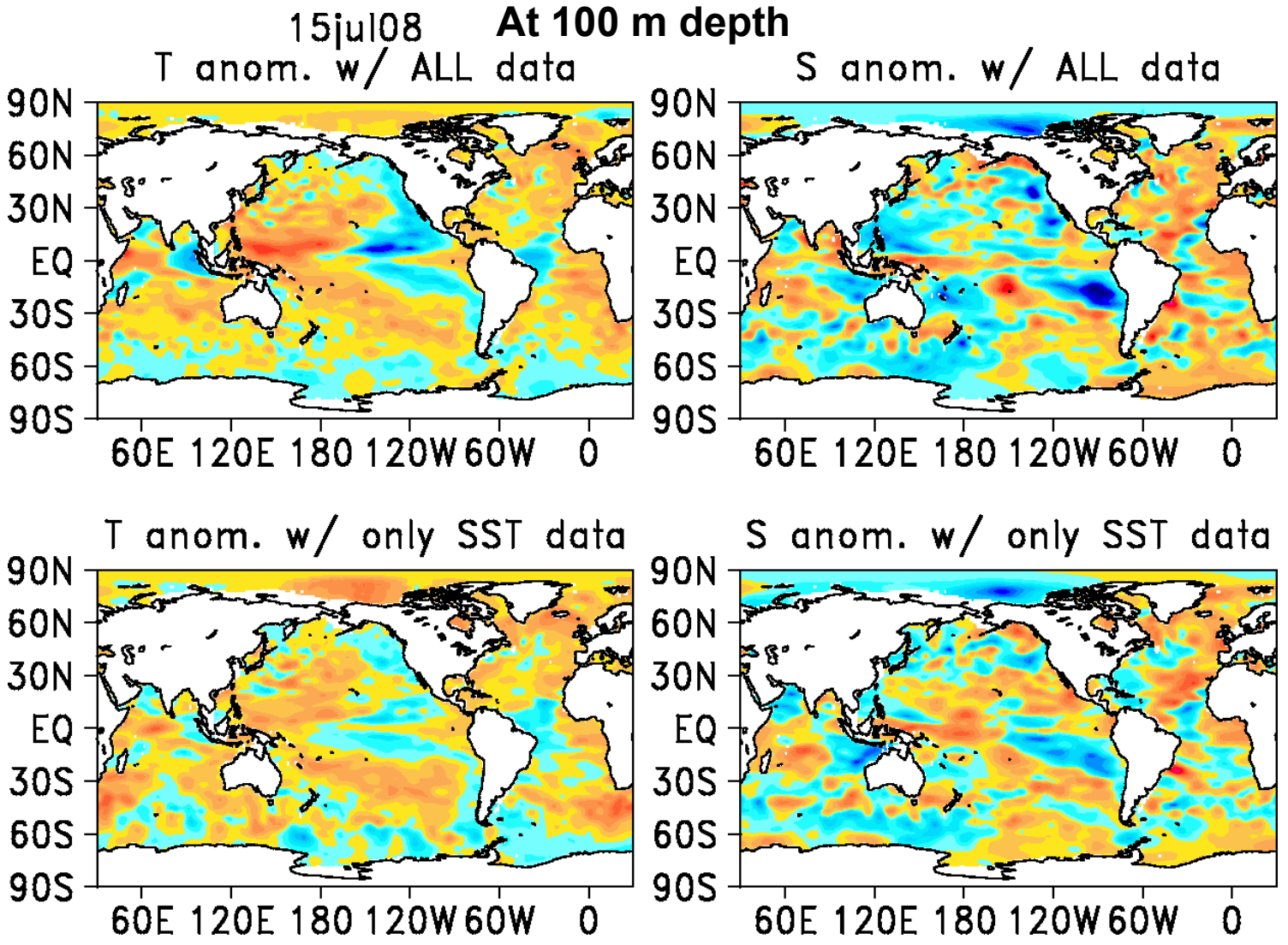
Ocean Subsurface T and S analysis (1950～)



With more accurate data by use of IQuOD

New Ocean T and S analysis

Trend + reconstructed Interannual–Interdecadal + pentad–daily

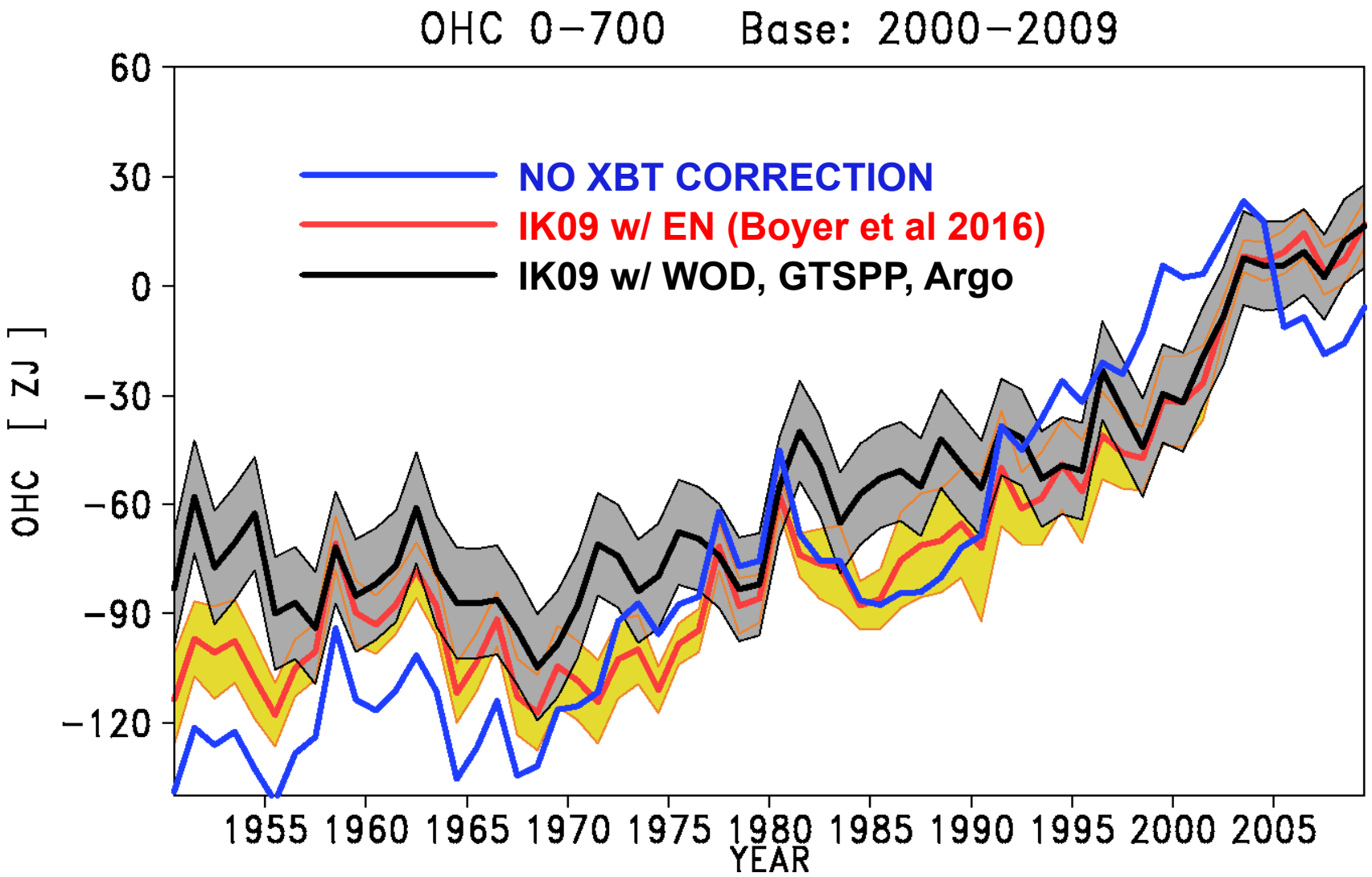


with All Obs

with SST Obs only

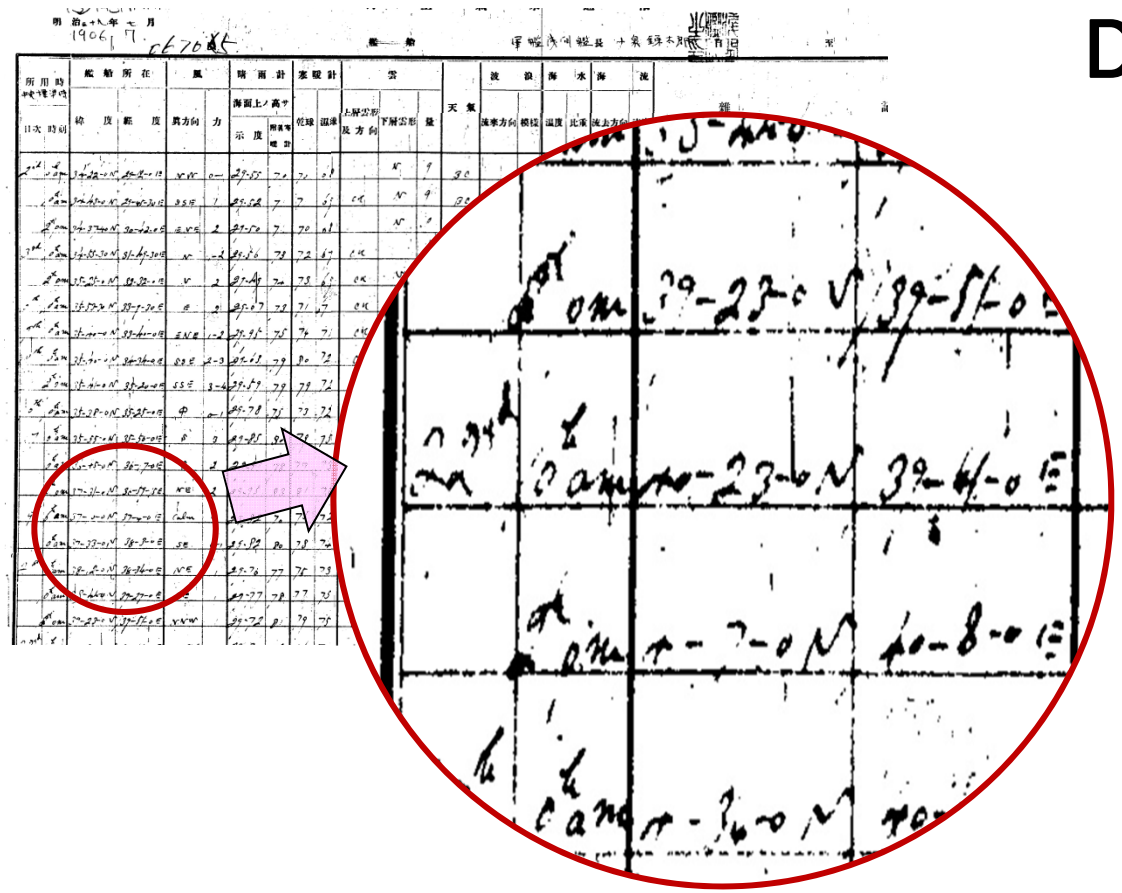
Ishii and Fukuda (2016, in prep)

IQuOD really necessary…



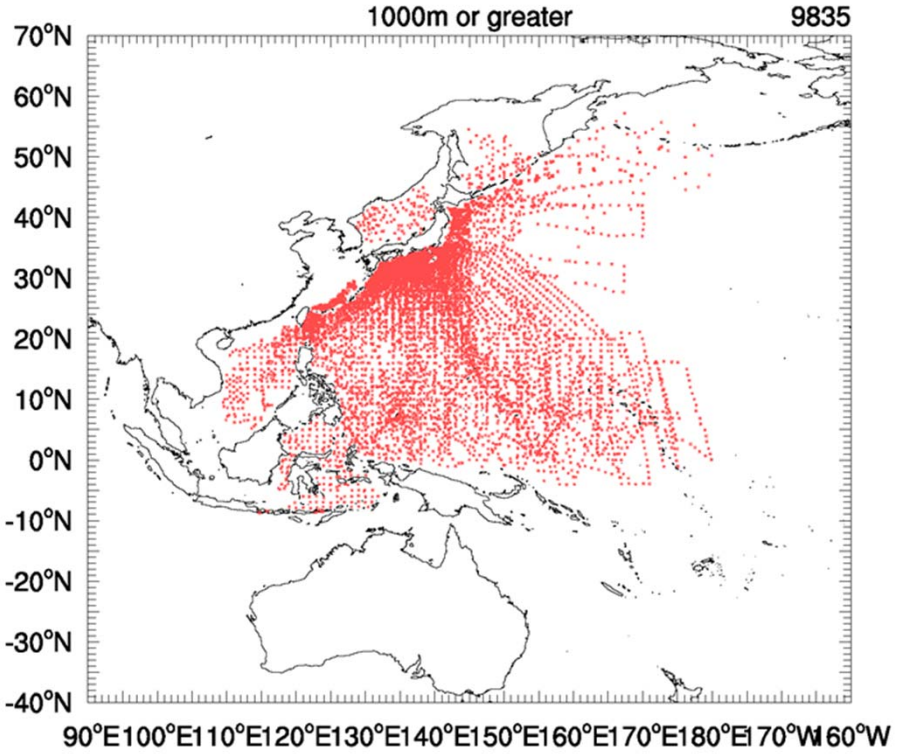
The objective analysis/mapping method is the same among the individual time series, but the observational databases are different between black and red. Shading indicates one sigma errors. The selection of observational database influences largely on the OHC estimation.

Data rescue and utilization of Observations before WW-II



SST and Marine-Meteorological Observations by Japanese Imperial Navy (1903-1944, ～1M)

30 % digitized in FY 2015



Ocean temperature observations (navy and fishery) available at depth greater than 1000m (1920～1945). The observational background is poorly known (Kizu 2015)

Data Rescue and 150-year Coupled Climate Reanalysis

International Data Rescue

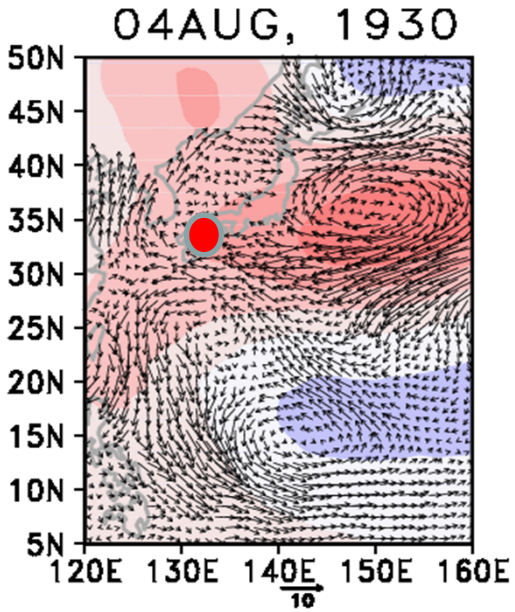
ACRE: Atmospheric Circulation Reconstructions over the Earth

ICA&D: International Climate Assessment & Dataset (WMO)

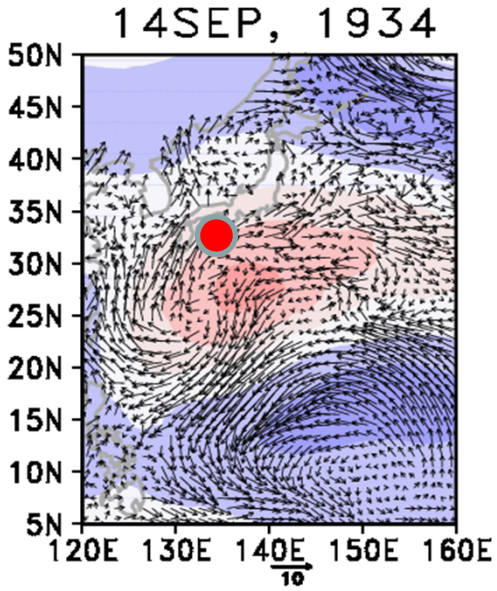
ICOADS: International Comprehensive Ocean-Atmosphere Data Set

IQuOD: International Quality Controlled Ocean Database

Typhoon in 1930



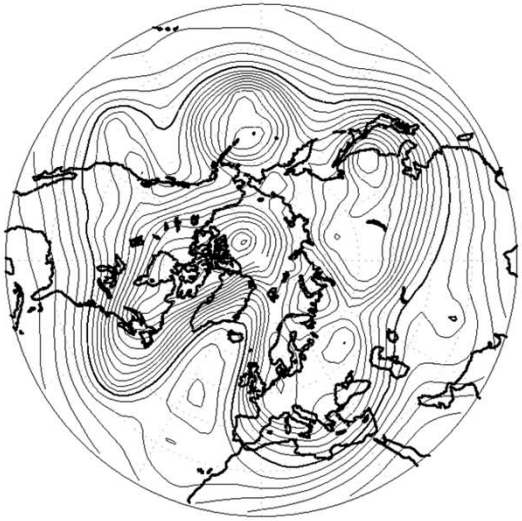
Typhoon Muroto



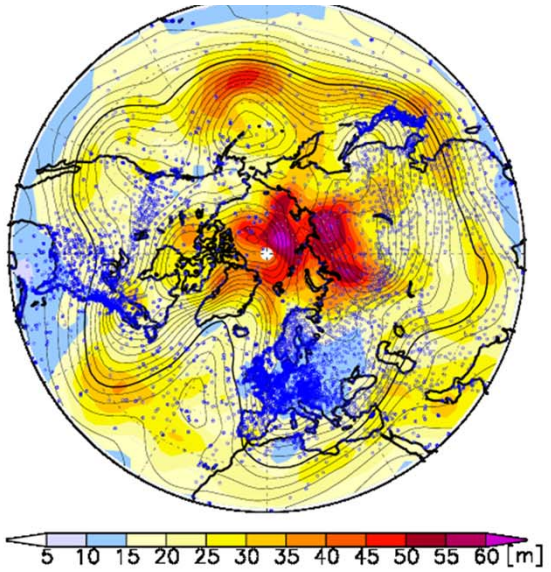
150-year Climate Reanalysis

Atmospheric and oceanic 3-D fields reproduced by assimilating surface pressure, and ocean subsurface temperature and salinity obs. with EnKF.

ERA-Interim



Climate Reanalysis

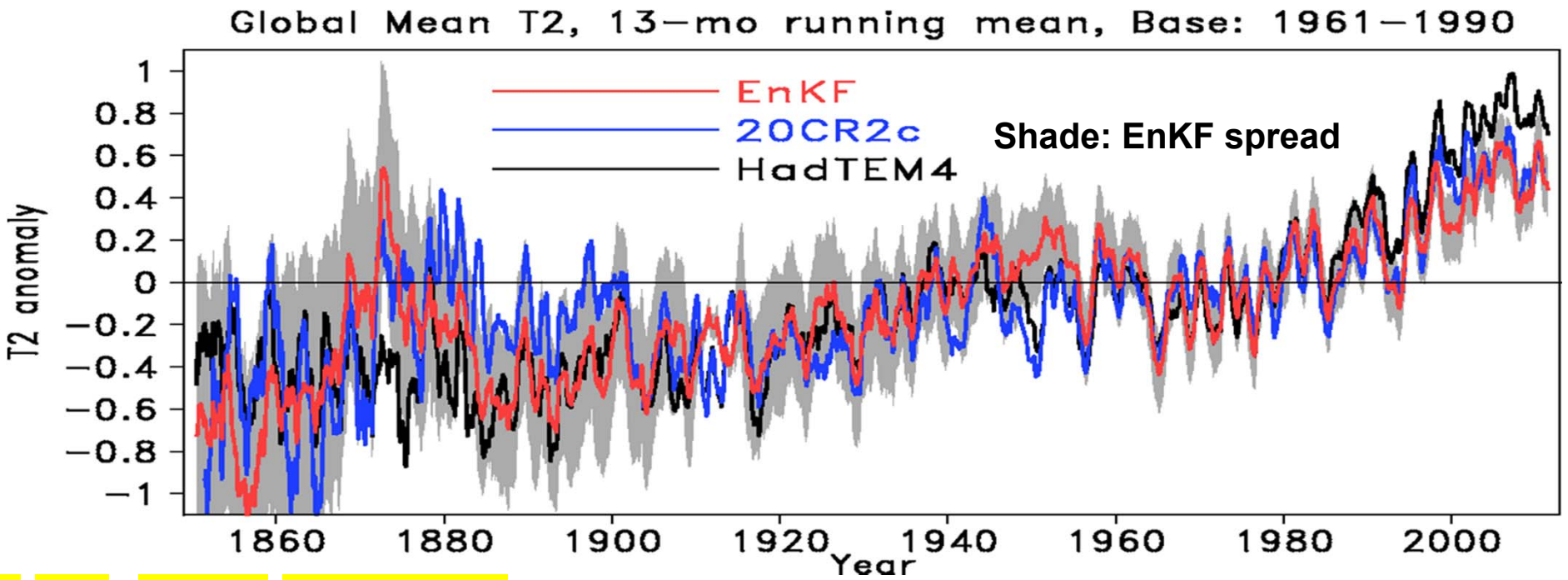


500 hPa height on 20th Feb., 2005
Shading indicates analysis error (right)..

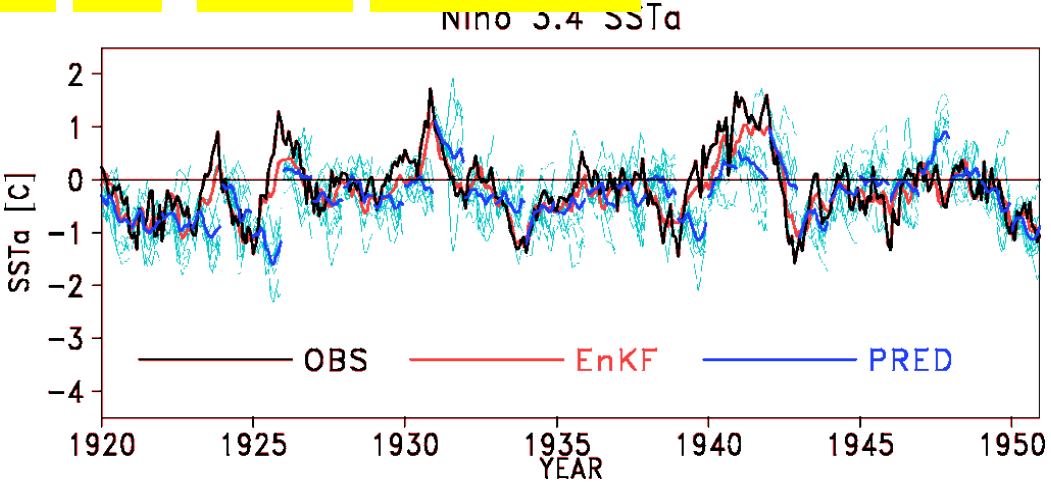
SOUSEI

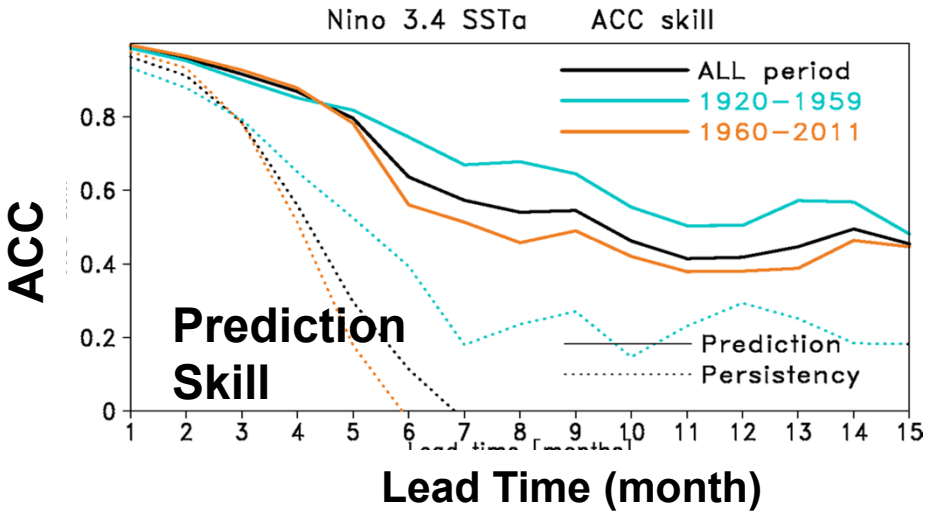
150yr Climate Reanalysis

(Ishii et al. 2016 in prep)



Nino 3.4 SSTa Hindcast



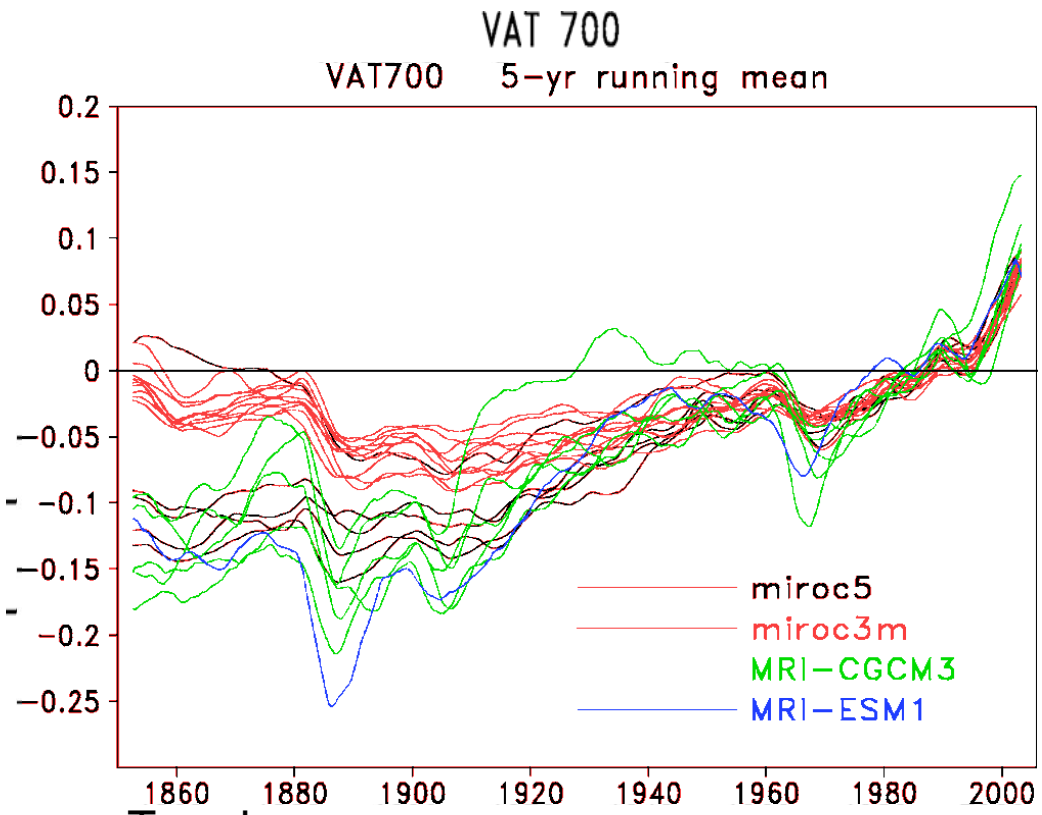


Hindcast (prediction targeting for past climate states) studies can be extended to periods longer than those of the major atmospheric reanalyses

➔ improving skill of climate prediction models

Updated Ocean Subsurface T and S Analysis assimilated in 150-yr Climate Reanalysis

TREND



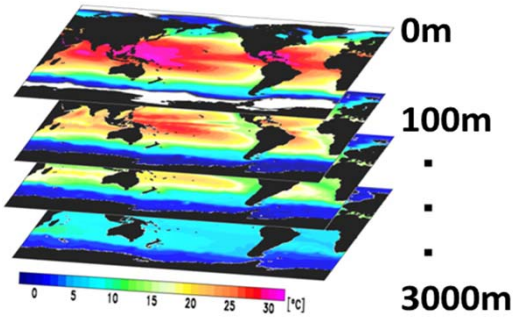
Trend

(EOF1) observations for 1960-

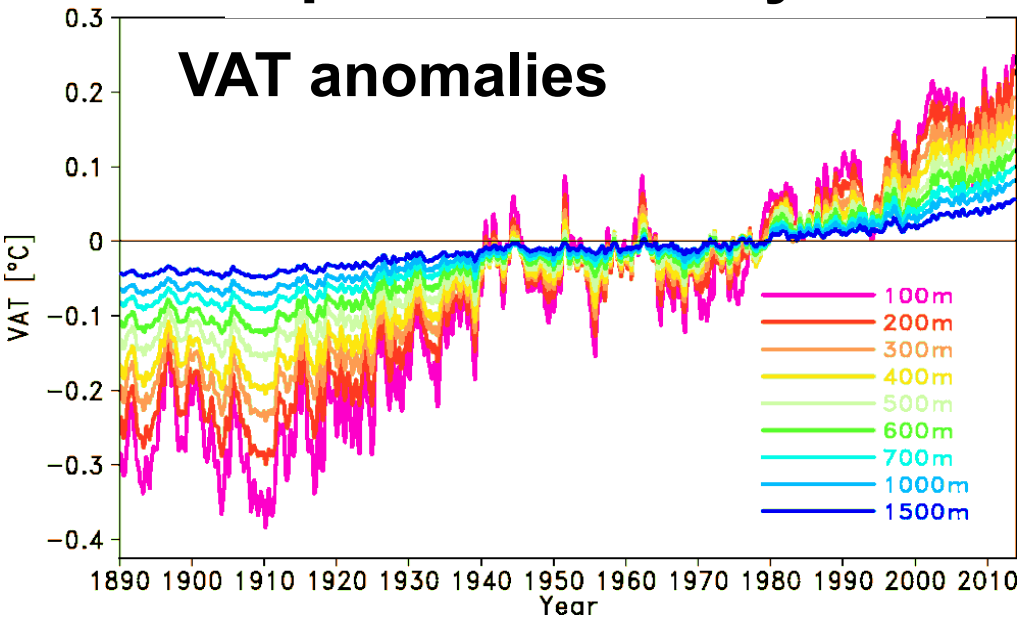
CMIP5 historical run for -1960

Zero trend given to Salinity

INTERANNUAL



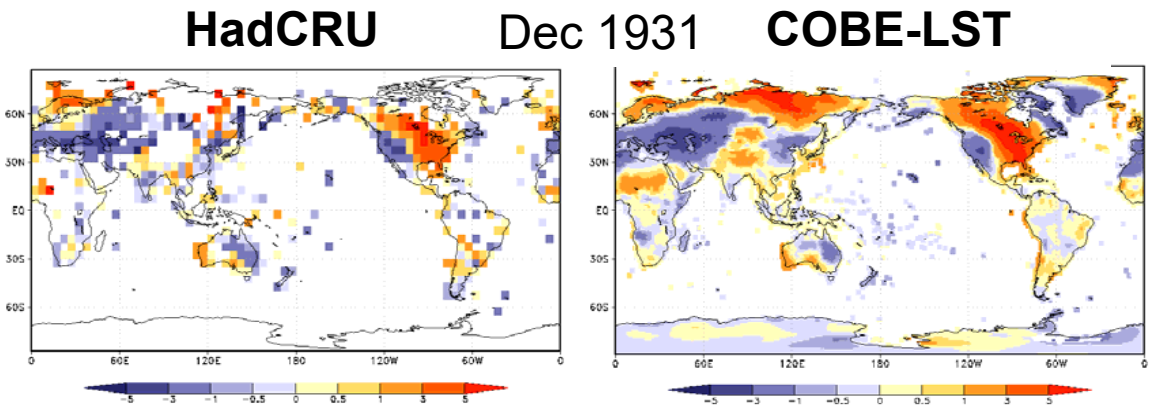
Updated T analysis

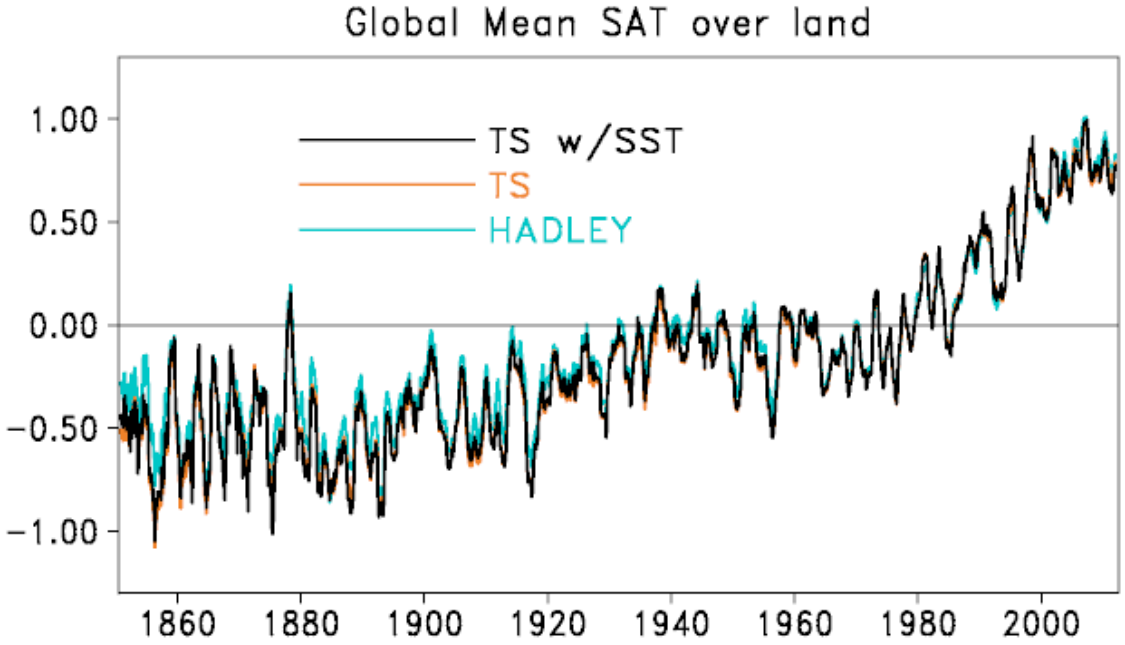


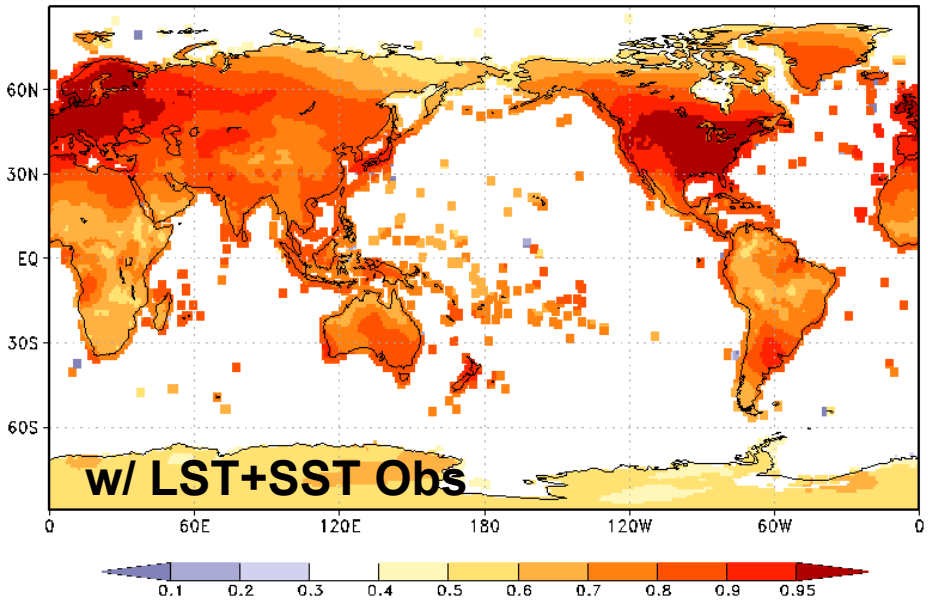
Historical Land Surface Temperature Analysis: COBE-LST

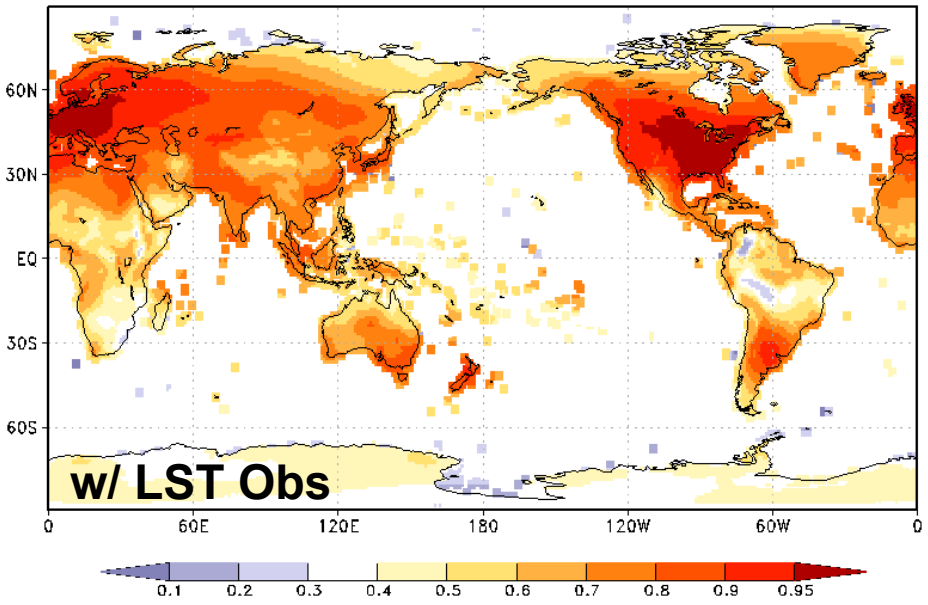
with observational database: ISTI

atmospheric data rescue on surface observations









Expected reproducibility for LST when the observed data distribution is the one in 1880

(Yasui and Ishii 2016, in prep)

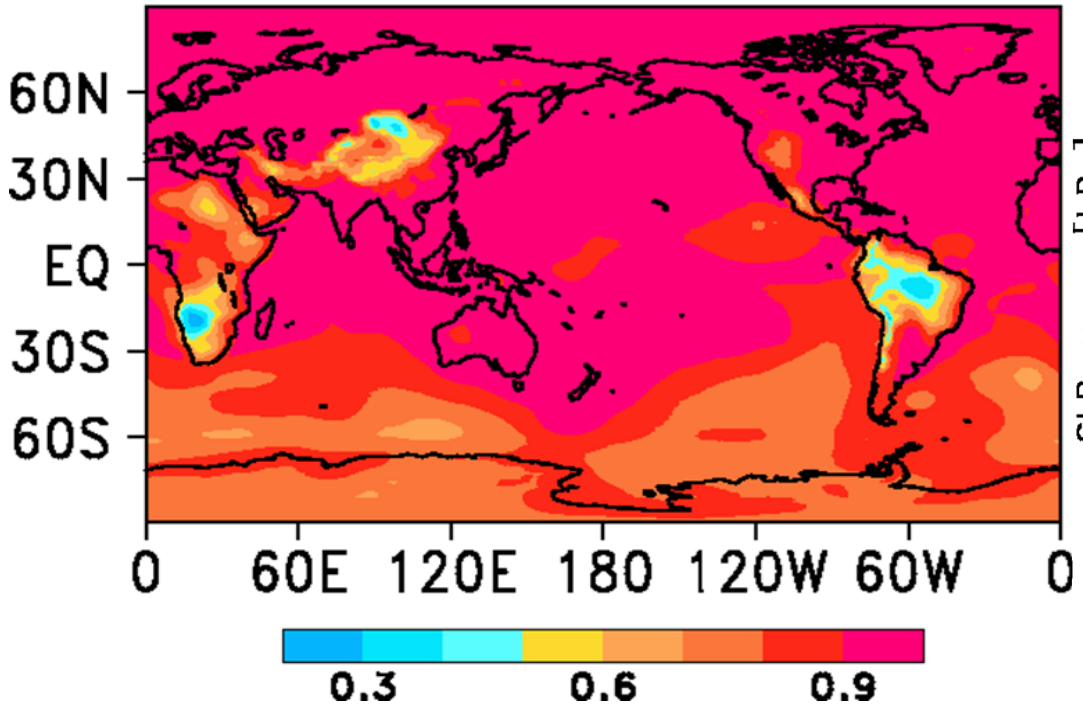
For monitoring global warming and verification of climate reanalysis

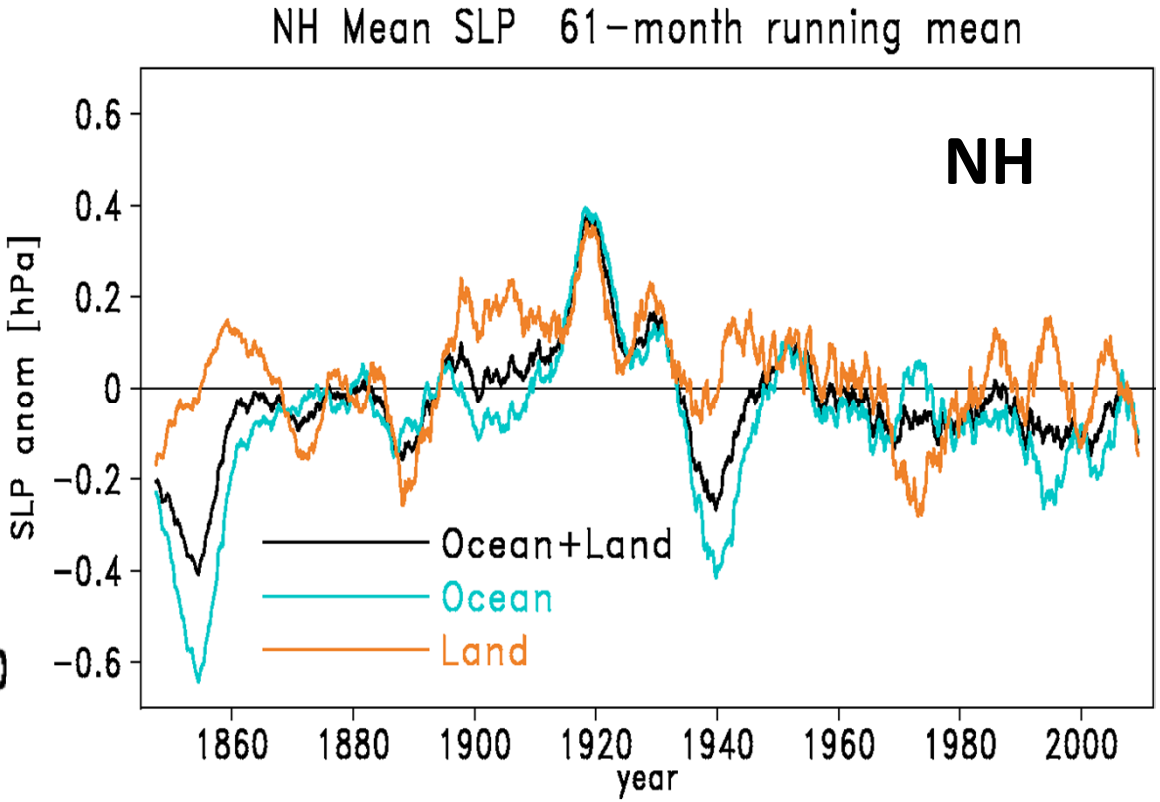
COBE-SLP2： Objective Analysis/Mapping of SLP

For understanding quality of historical surface pressure observations for use as inputs of the climate reanalysis.

- Using the same methodology as COBE-SST2 (Hirahara et al. 2014): MTA
- Climatology and interannual EOFs from JRA-55 (1961-2005)
- 6-hourly analysis from 1845 onward, 1-deg. global land and oceans
- No trend prescribed.
- ISPD v. 3.2.8 (surface pressure) and IBTrACSv3 (tropical storm track data)

Monthly COBE-SLP2 vs ERA 1958-2010





Summary

- Various atmosphere and ocean data rescue activities is now undertaken in Japan, collaborating with international programs.
- XBT-Japan, a working group under the Japan Group of Experts to Advance IOC Programs, was established in 2012 for reconstructing oceanographic data reported by Japanese agencies ,institutes, and universities, as well as for contributing to the IQuOD activity.
- High-quality and long-term observational databases are very necessary for understanding past 150-yr climate variations.