


Detailed SST structures of the North Pacific climatic regime shift in the 1920s and 1940s based on 1-degree SST data compiled from COADS and the Kobe collection



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SST Gridded data throughout the 20th century

- Without strong interpolation
 - UK: MOHSST6 (5×5)
 - US: COADS (2×2)
 - The present study (1×1) using COADS 1-c and Kobe collection
- With strong interpolation
 - UK: HadISST (1×1)
 - US: LDEO (Kaplan) (5×5, based on MOHSST5)

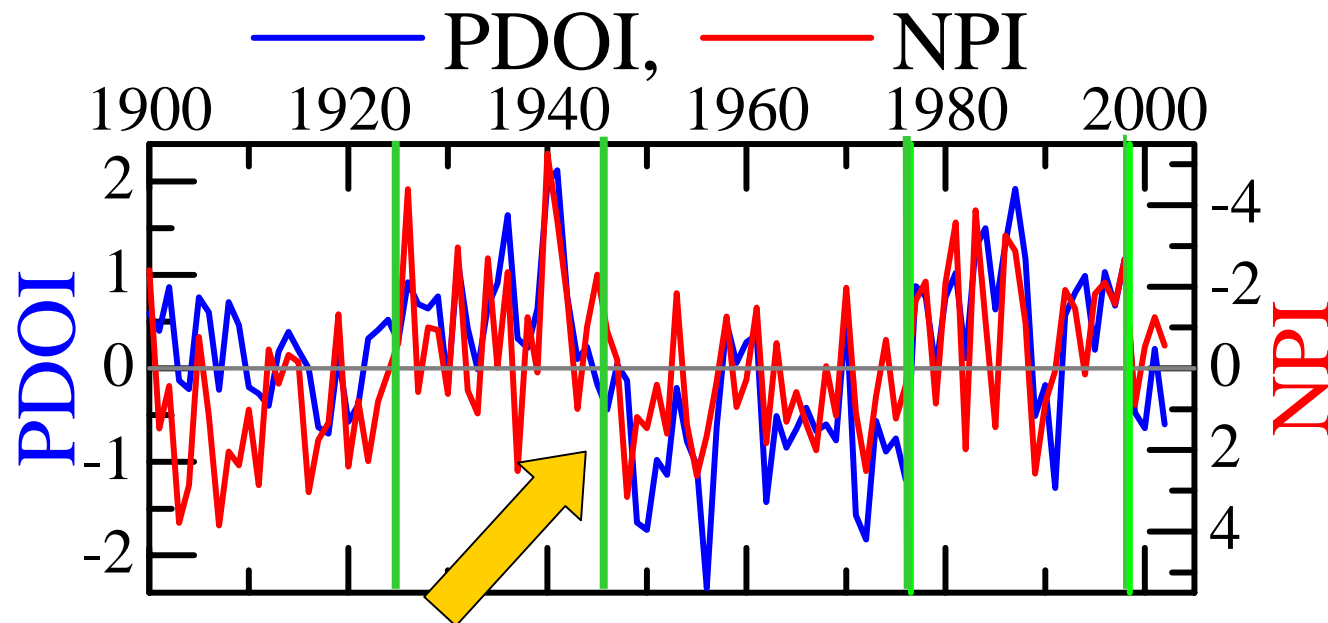


Kobe collection

- Hand-written marine meteorological data archived at Kobe marine observatory.
 - The data after 1932 were digitalized and were included in COADS1-a.
 - The data before 1932 were recently digitalized from 1995-2002.
 - JMA (Ms. Manabe, now in WMO)
 - 1998 edition 1-million→COADS 1-C
 - 2000 edition 0.57 milion
 - 2001 edition 0.33 milion
 - 2003 edition 1.17 milion
- } Not included I-COADS yet.

Research subject to be studied using the present data.

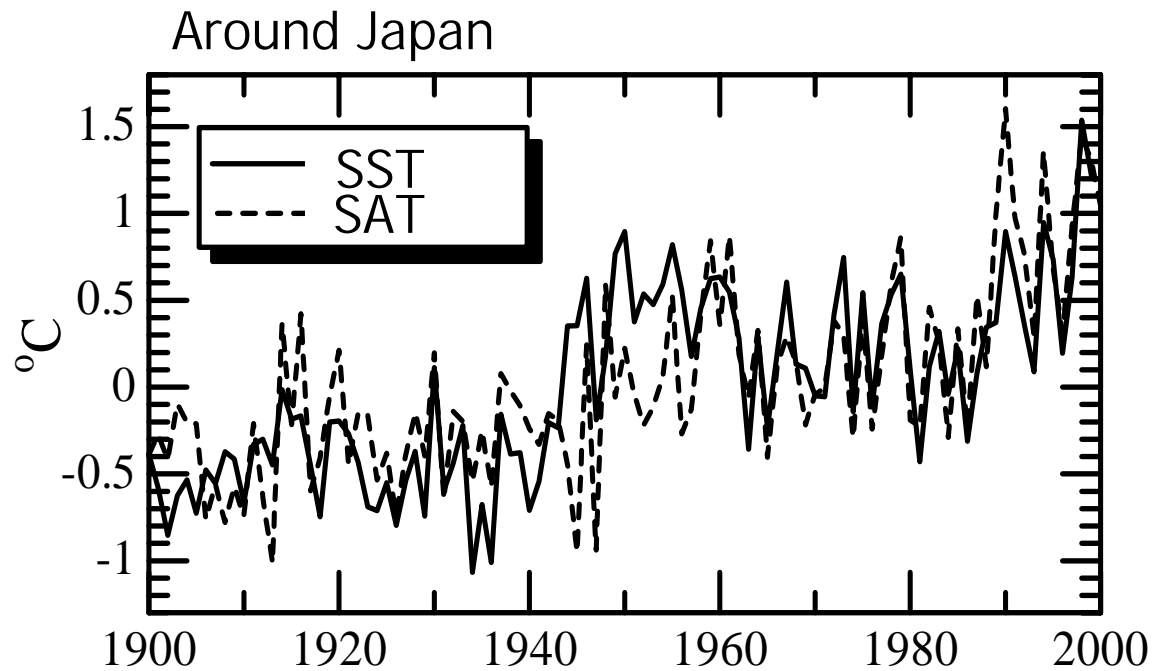
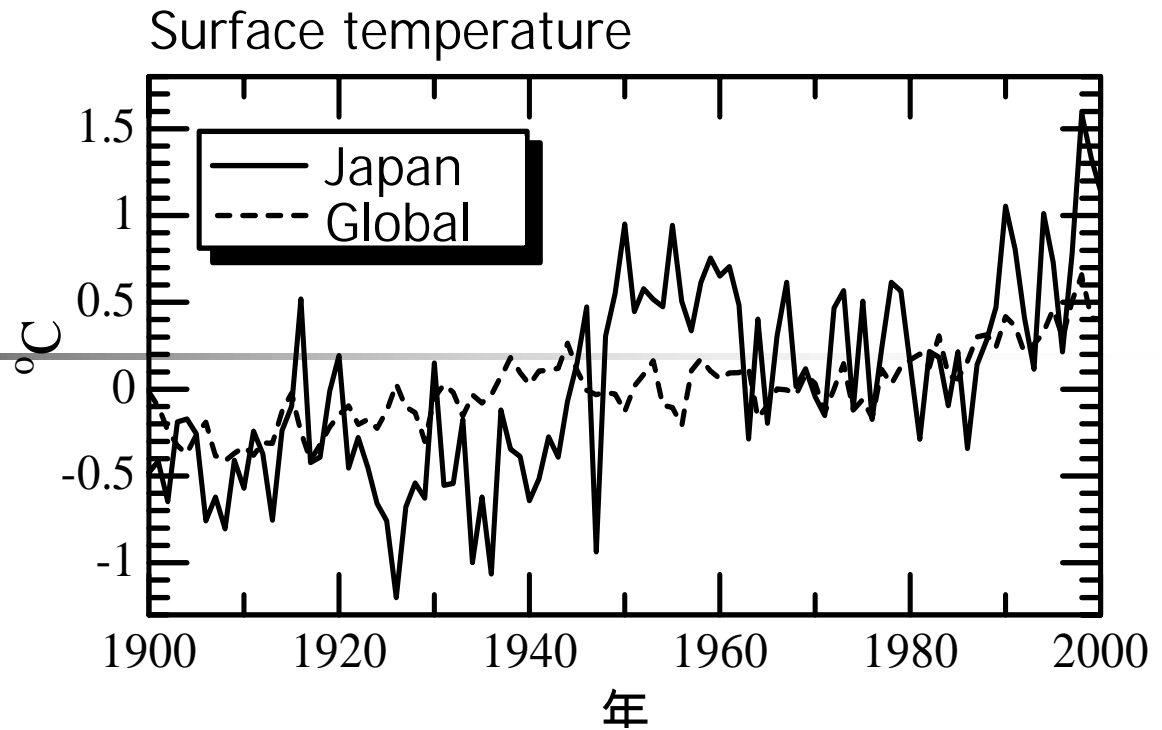
- (1925/26 &) 1947/48 North Pacific climatic regime shift.
 - Inclusion of the new Kobe collection improve the data before 1932.



1947/48 regime shift



- Large impact to the Japanese climate



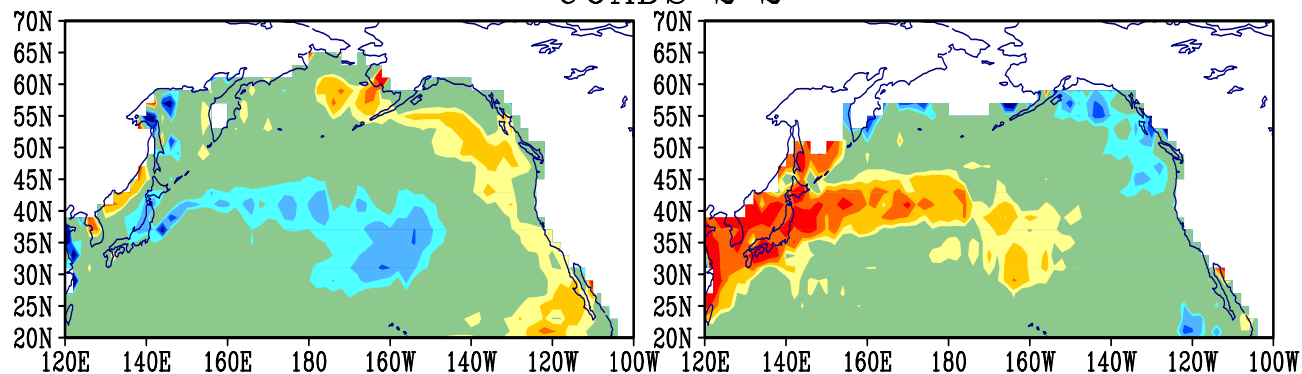
Without subjective QC

77-97 minus 48-76

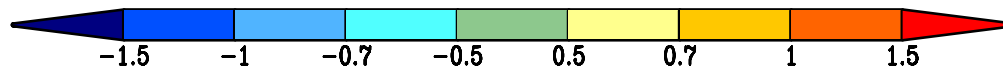
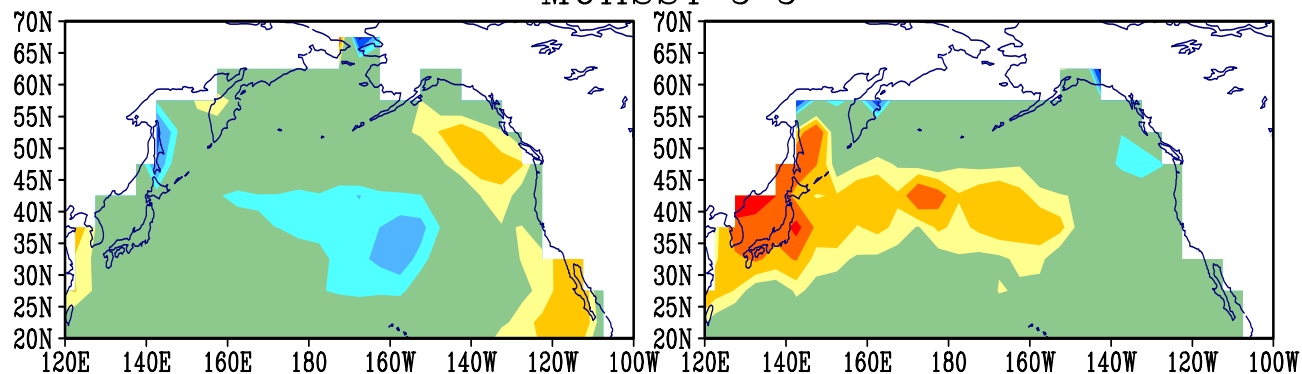
48-76 minus 25-47

COADS LKORF 1*1

COADS 2*2



MOHSST 5*5



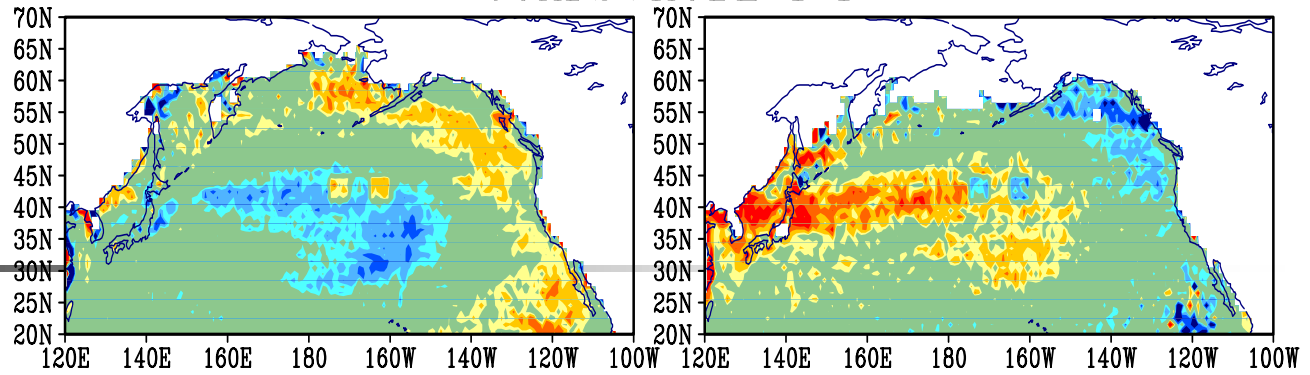
Without
subjective
QC

■ Unrealistic!

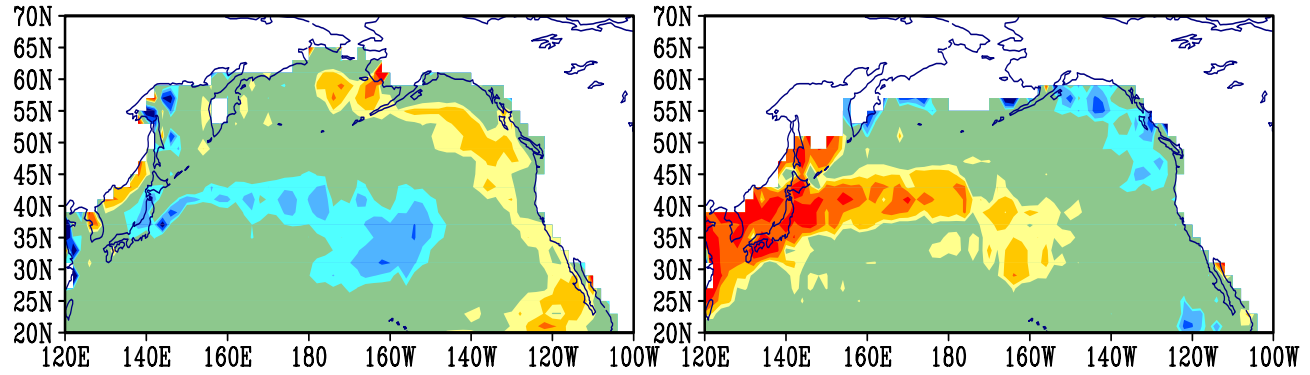
77-97 minus 48-76

48-76 minus 25-47

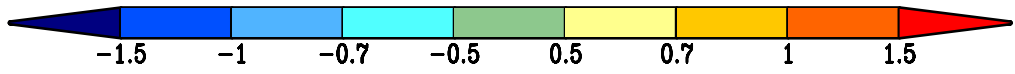
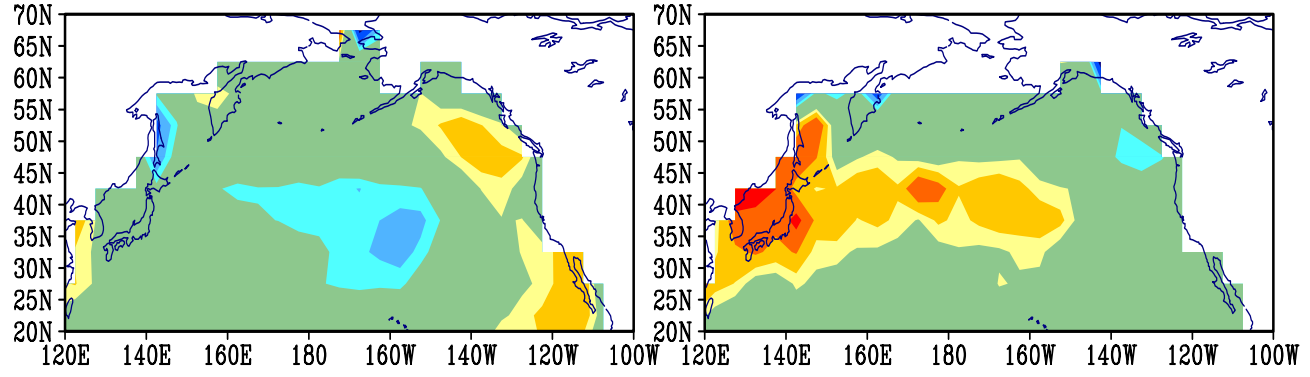
COADS+KOBÉ 1*1



COADS 2*2



MOHSST 5*5

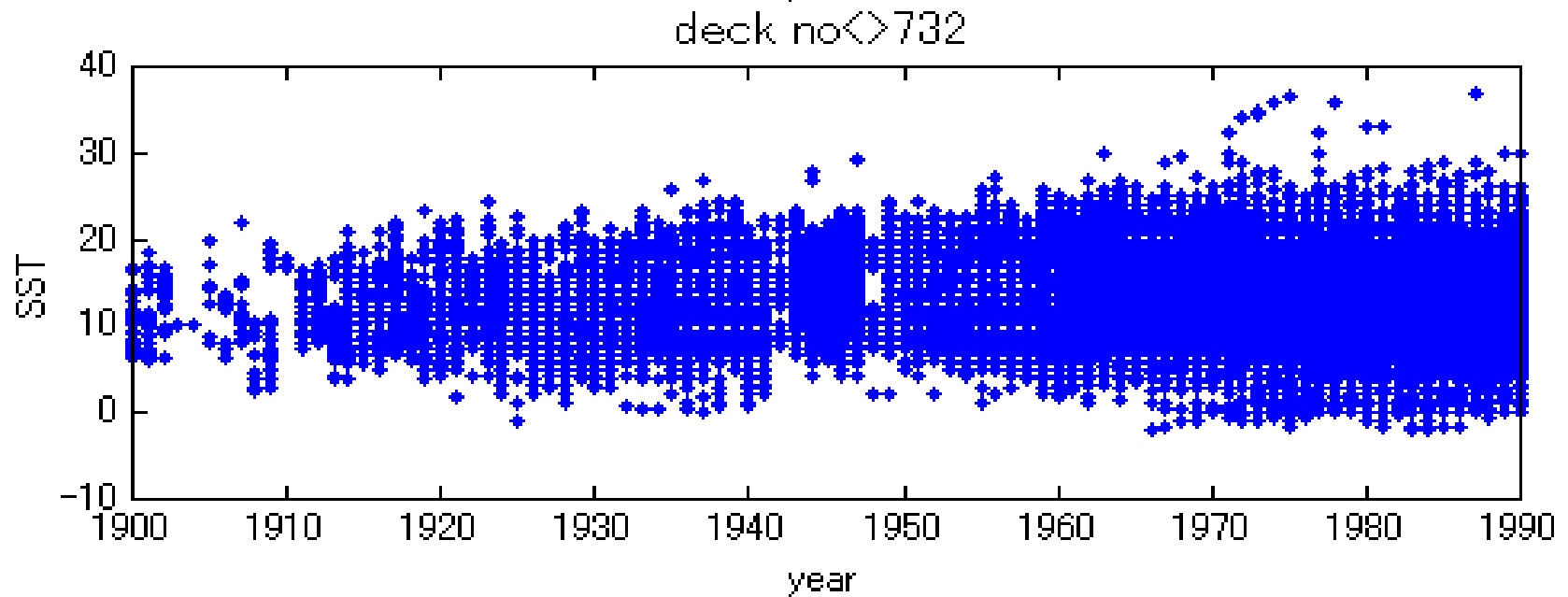
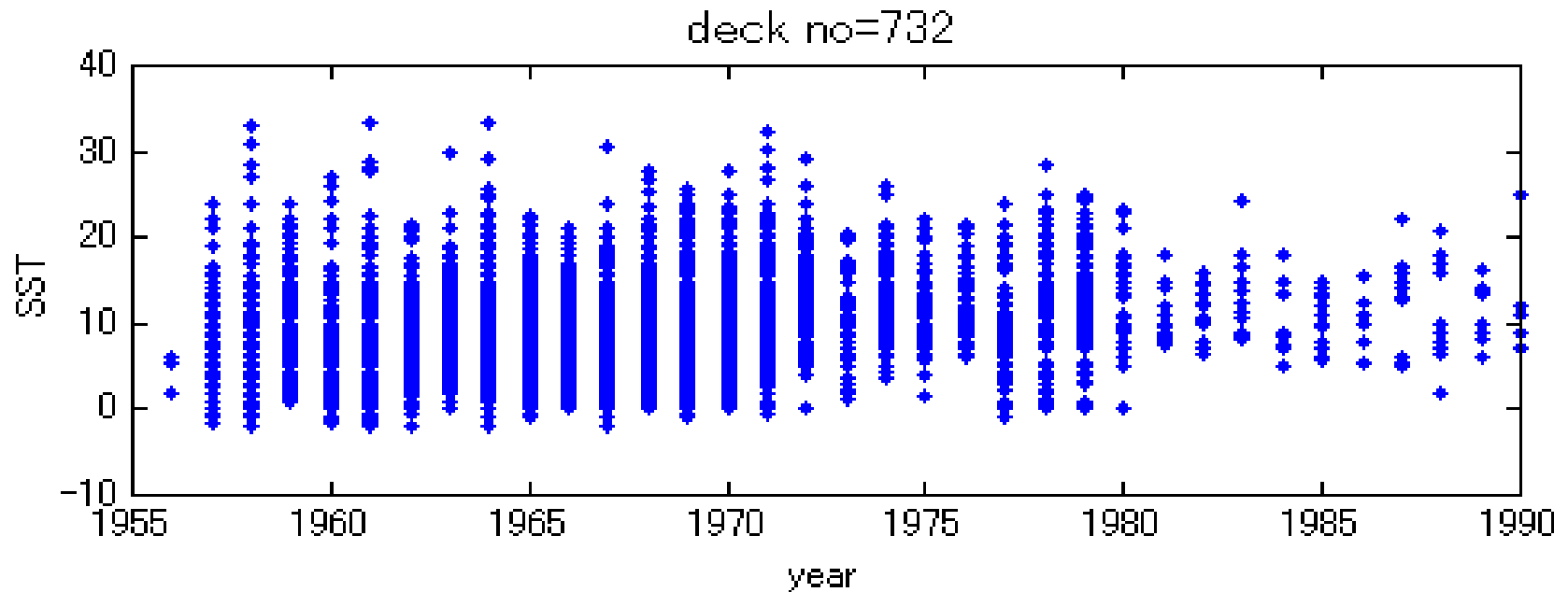




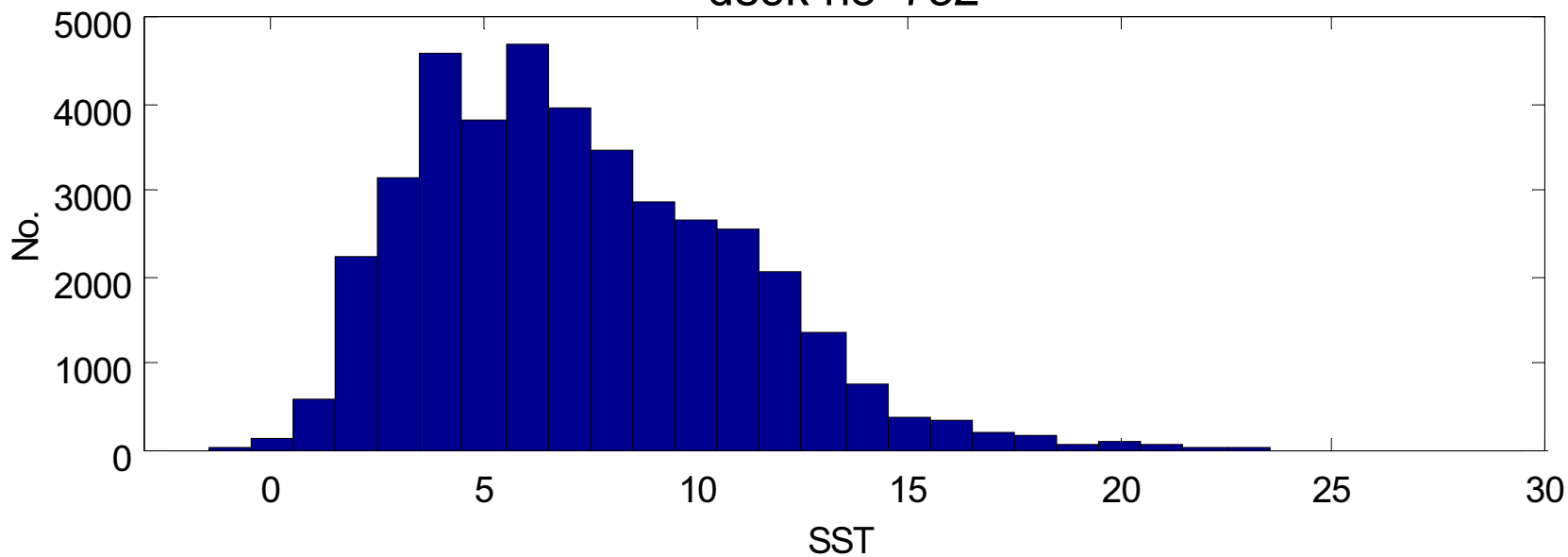
Subjective quality check

- Gridded anomalies are produced without subjective quality check.
- For regions that contains suspicious anomalies, we draw histogram, scatter diagrams for time, longitude, and latitude.
- Erroneous data (subjectively determined) are removed, and gridded data are reproduced.

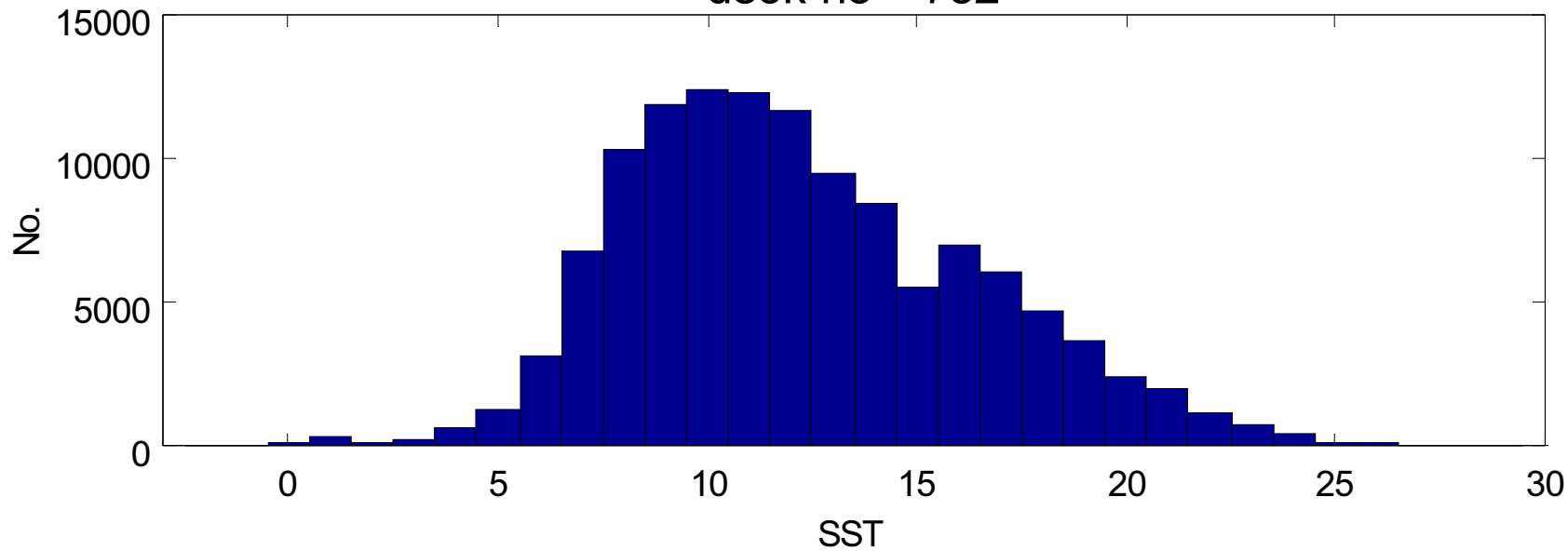
732 (40%), 927 (14%), 926 (9%)



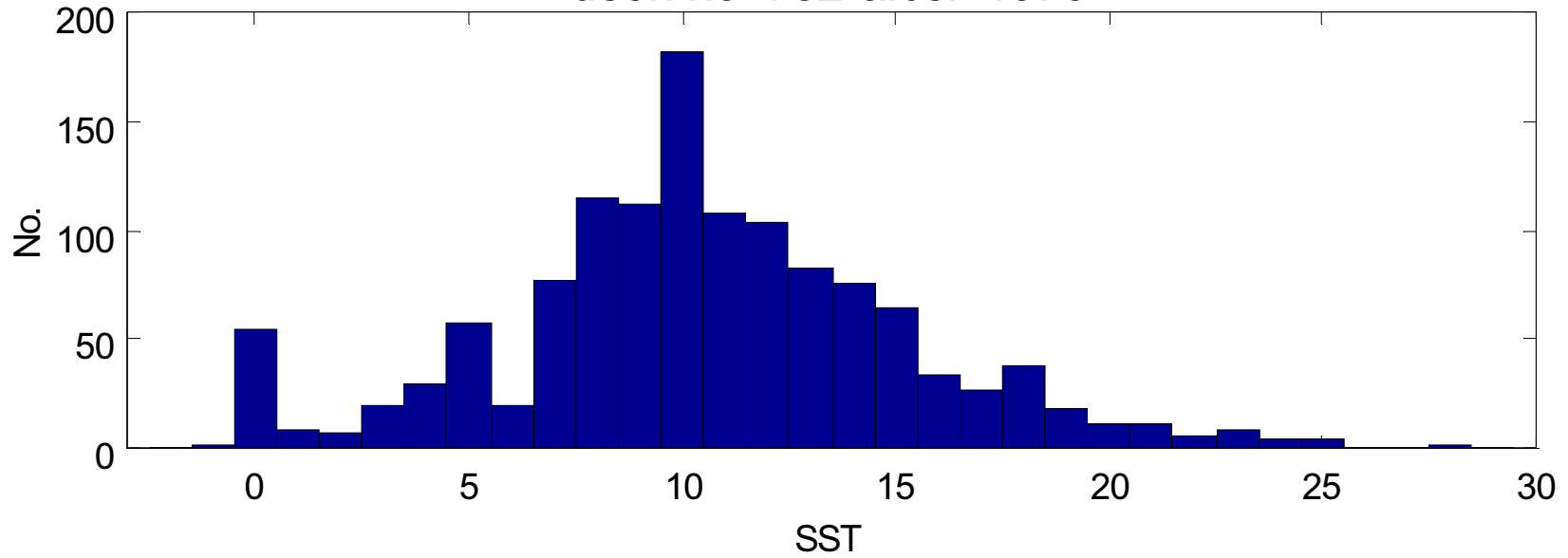
deck no=732



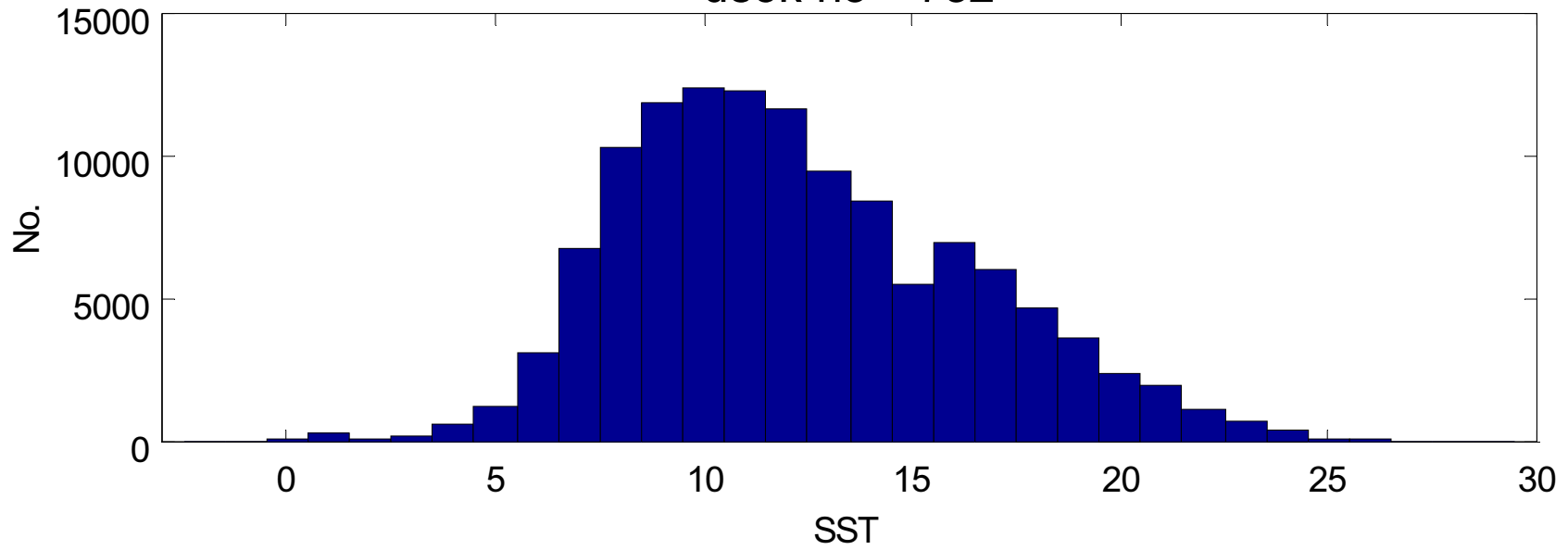
deck no<>732



deck no=732 after 1976



deck no<>732





Removal scheme of deck 732 in the central North Pacific

regions	lat.	lon.	yr.	SST	deck no.
		175°W–			
		170°W or			
	40°N–	165°W–	1956–		
central North Pacific	45°N	160°W	1975	all	732

Removed data, subjective QC

regions	lat.	lon.	yr.	SST	deck no.
		175°W– 170°W or			
central North Pacific	40°N– 45°N	165°W– 160°W	1956– 1975	all	732
eastern North Pacific	26°N– 30°N	125°W– 119°W	1960– 1975	all	732
Tropics	20°S– 20°N	all	all	all	all
tropics	20°S– 20°N	all	all	<5.5	555 706 714 732 883 888 889 892 926 927
western tropical South Pacific	20°S– Eq.	140°E– 175°W	all	<10	714 732 888 892 926
east of Madagascar	30°S– 20°S	50°E– 60°E	all	<5.0	all
eastern tropical South Pacific	25°S– 10°S	100°W– 80°W	all	<5.5	all
east of southern South America	50°S– 40°S	60°W– 50°W	all	all	732
west of southern South America	33°S– 30°S	10°E– 15°E	all	all	732

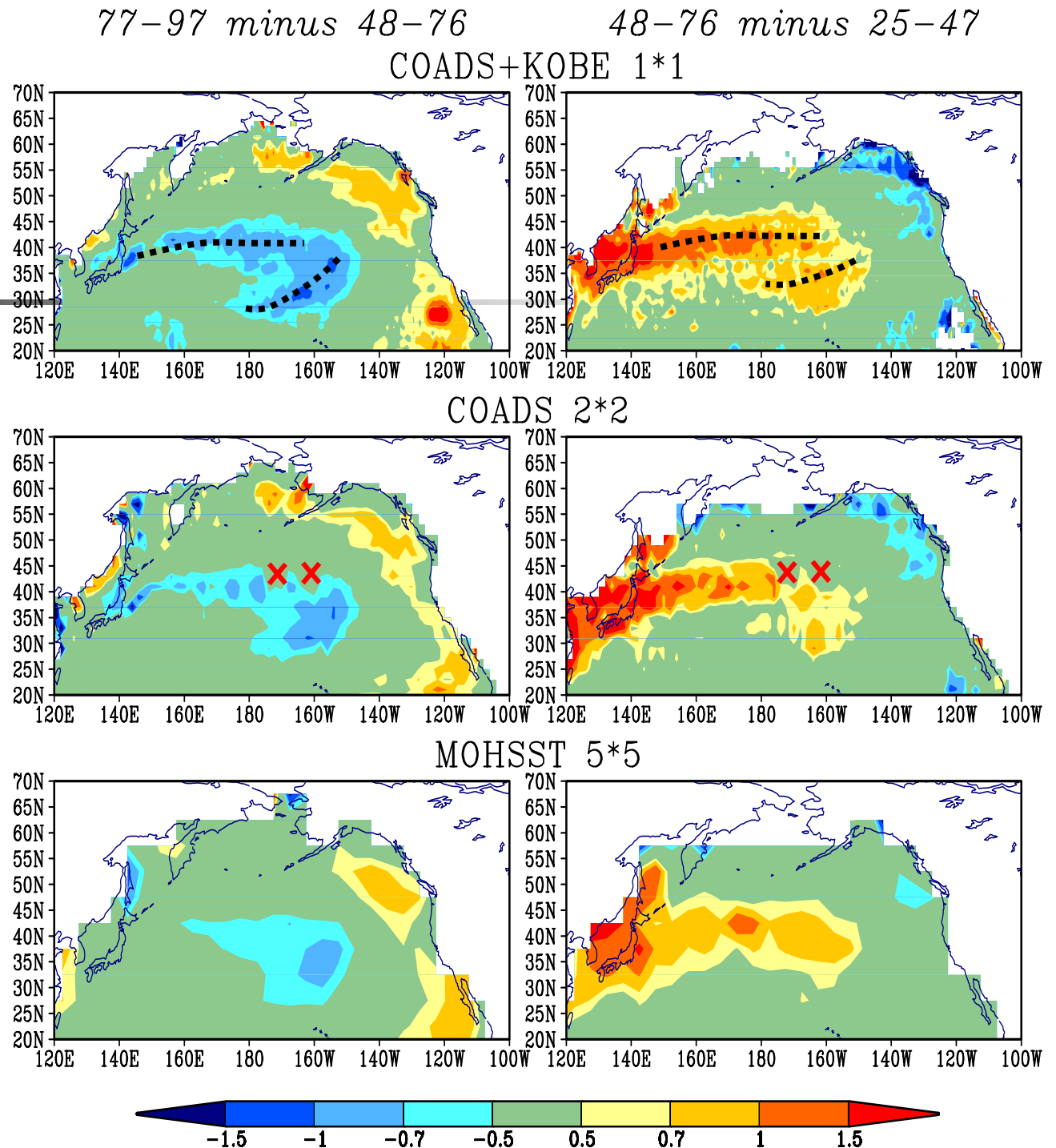
Gridding Method

- 1. Subjective quality control.
- 2. Climatology from 1950-1997 (daily, 1×1 degree)
- 3. With the climatology anomalies of respective observations are calculated using spatial bi-linear interpolation.
- 4. Objective quality control.
 - If an anomaly is larger than 3-standard deviation, the anomaly is not used for further process.
- 5. Repeat the above processes 2-4.
- 6. Gridding by simple average of anomalies on a monthly, 1×1 degree.
- 7. Apply SST correction of Folland and Parker (1991)
- 8. A Gaussian filter (100km zonal, 25km meridional) is used to yield annual (or winter or summer) anomalies.

N-Pacific win & spr



- The SST changes are prominent in subarctic front and subtropical front for the 1940s shift as well as 1970s shift.



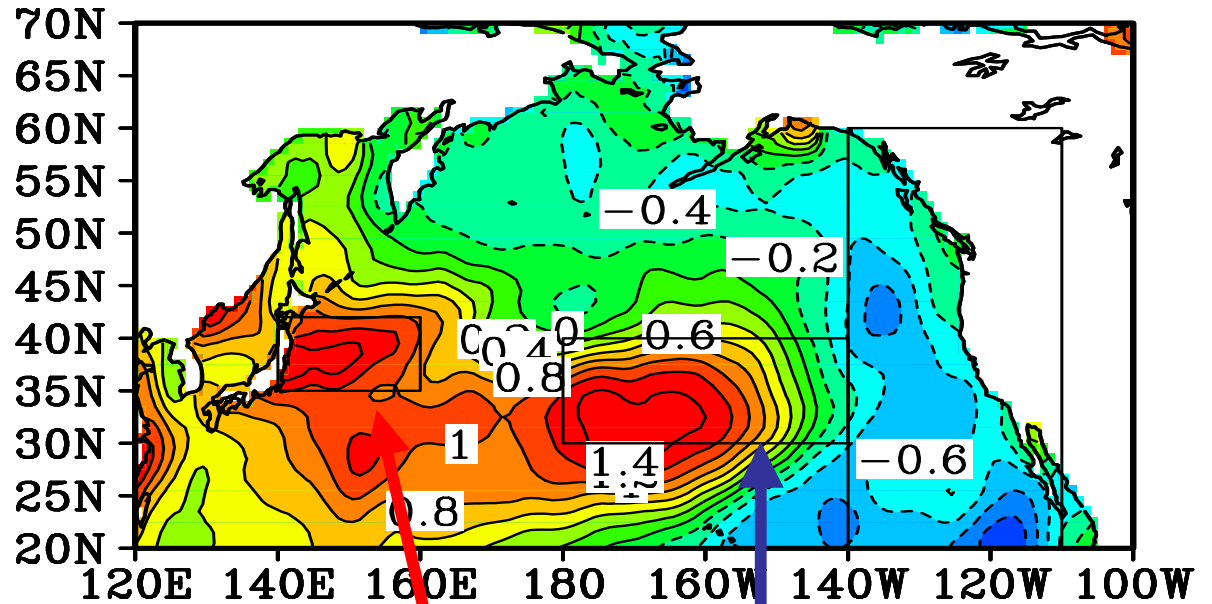
Similarity to 98/99 change



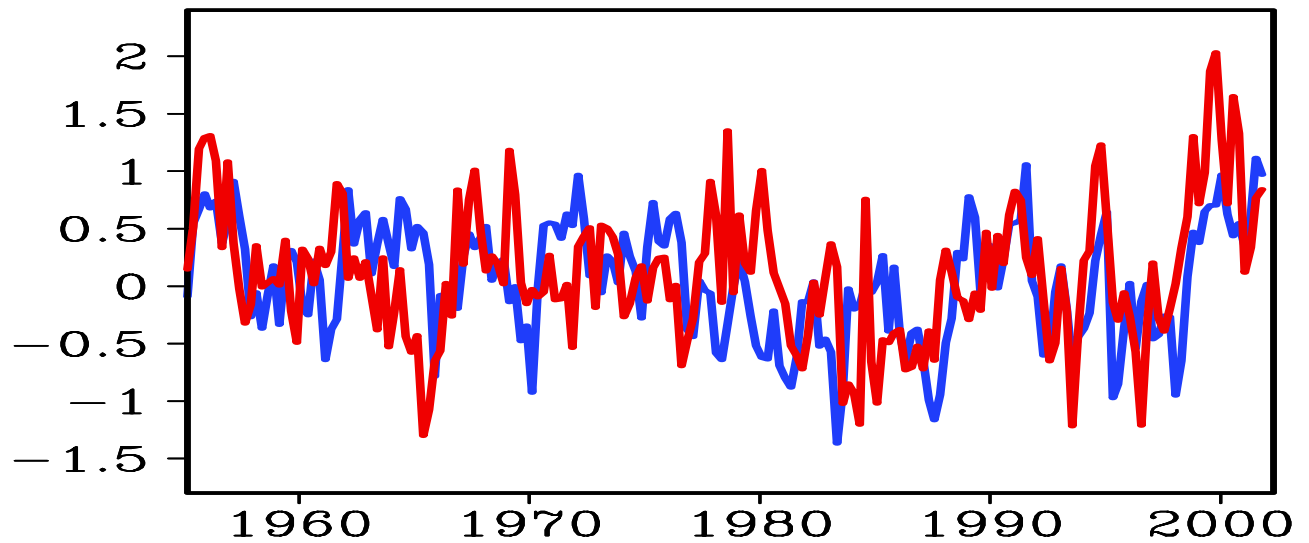
- KOE SST marked the highest value in 1999-2000, with some similarity to 1940s shift.

Minobe (PiO 2002)

SST Diff. 99-02 minus 77-98



Central North Pacific
Kuroshio-Oyashio Ext.



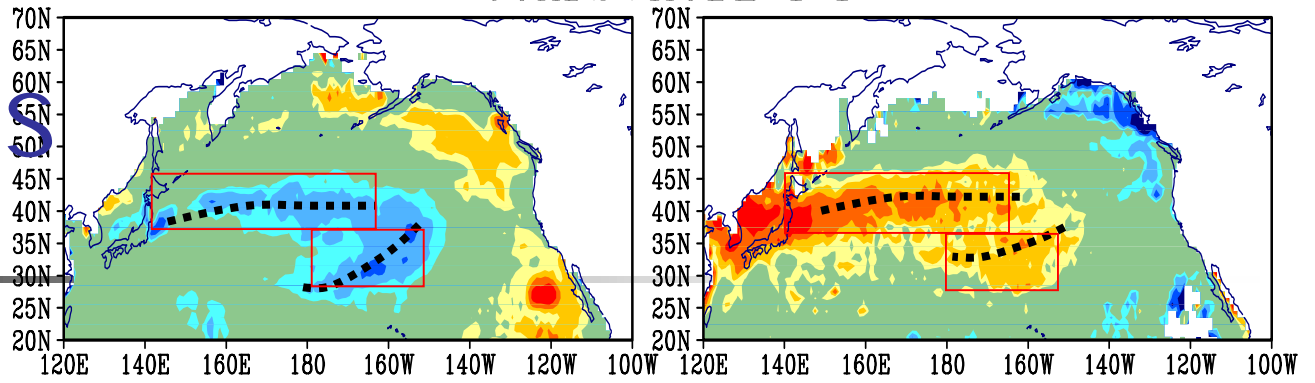
Time series

- SubArctic Front (SAF)
- SubTropical Front (STF)

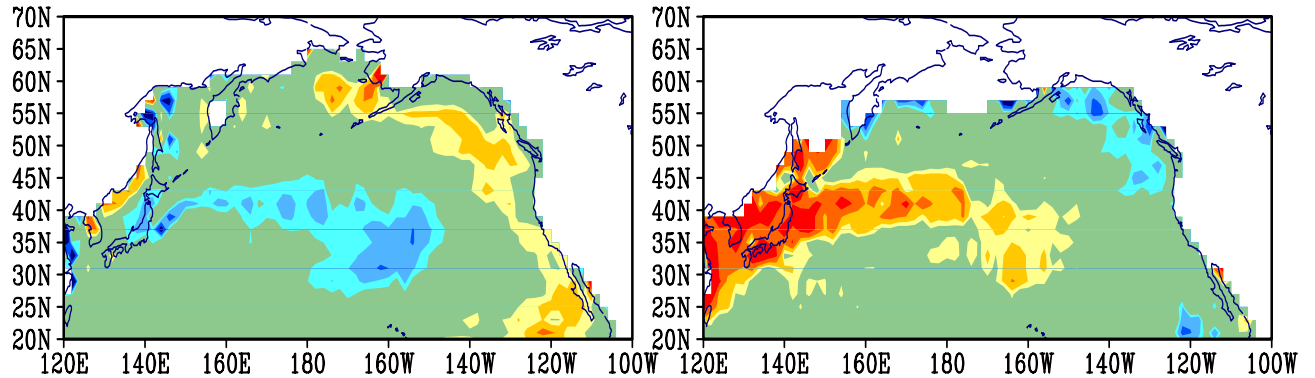
77-97 minus 48-76

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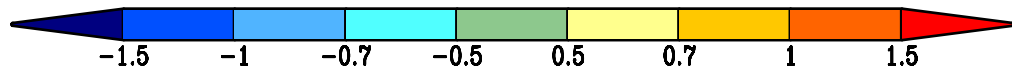
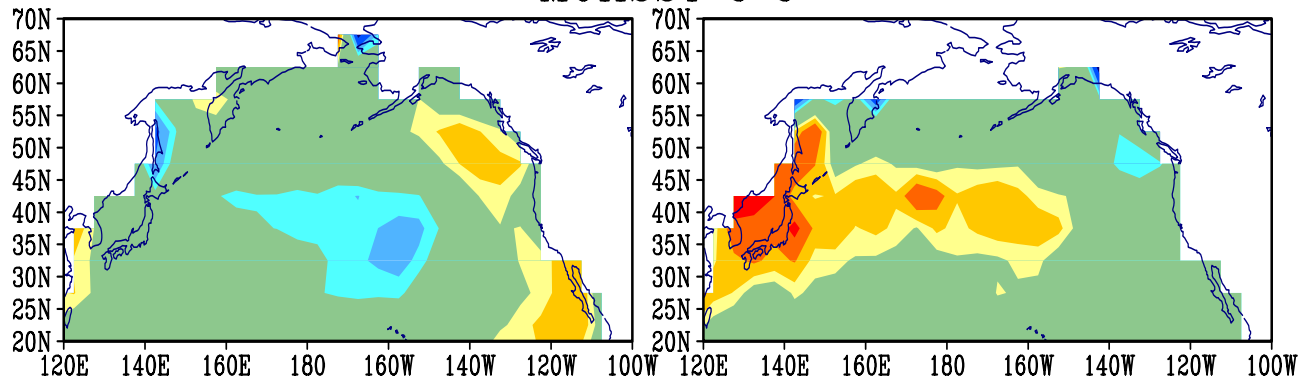
COADS+KOBÉ 1*1



COADS 2*2

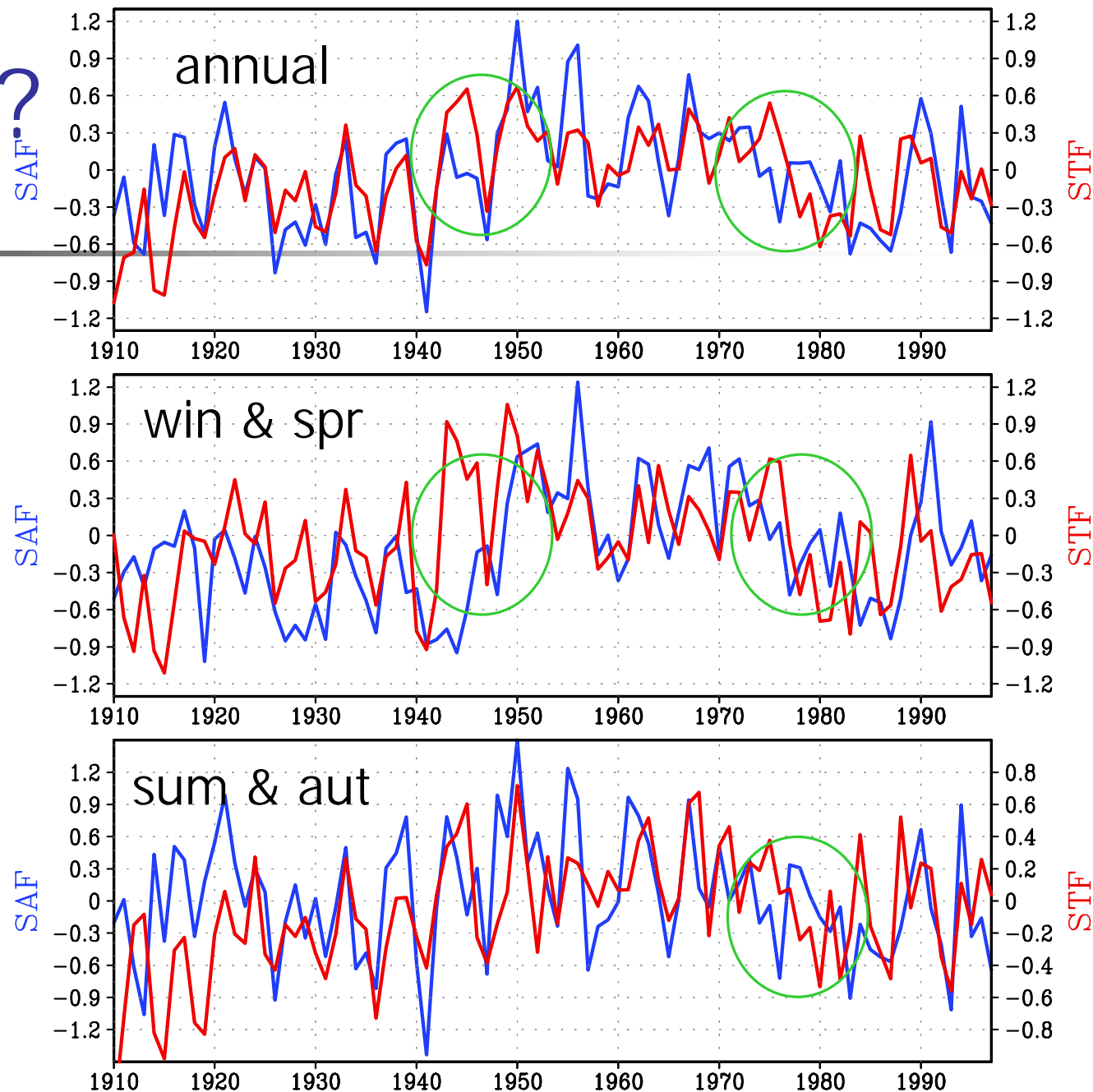


MOHSST 5*5

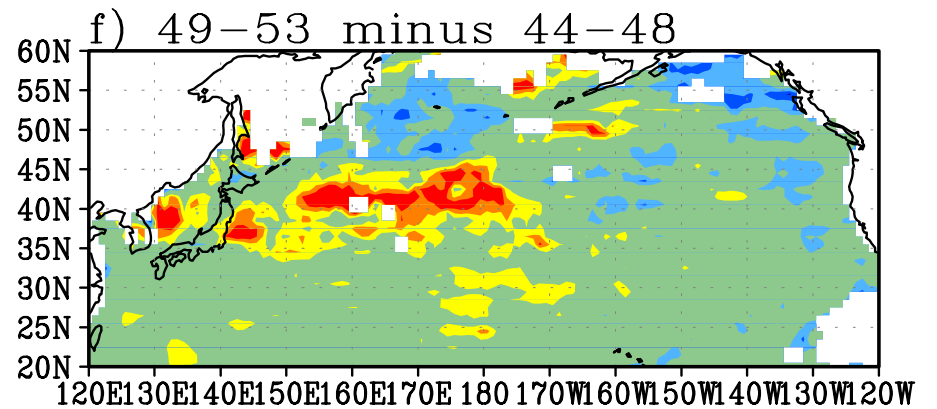
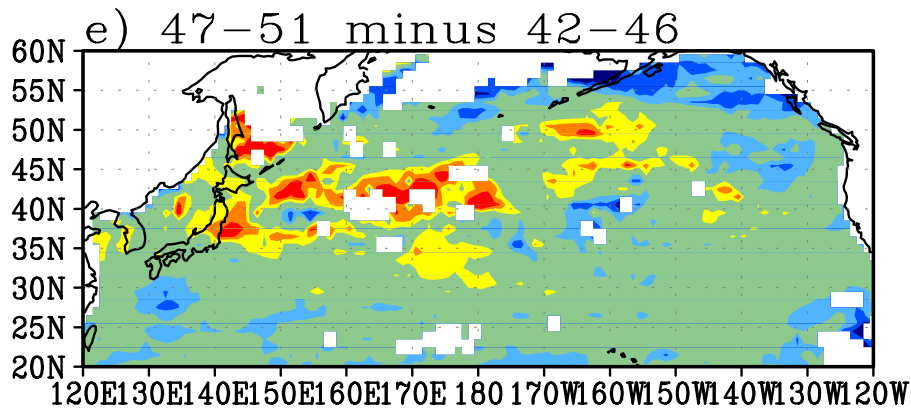
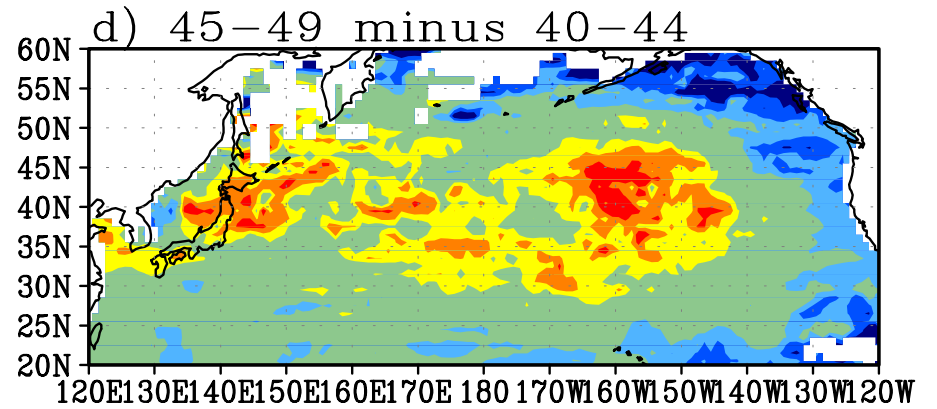
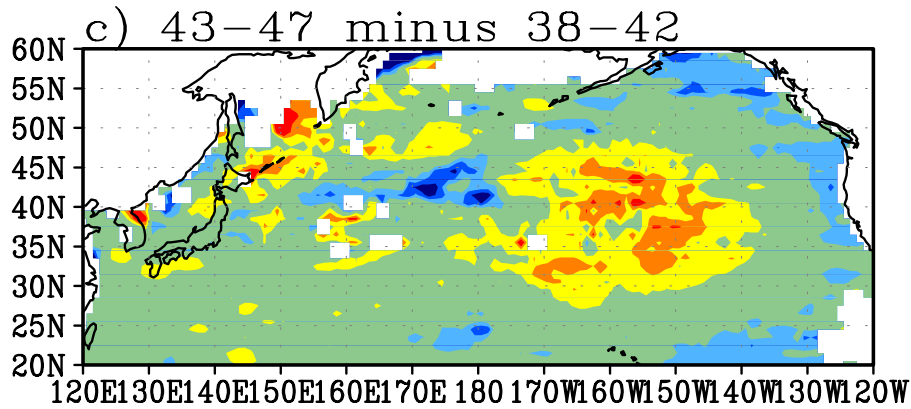
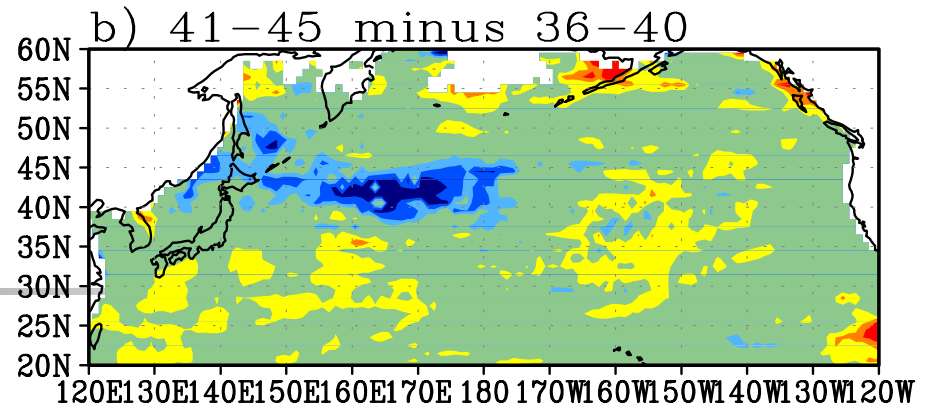
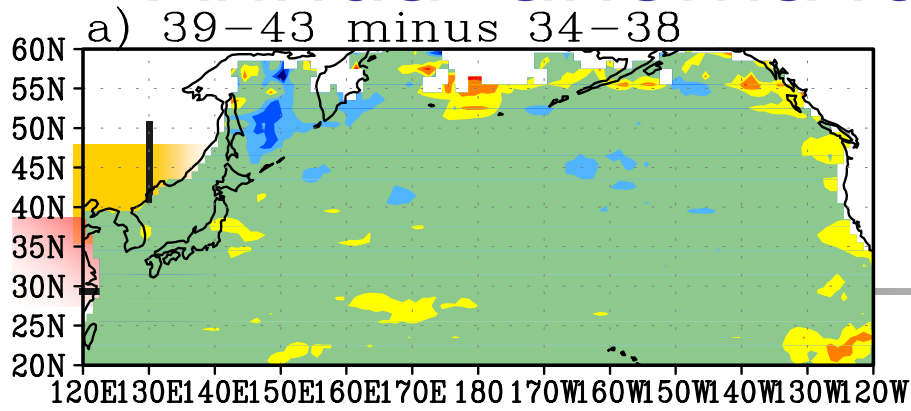


Subarctic front leads?

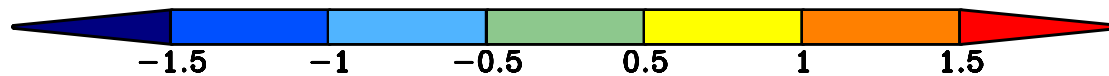
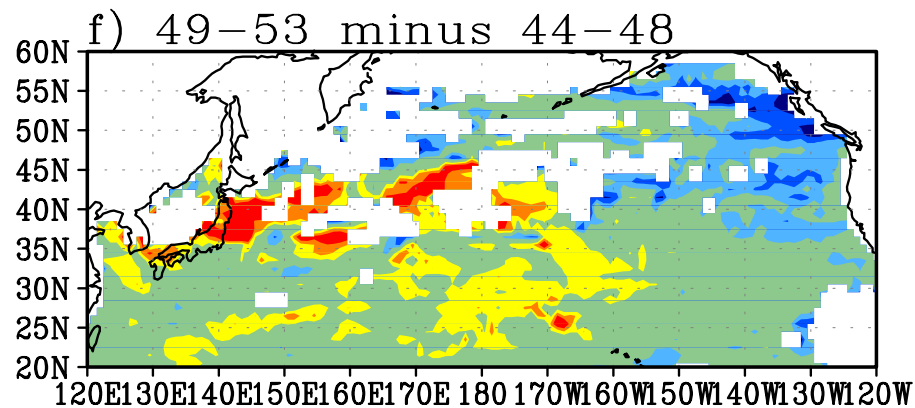
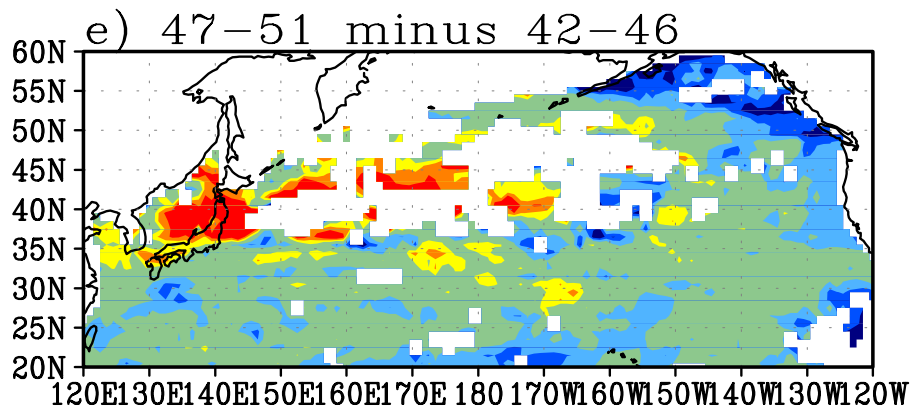
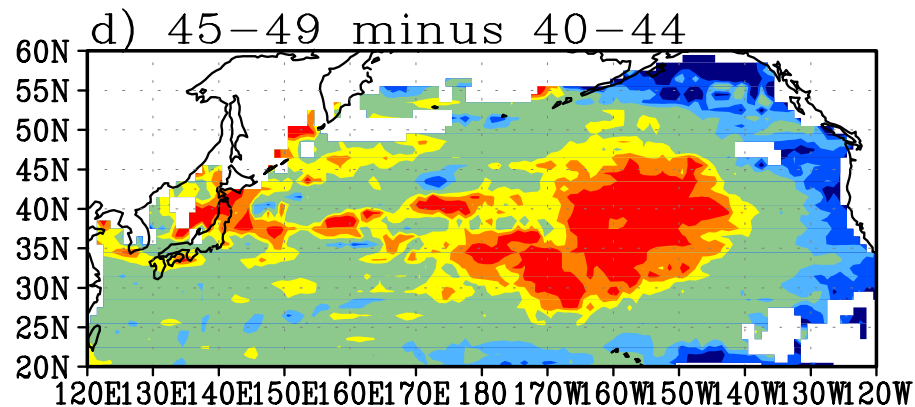
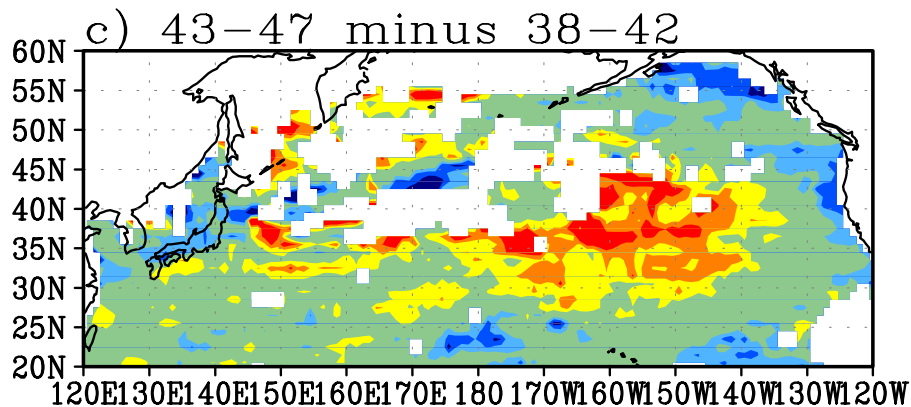
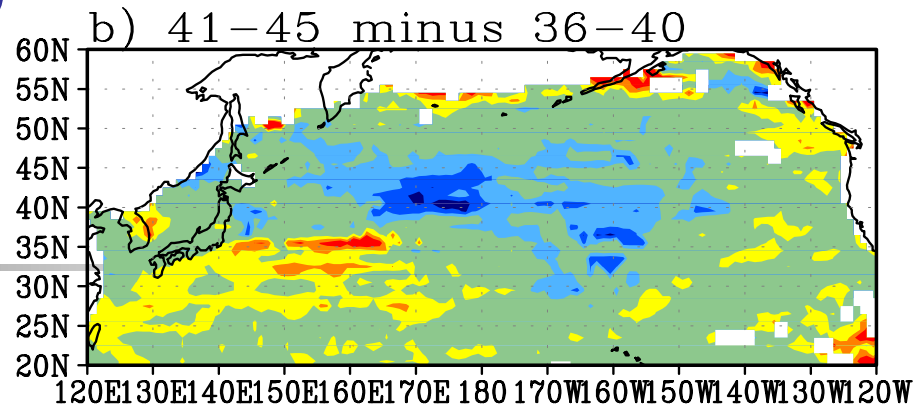
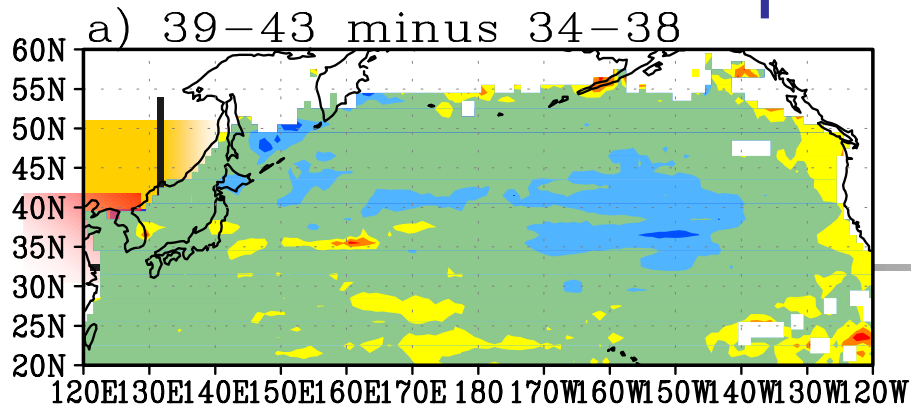
- SAF leads STF in the 1970s,
- But STF appears to lead SAF in 1940s.



Annual anomalies



Winter & Spring

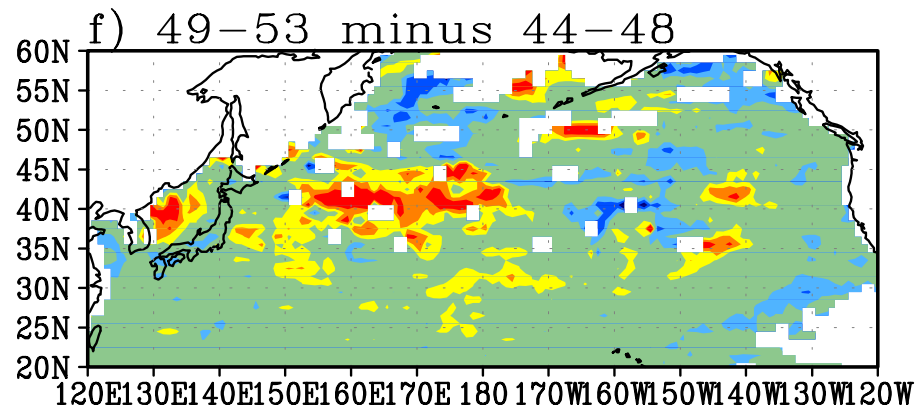
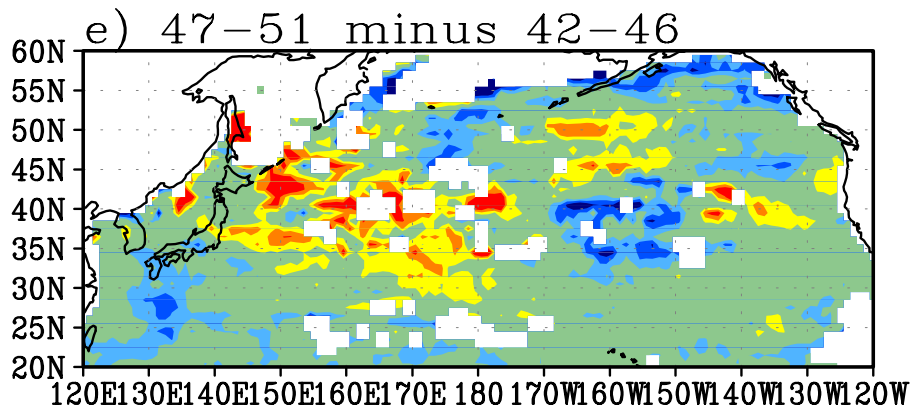
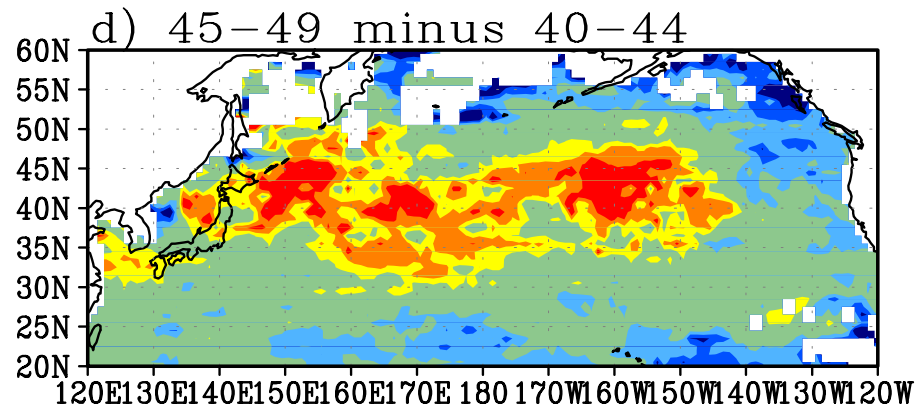
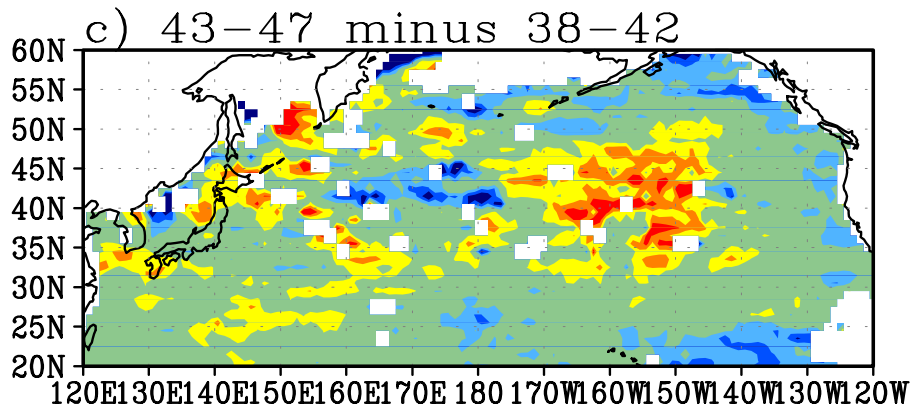
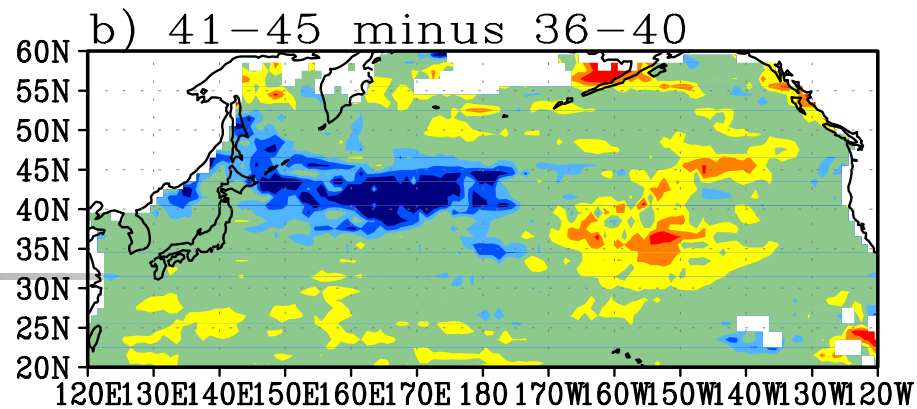
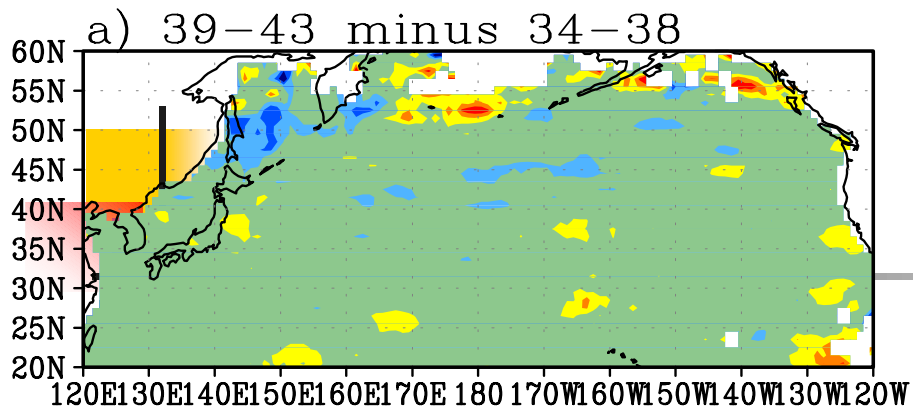




Summary

- New gridded data are produced using COADS (2001 version) and Kobe collection (2000, 2001 2003 editions).
 - Erroneous data (e.g., over the North Pacific) were removed subjective quality control.
- The subarctic and subtropical fronts were the center of action for the 1940s climatic regime shift over the North Pacific as well as the 1970s shift.
- The subarctic front does not lead the subtropical front in the 1940s.
- Digitalization of Japanese navy ships are desirable for clarifying the detailed change of the 1940s shift.

Summer & Autumn



Subarctic front in the 1925/26 shift

