Salinity variability in Japan/East Sea

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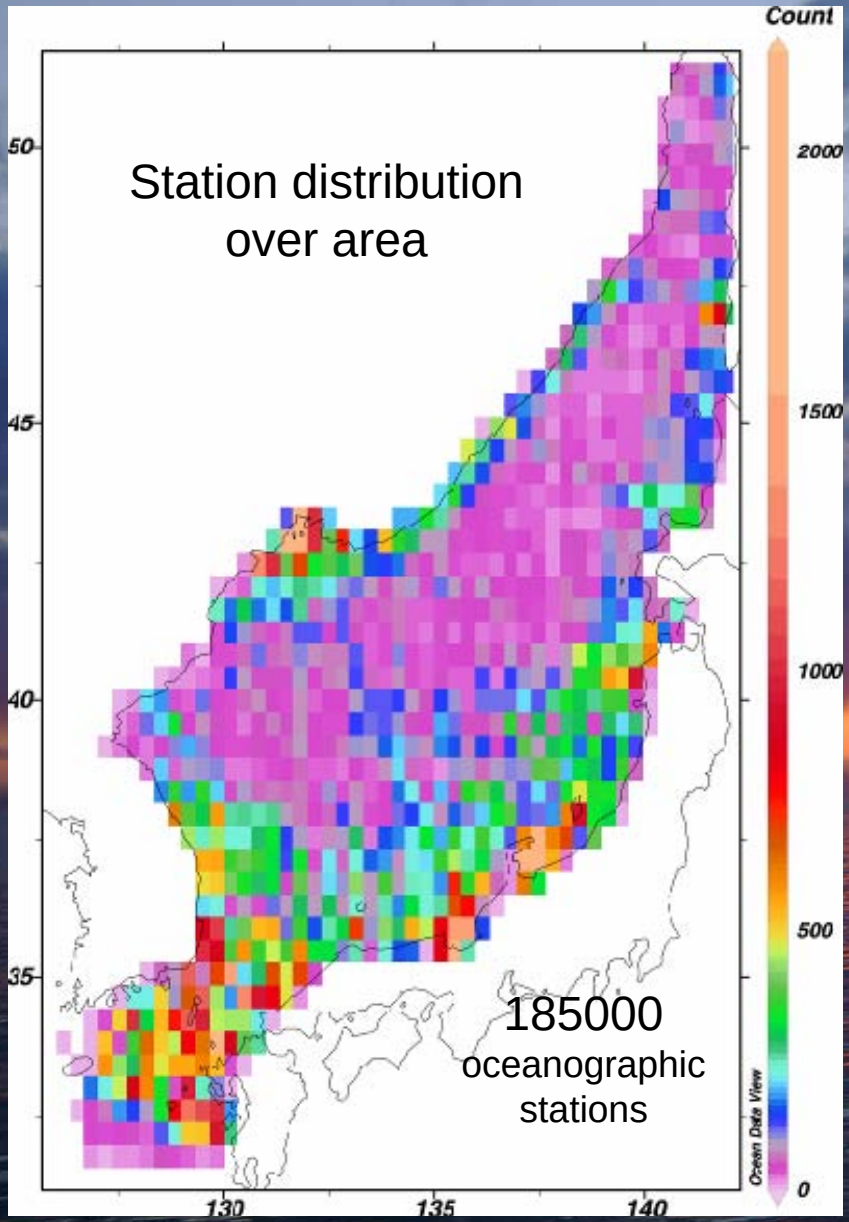
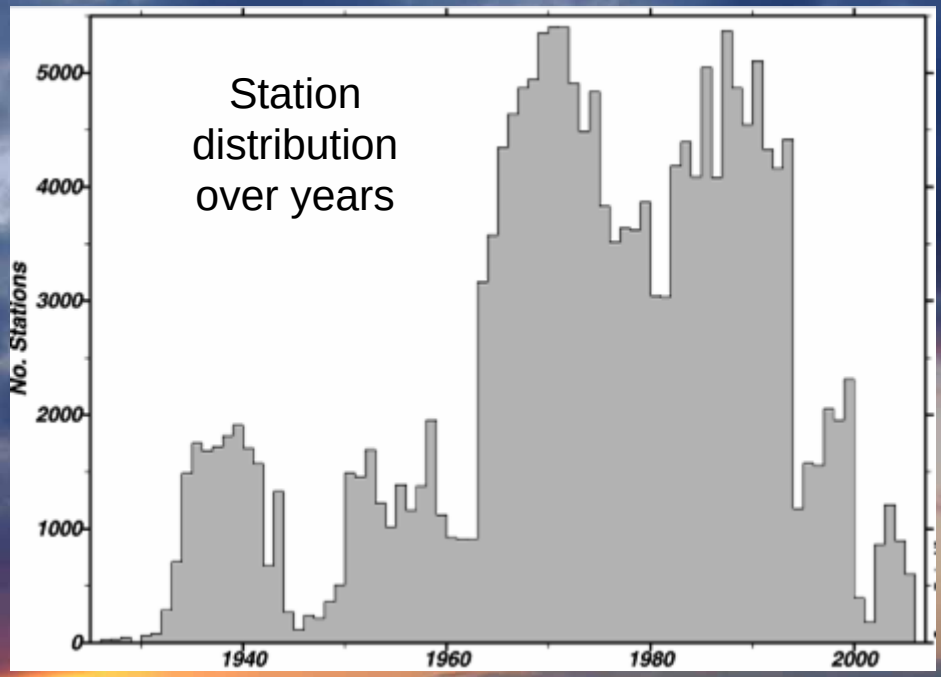
Goals and methods

- Multiscale variability of Japan/East Sea salinity is examined:
  - ✓ *using an oceanographic database for 1920-2006 which includes about 185,000 salinity profiles;*
  - ✓ *using* GDEM *grid [https://128.160.23.42/gdemv/gdemv.html]*
- Accuracy of salinity tool measurements for the different time periods is determined.
- Statistical research of salinity is carried out. There is used cluster analysis mainly.

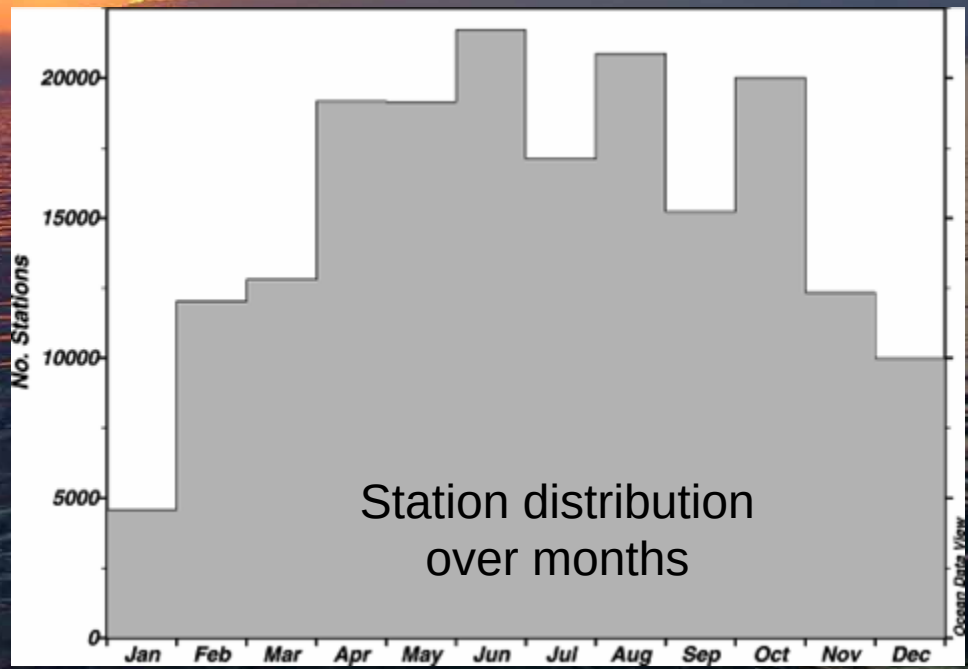


Station distribution over area

185000 oceanographic stations



Station distribution over years

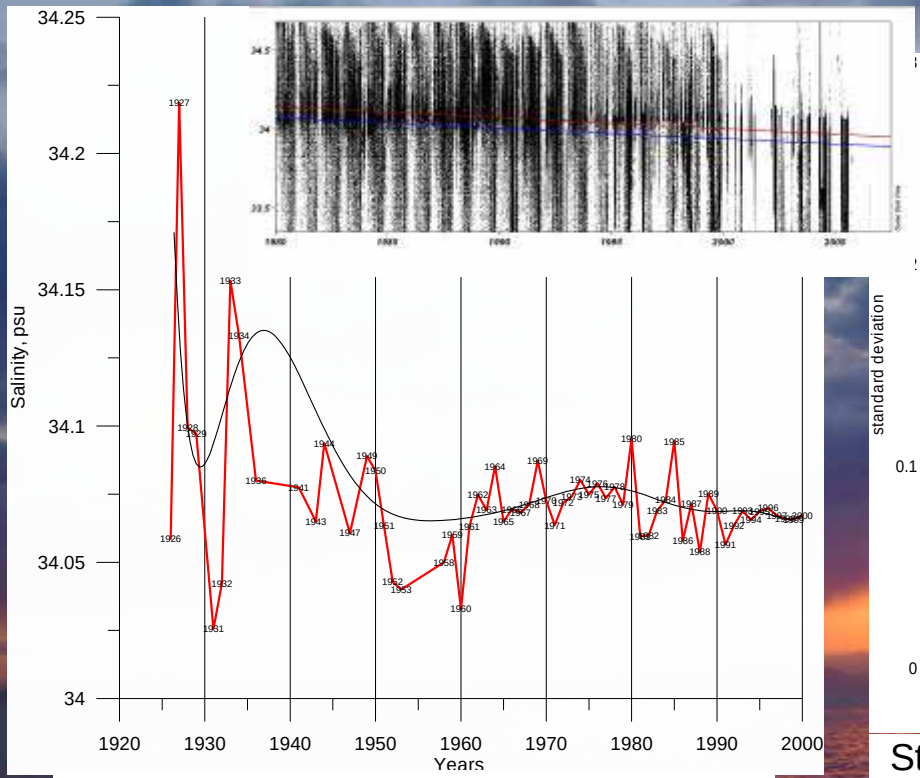


Station distribution over months

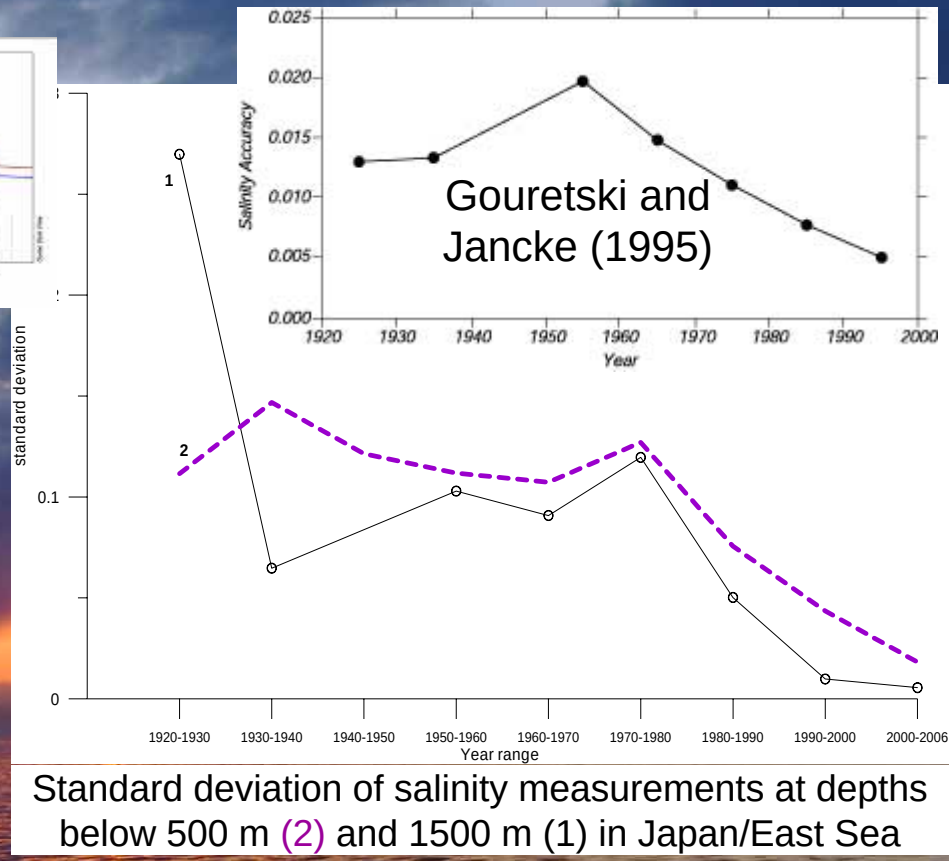
Data with salinity profile are collected from multiple sources using Ocean Data View

(Schlitzer, R., Ocean Data View, http://odv.awi.de, 2007)

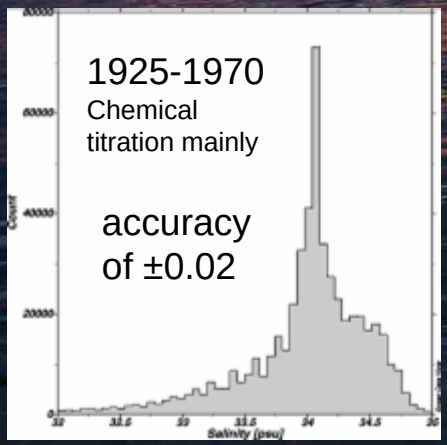
Accuracy of salinity measurements over different time period in Japan/East Sea

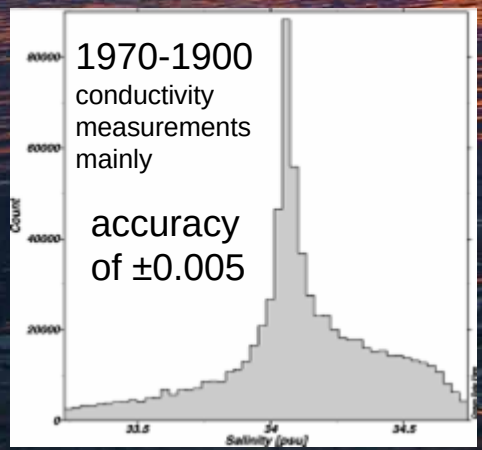


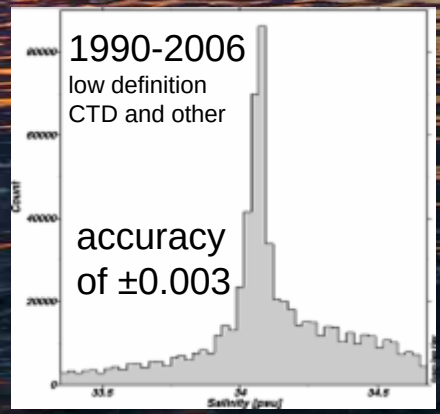
Annual salinity in layer 1000-2000 m

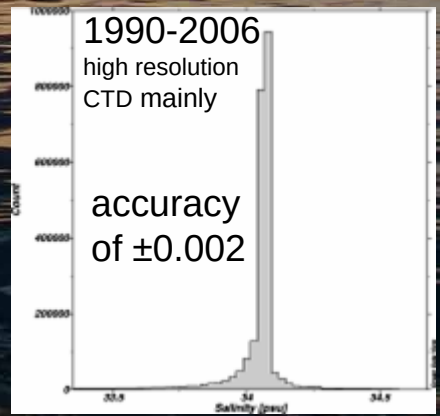


Standard deviation of salinity measurements at depths below 500 m (2) and 1500 m (1) in Japan/East Sea



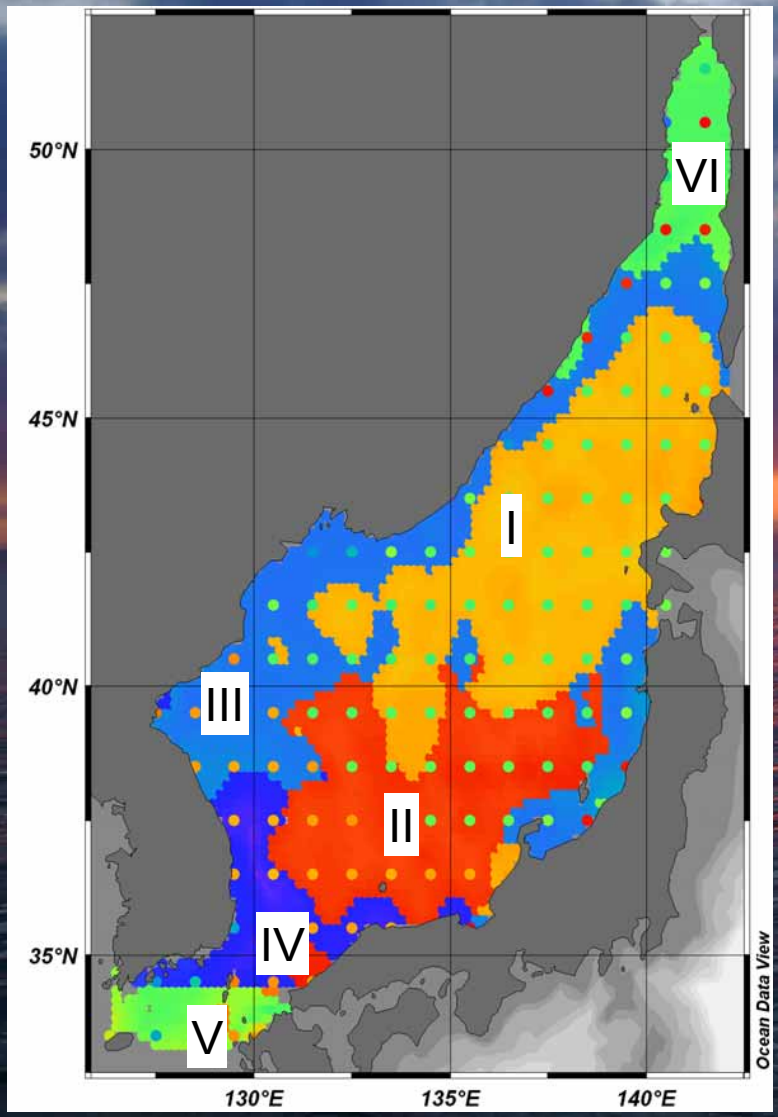


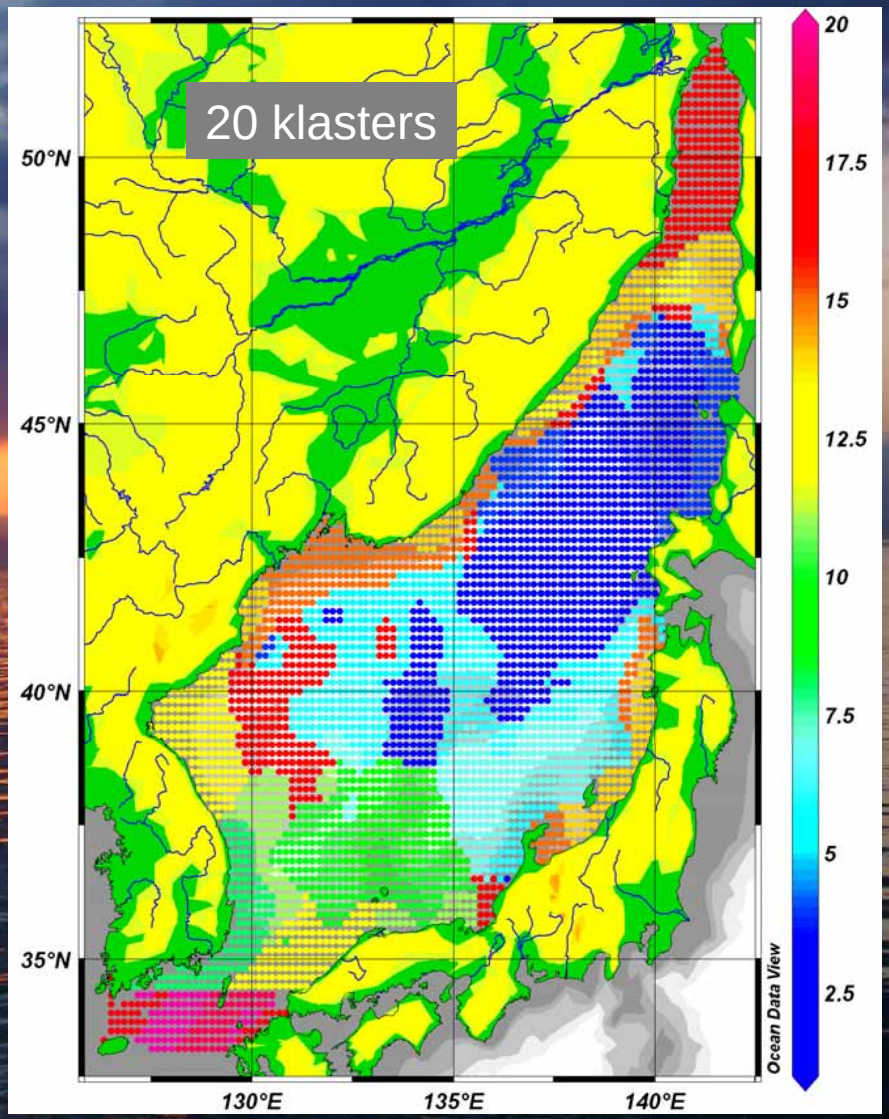




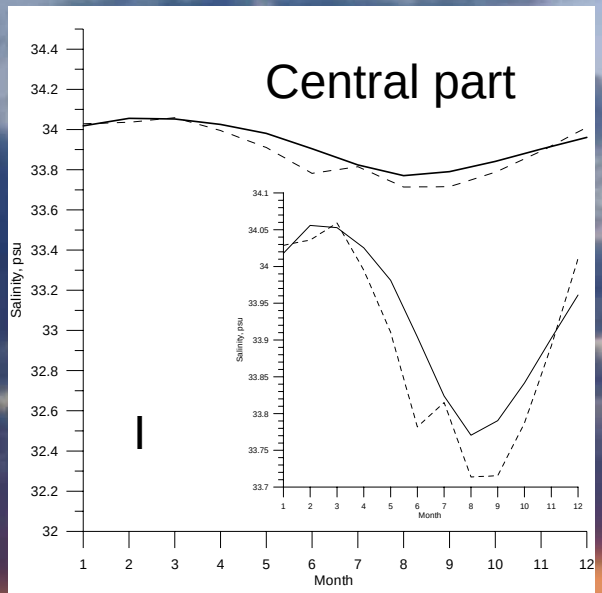
Salinity distribution over various measurement time period

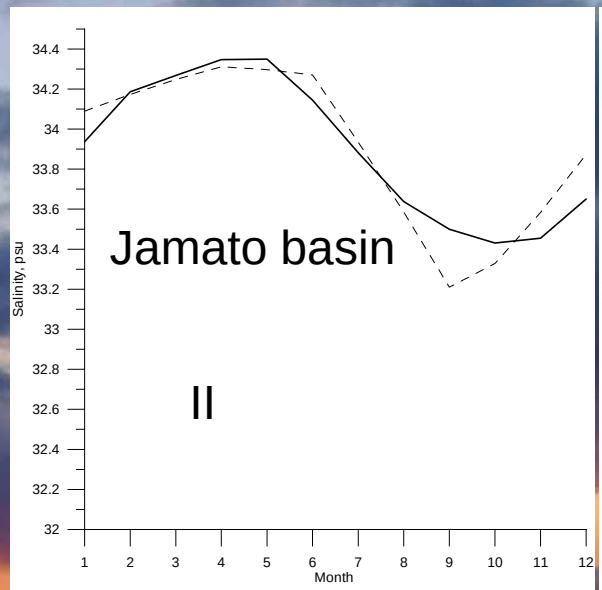
K-mean cluster analysis of salinity seasonal variation curves

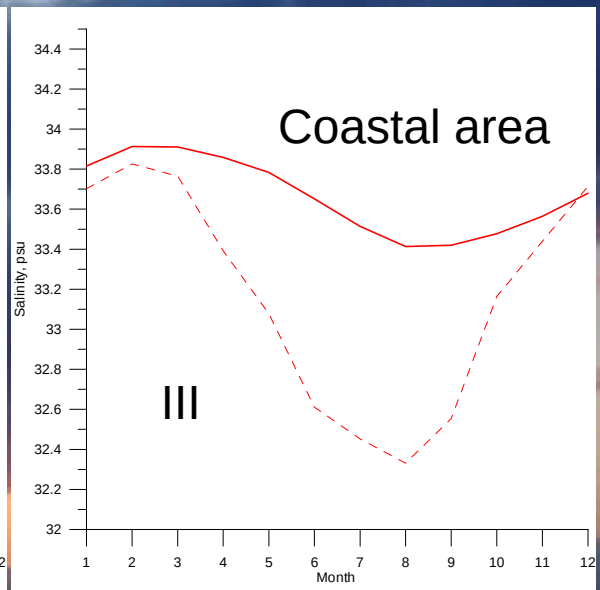


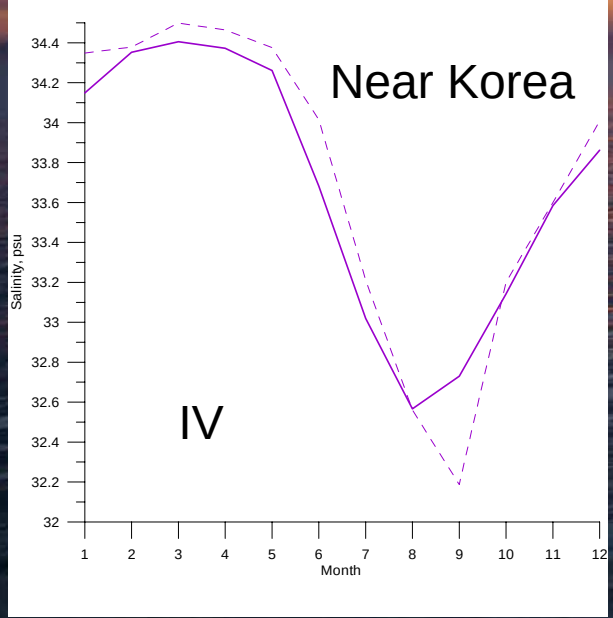


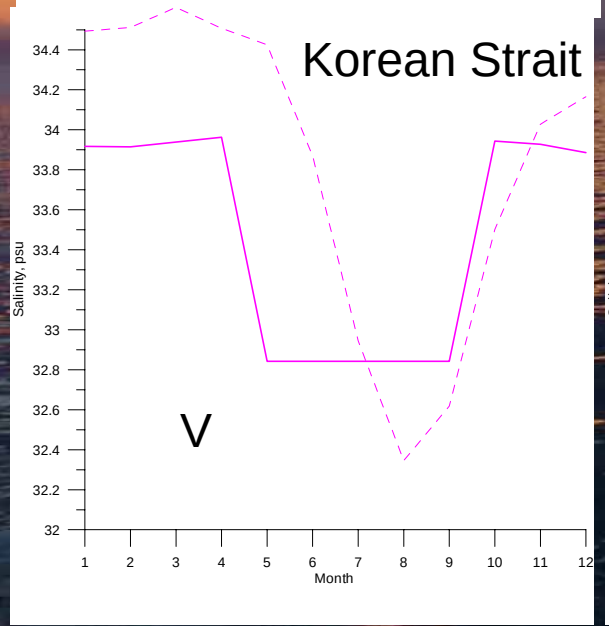
Seasonal variation of averaged water salinity at the surface in different subregions of the Japan/East Sea

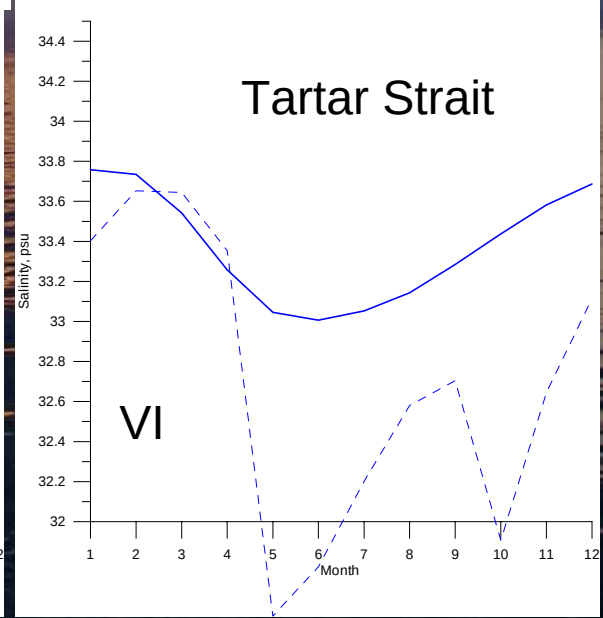








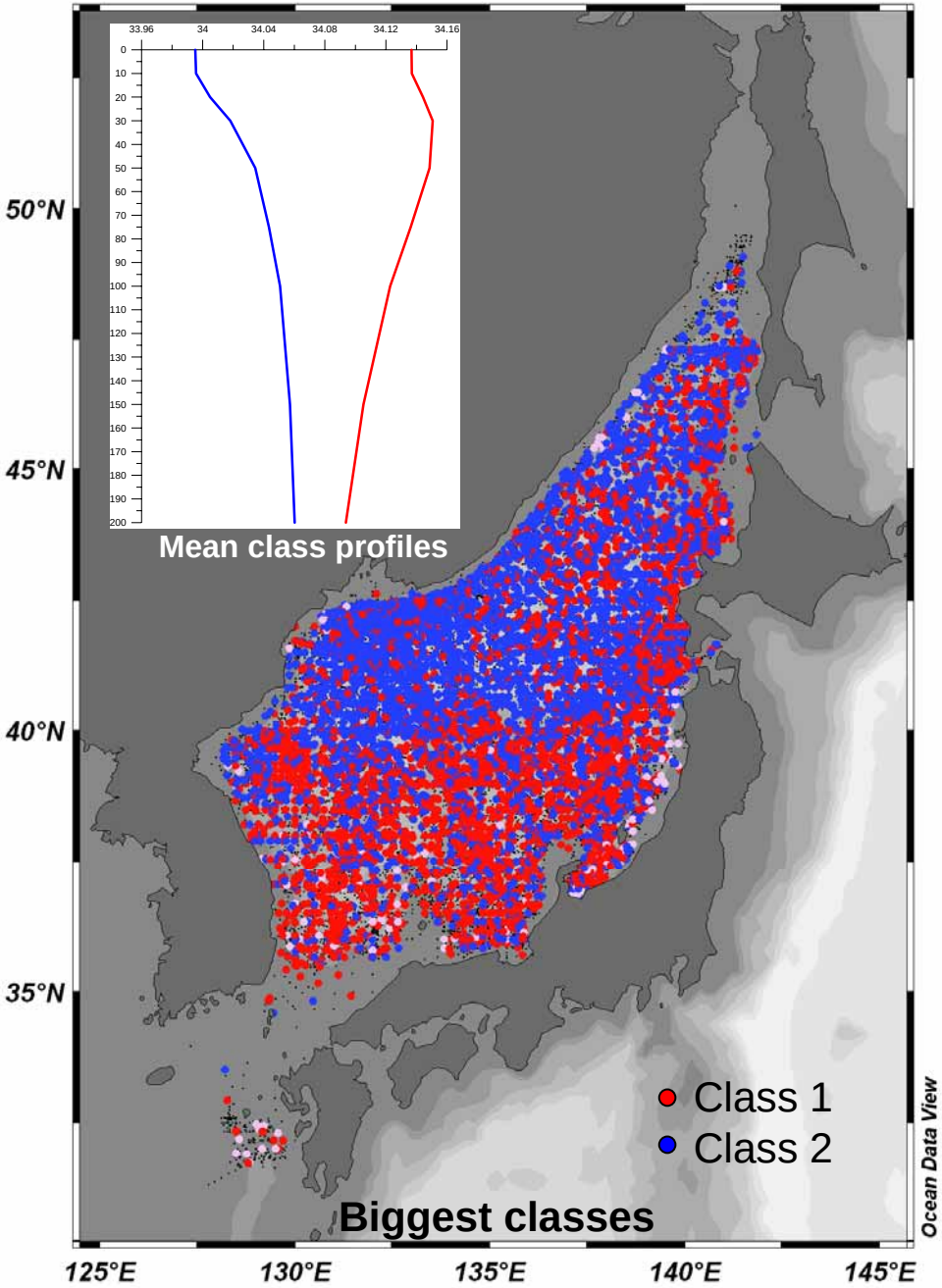




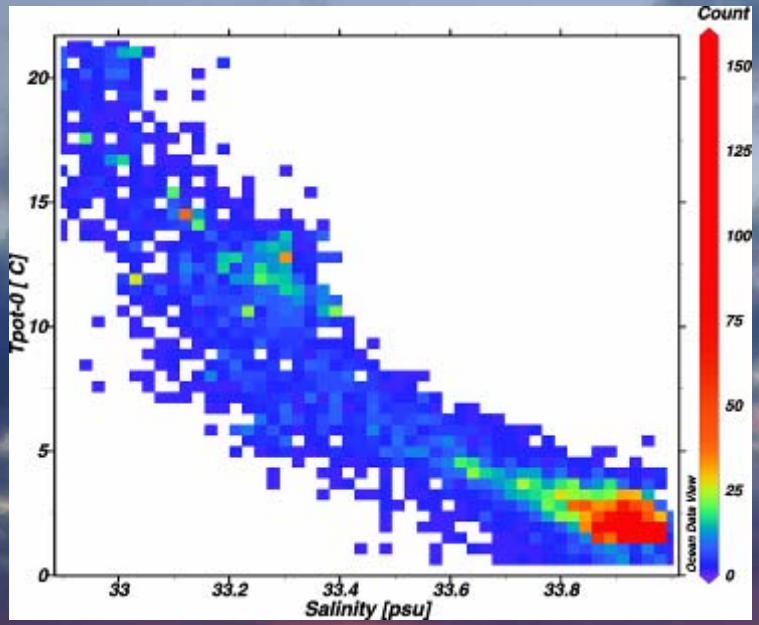
GDEM

Data Base

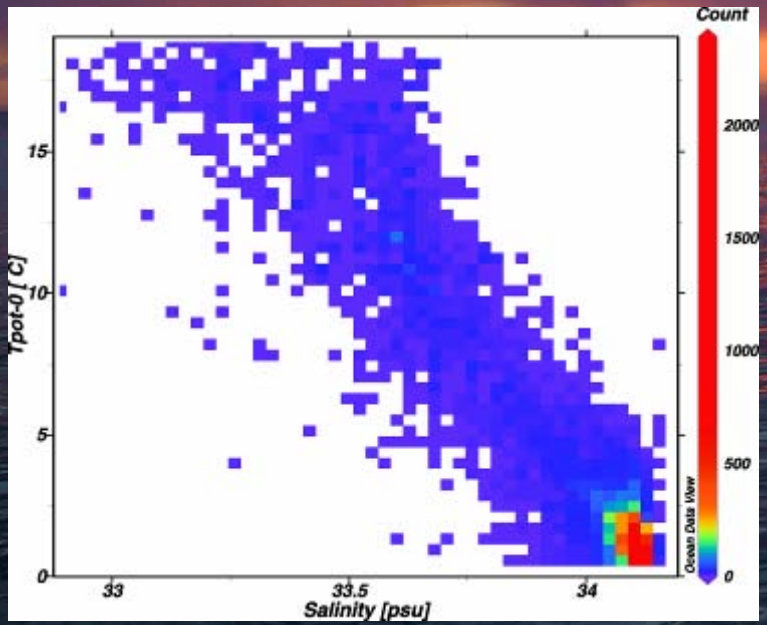
K-mean cluster analysis of salinity profiles in layer 0-200 m

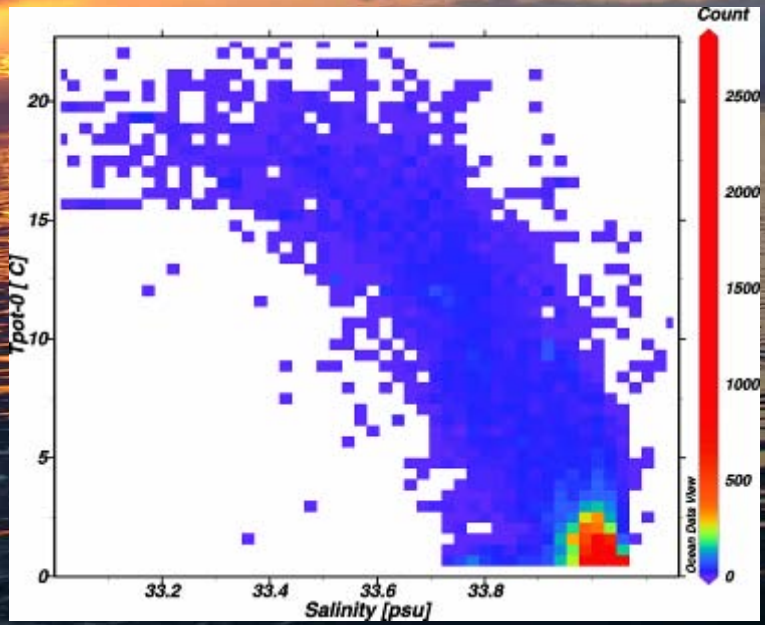


72000 salinity profiles were analyzed. About 15 clusters were marked. There are shown seasonal and spatial features of salinity variability. Clear differences between Northwestern and Southeastern parts are became apparent.

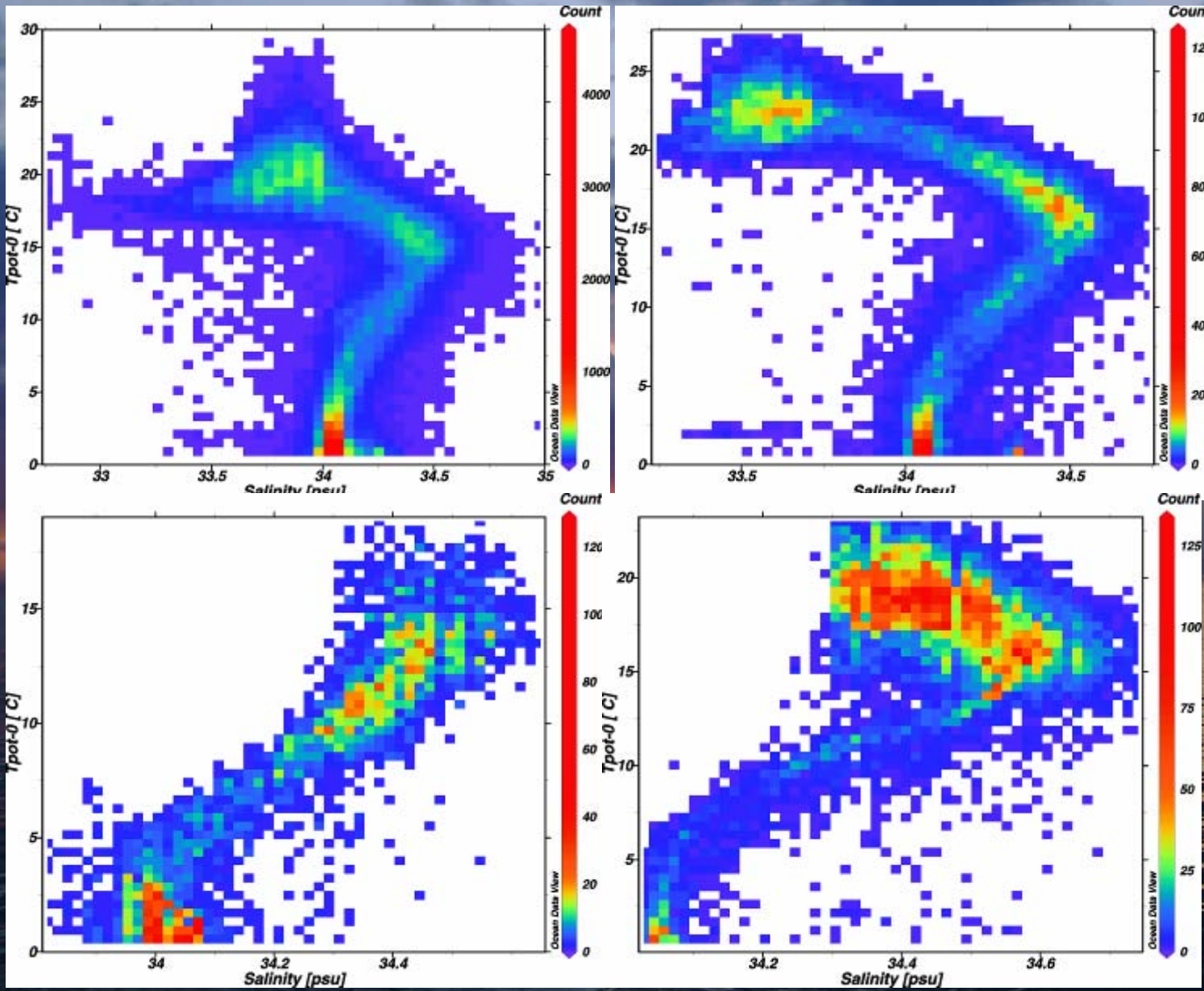


TS-diagram also has characterized features for Northwestern and Southeastern parts of Japan/East Sea. Forms of TS-scattering for North area are monotonous mostly and differed by slope and dispersion.





Typical TS-diagram in the North part of the Japan/East sea



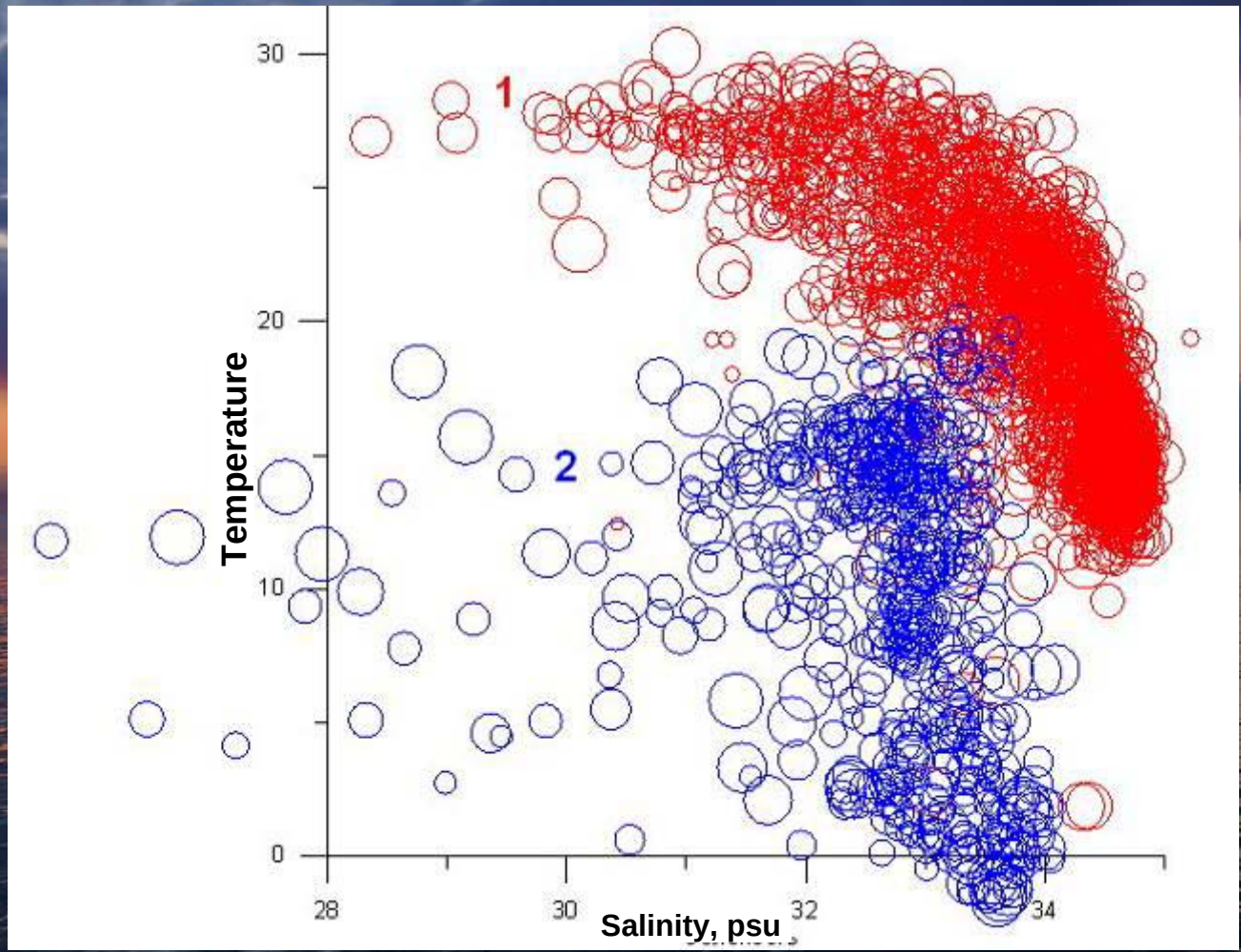
Forms of TS-scattering for South area are more various and more differed.

Maximum dispersion TS-scattering is observed in coastal area both north and south sea parts.

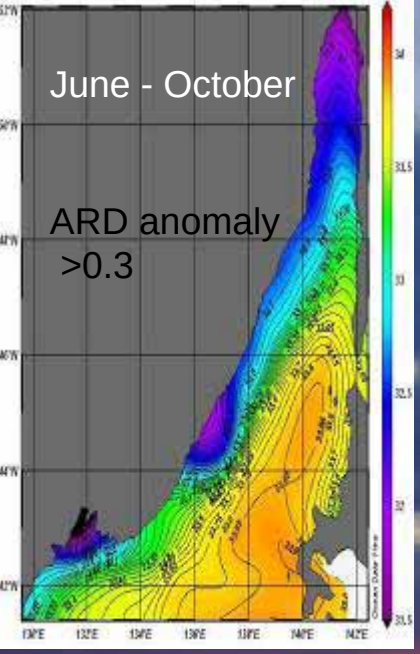
Typical TS-diagram in the South part of the Japan/East sea

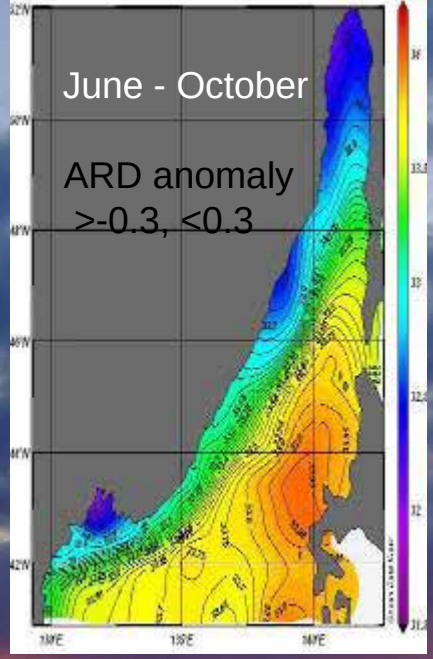
Temperature and salinity in various regions of the Japan/East sea have noticeable distinct

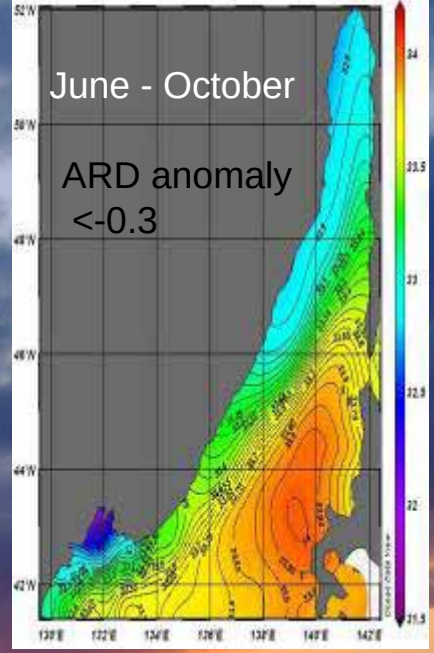
- Waters of Tartar and Korean Straits reveal max differences more in temperature less in salinity.
- Both are influenced power river input at the adjust areas (Amur and Yangtze).

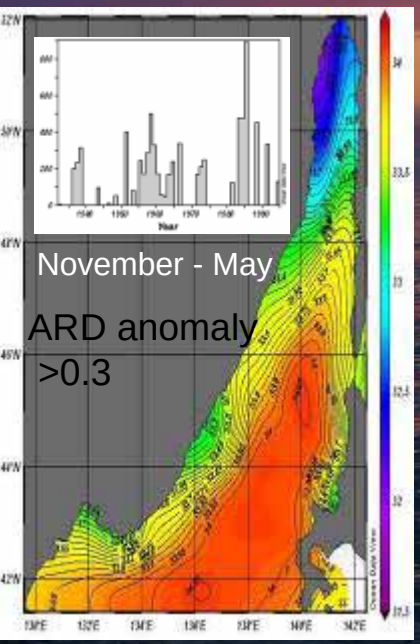


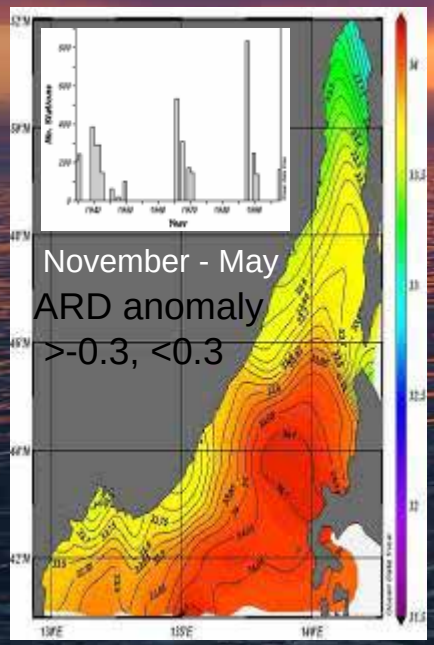
TS-scatter in Korean (1) and Tartar (2) straits, 1928-2005

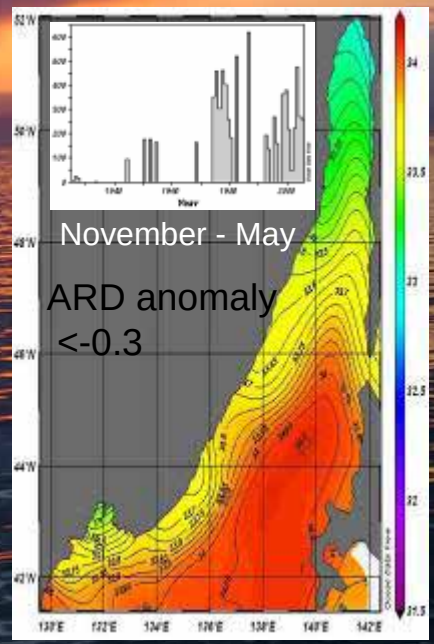






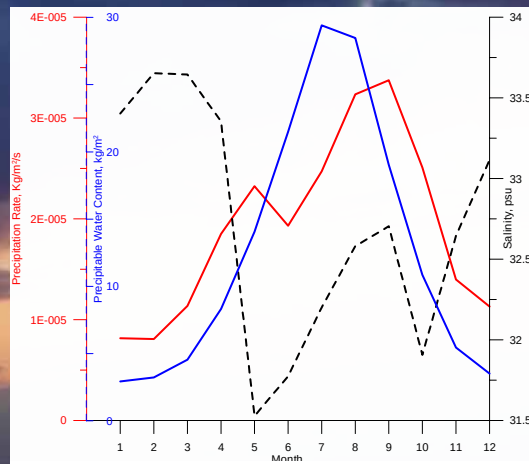






Salinity distribution in the north part of the Japan/East Sea over time periods of different Amur river discharge (ARD) anomalies

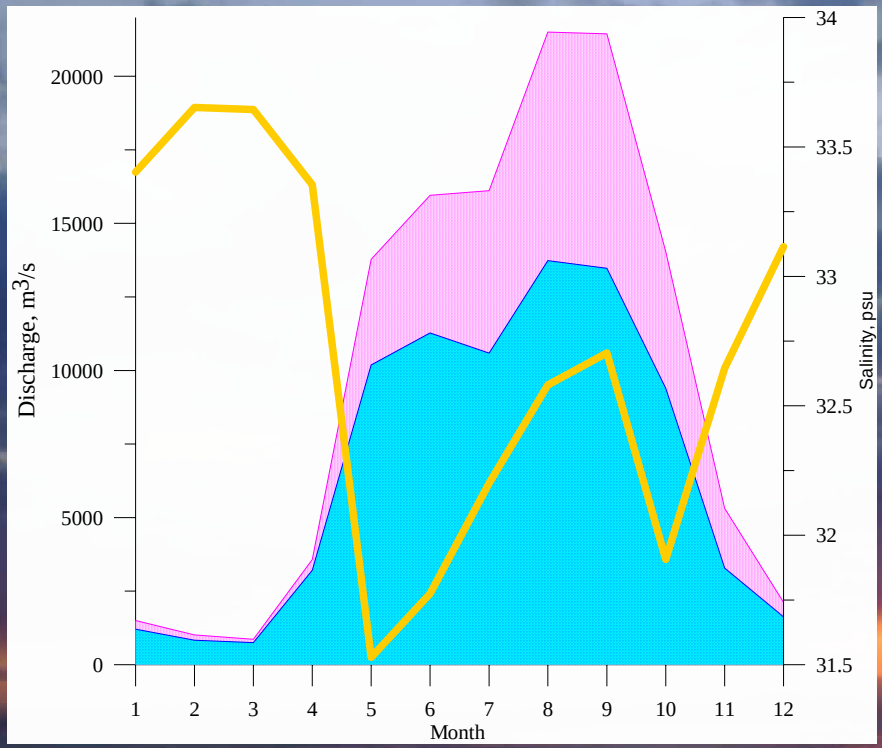
Amur River input impact on Tartar strait salinity on the whole



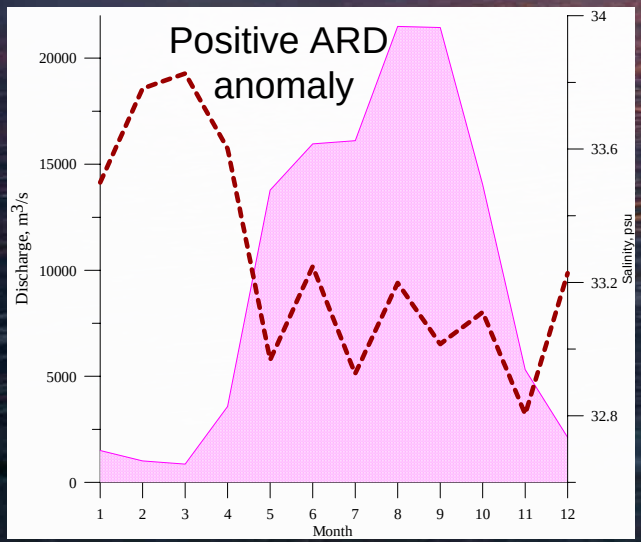
Annual variation of salinity and precipitation in Tartar strait

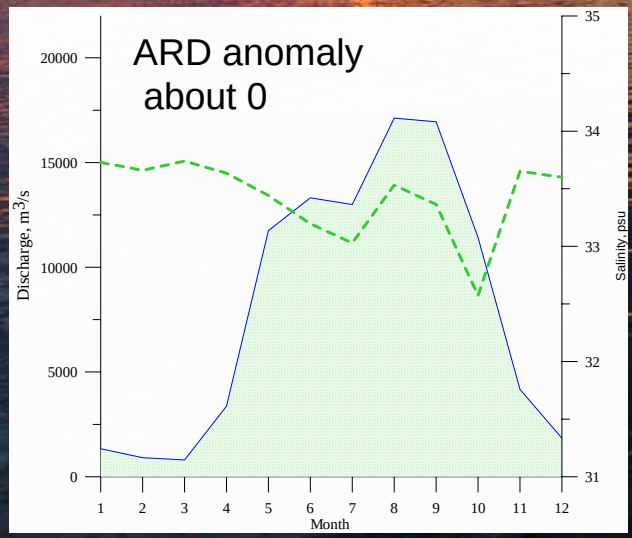
Minimum salinity of the Tartar Strait waters is marked in May and October. There are closely related with Amur River run-of and monsoon.

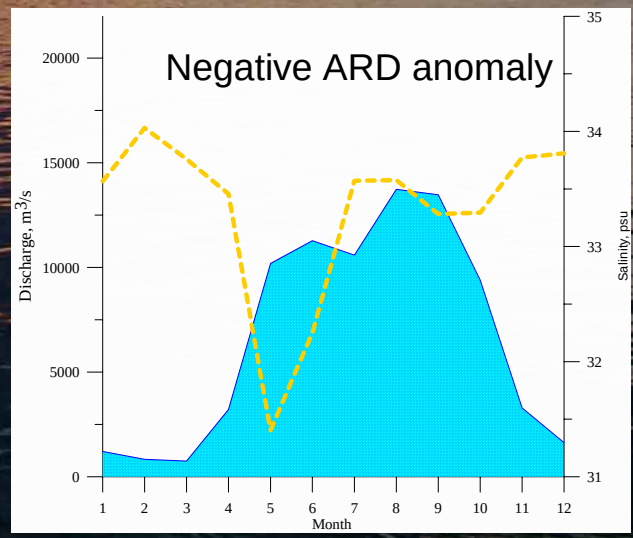
Annual variation of surface water salinity in Tartar strait and Amur River discharge



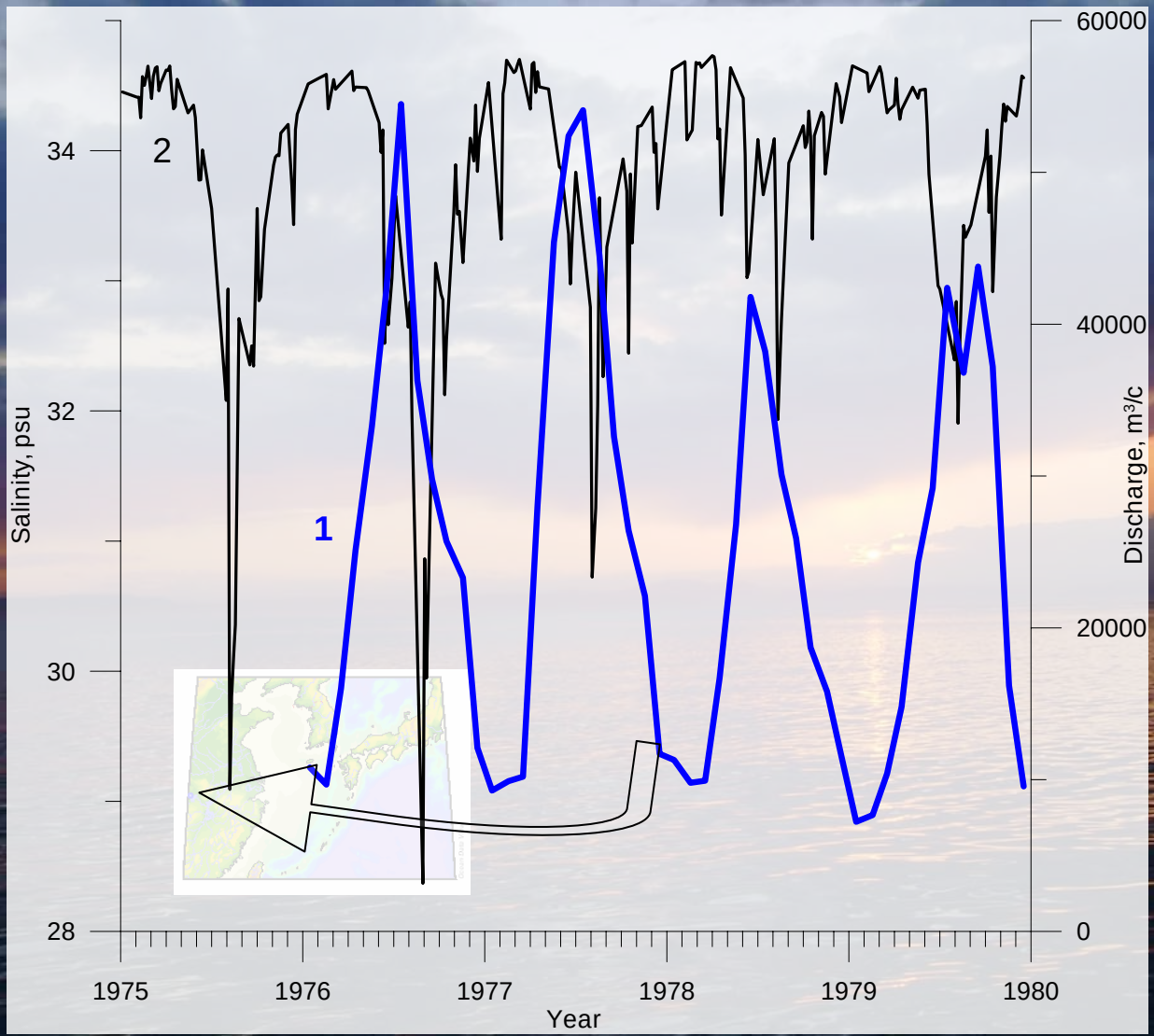
May salinity minimum is pronounced over Amur River low-flow period. When Amur River is full-flowing Tartar strait surface water has low salinity over all worm season. When Amur River run-off is normal minimum salinity become apparent at the October when northern wind begin be more intensive.



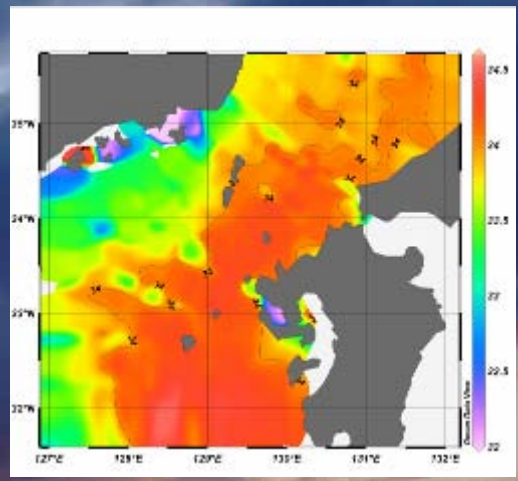




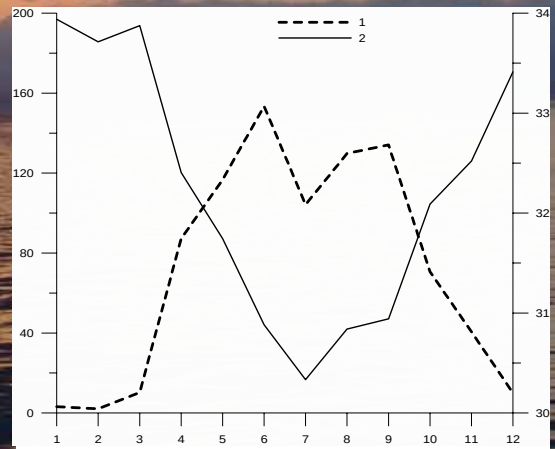
River fresh water influence on surface salinity variability and distribution



Monthly discharge of Yangtze River (1) and oscillations of monthly salinity in Korean strait 0-5 m layer (2)

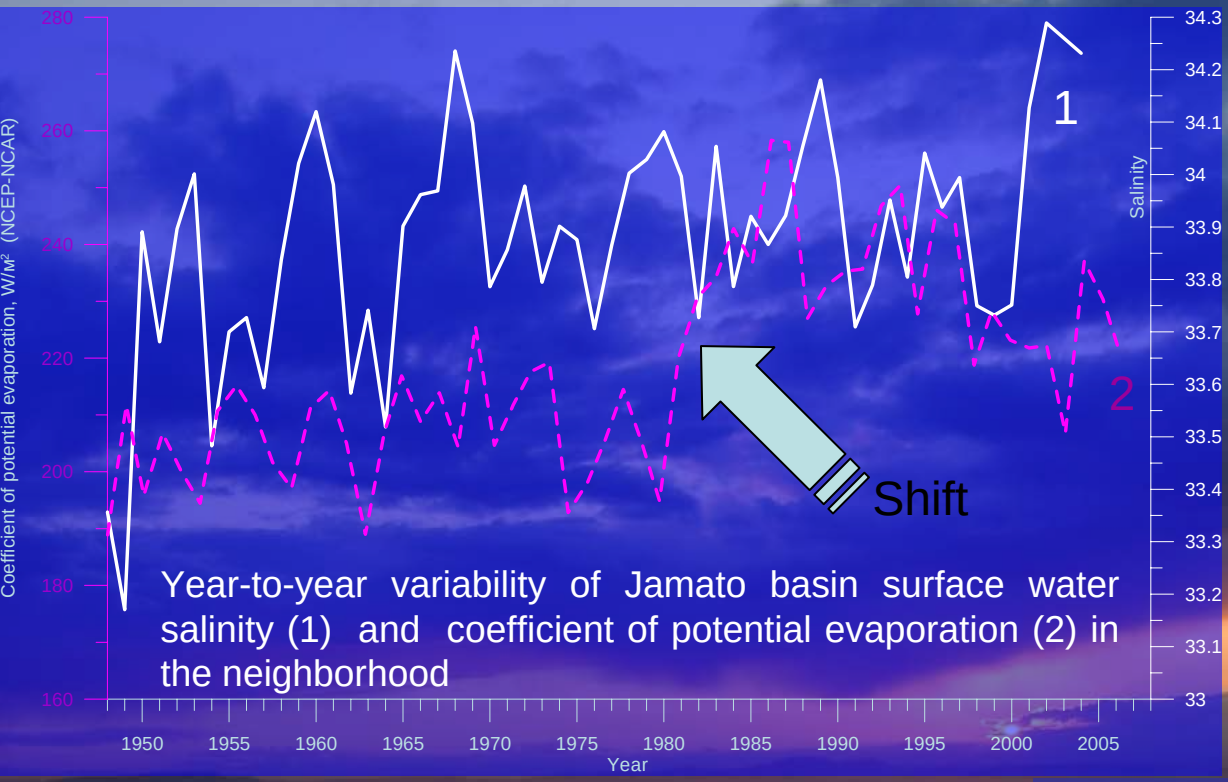


Annual salinity distribution in Korean Strait



Annual variation Peter the Great Bay surface salinity (2) and Suifun River Input (1)

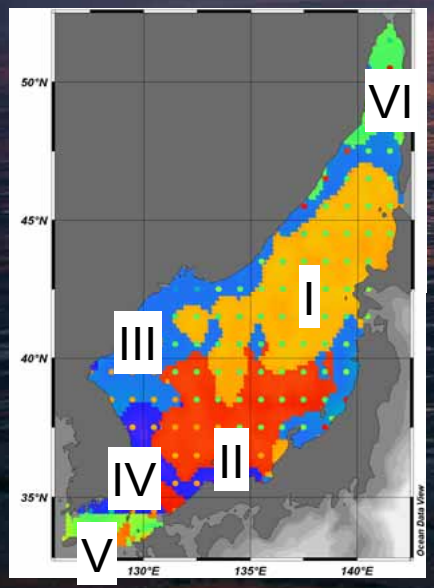
1948-2005



Year-to-year variability of Jamato basin surface water salinity (1) and coefficient of potential evaporation (2) in the neighborhood

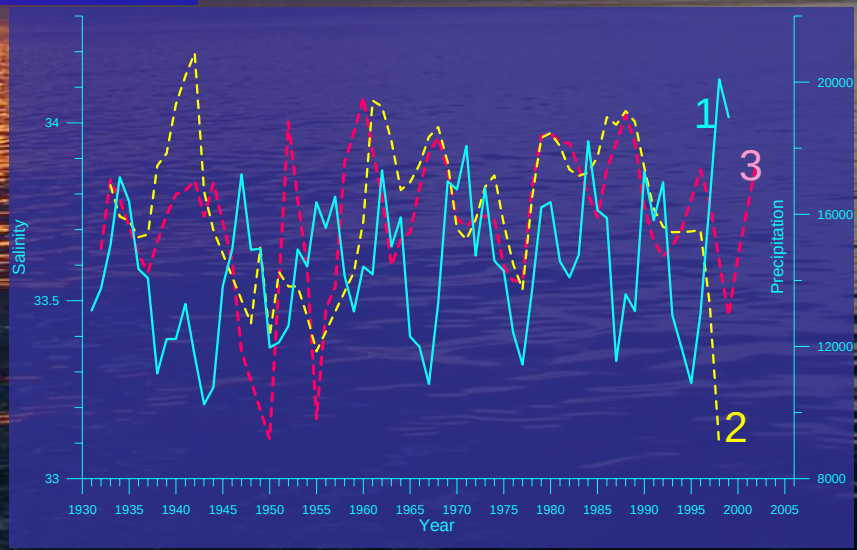
Correlation surface water salinity and evaporation affinity

Subregion	Correlation coefficient
1	0.44
2	**0.68**
3	**0.5**
4	0.37
5	0.36
6	0.3

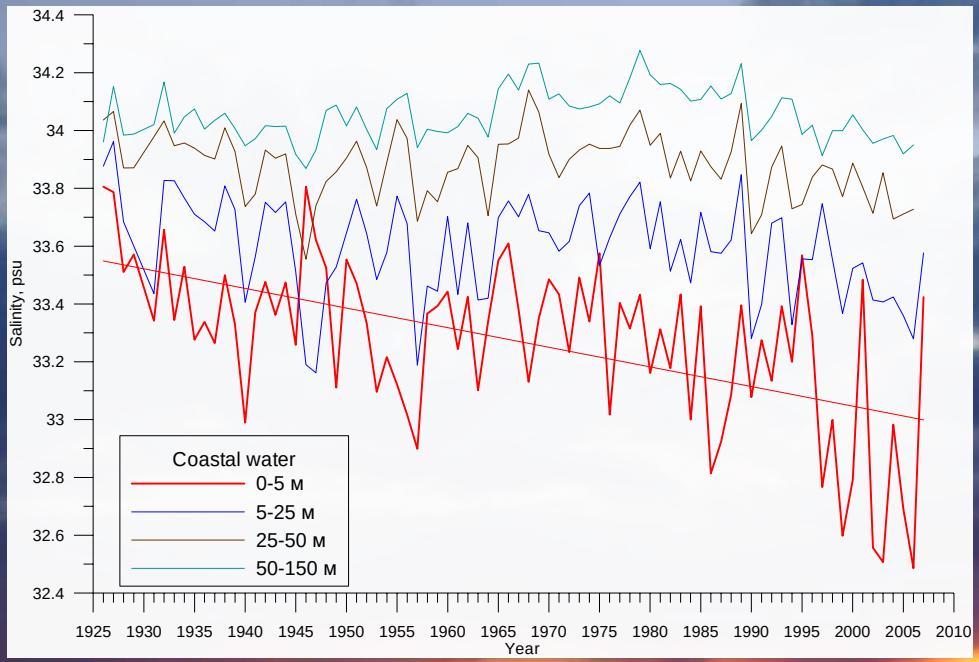


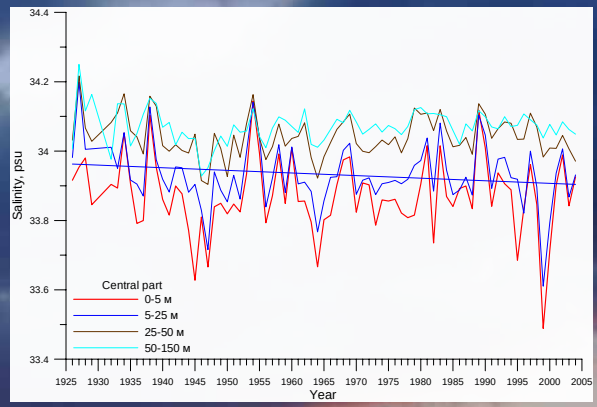
Correlation surface water salinity and precipitation

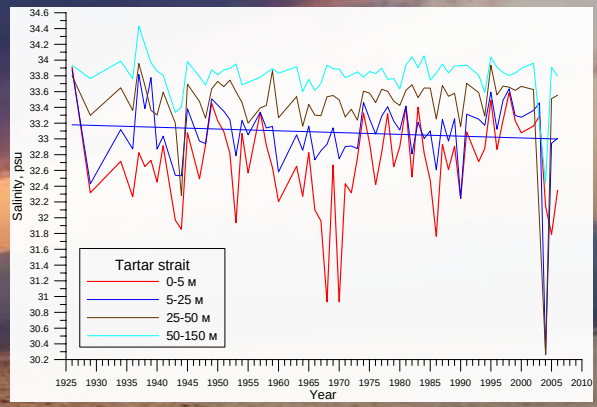
Subregion	Correlation coefficient
1	**-0.38**
2	**-0.37**
3	**-0.5**
4	**-0.6**
5	**-0.73**
6	**-0.17**

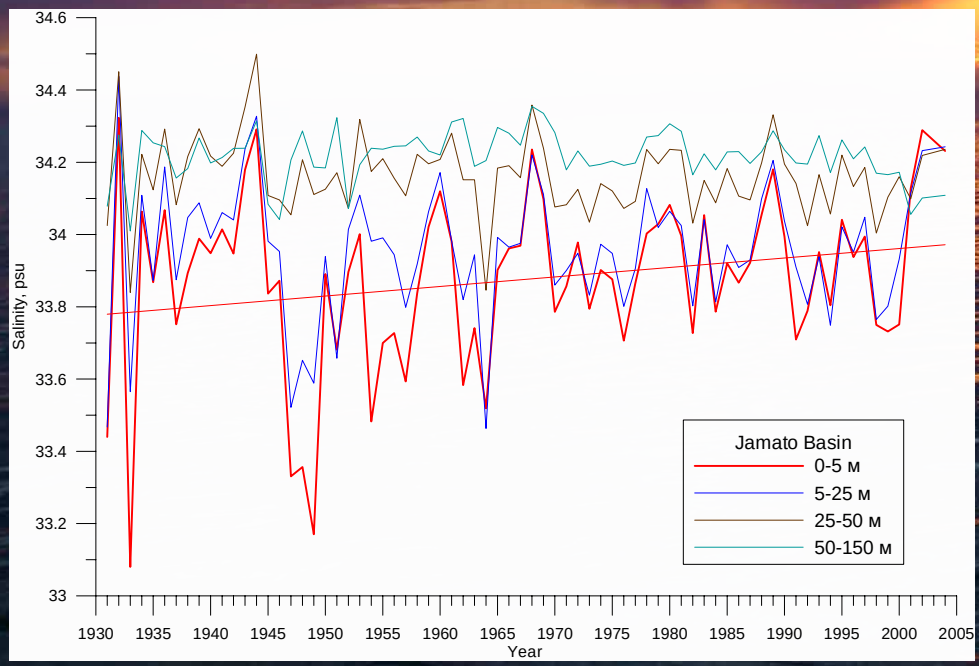


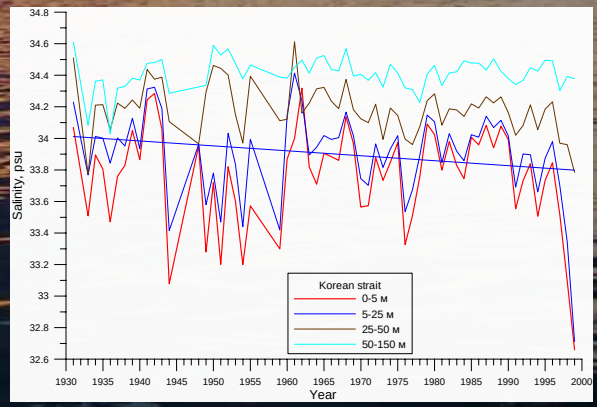
Variability of precipitation sum (1) in Bussan and salinity at the surface of Korean strait (2) and near Korea(3)



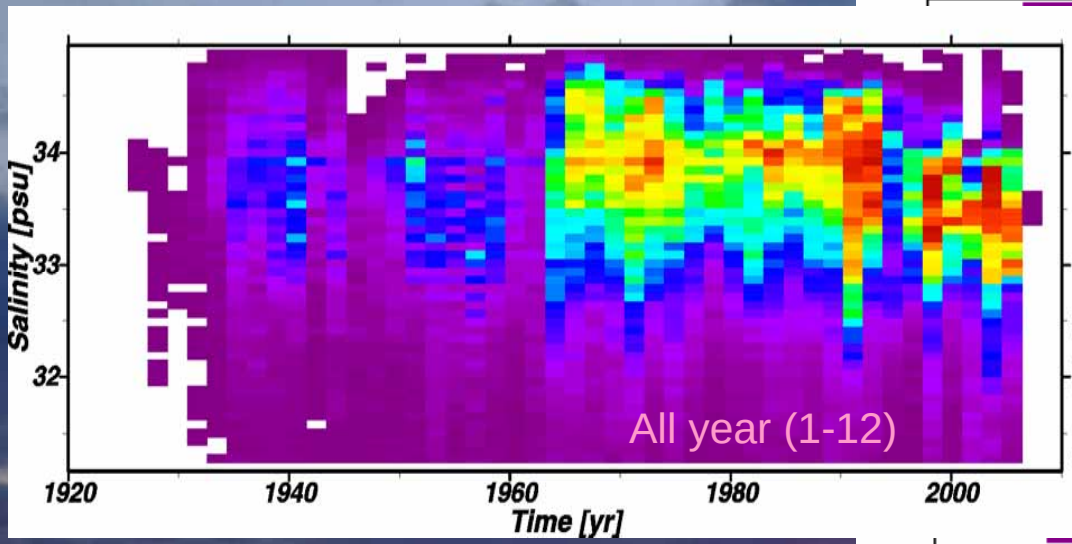


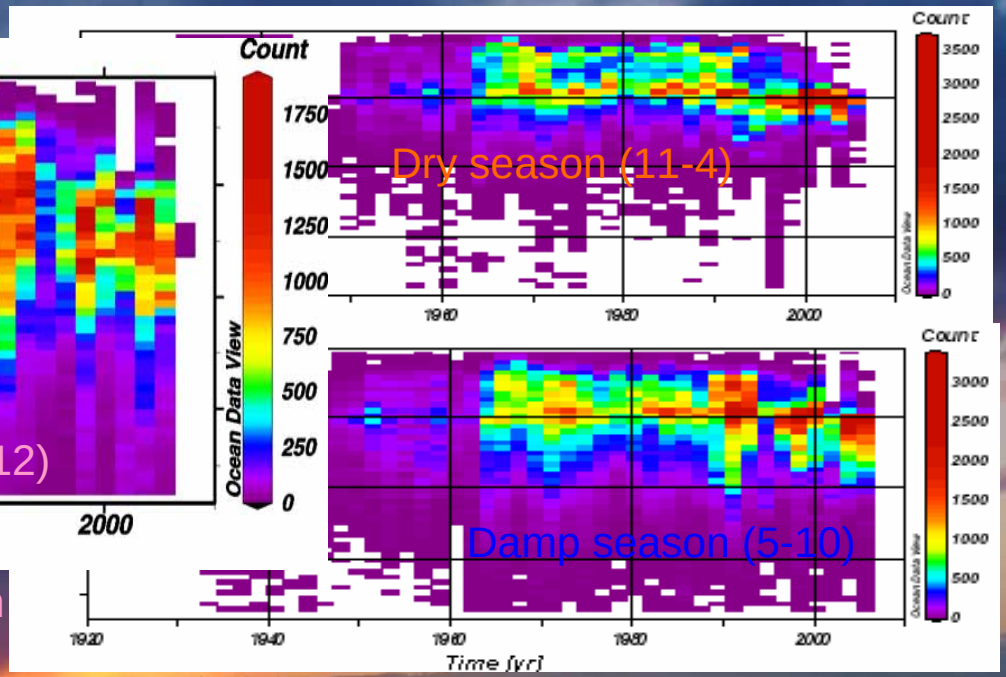






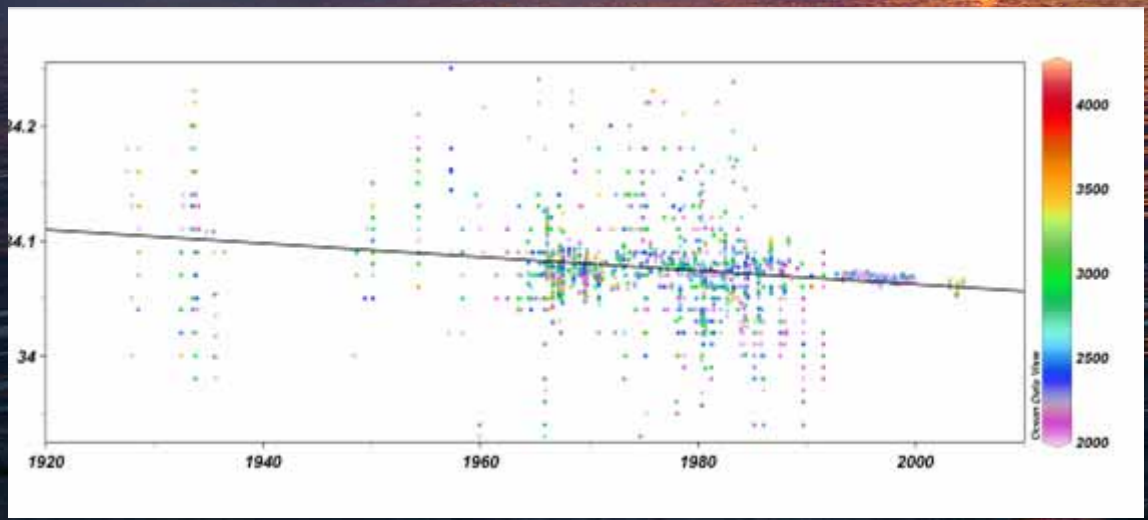
Year-to-Year upper layer water salinity variability in Japan/East Sea subregions

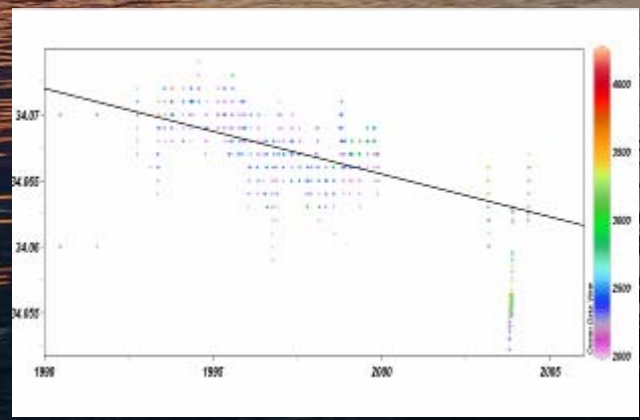




Count diagram of the salinity in layer 15-50 m

For the last time salinity less then 34 psu became marked more often in up layer of the Japan/East Sea. And the salinity tends decrease in deeper layer





Salinity trend below 2000 m in Japan/East Sea central basin

Summary

- Japan Sea divided on 6 separate subregions with cluster analysis of salinity seasonal variation.
- Spatial and temporary salinity distribution here reveals own character factor-dependent in different ways. Any kind advection and wind exert profound effect in addition to evaporation-precipitation ratio.
- River input influence on salinity variability in Tartar and Korean straits and adjacent area
- Last time frequent salinity value is downstream than before

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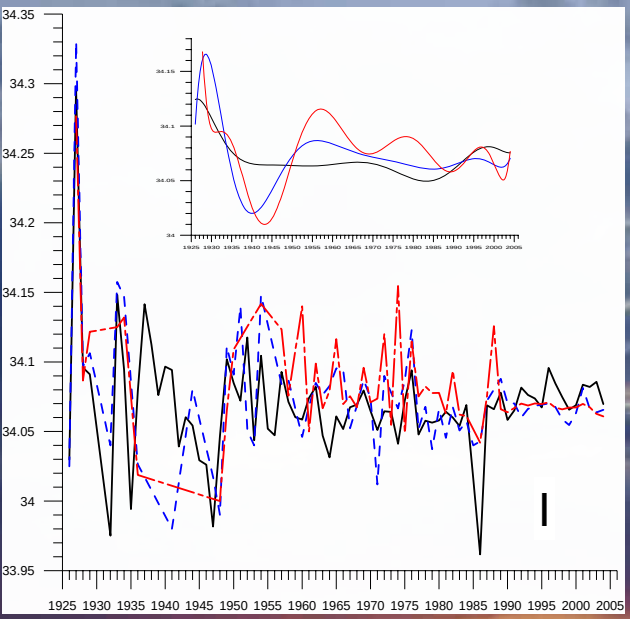

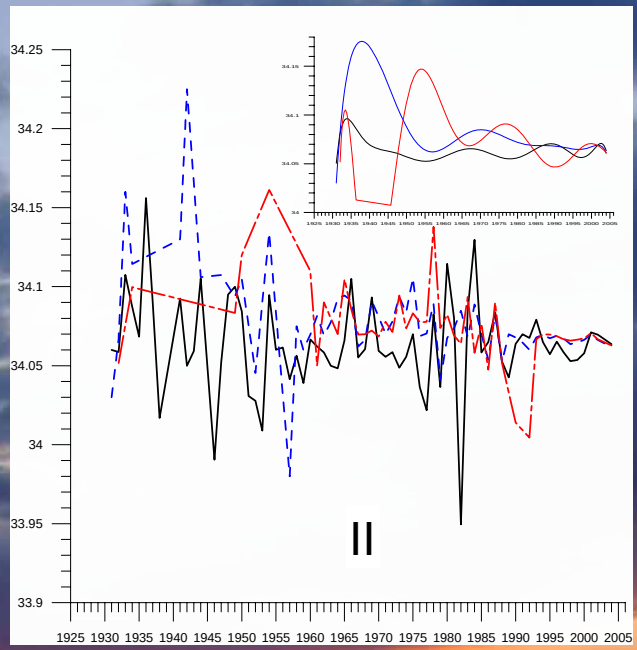

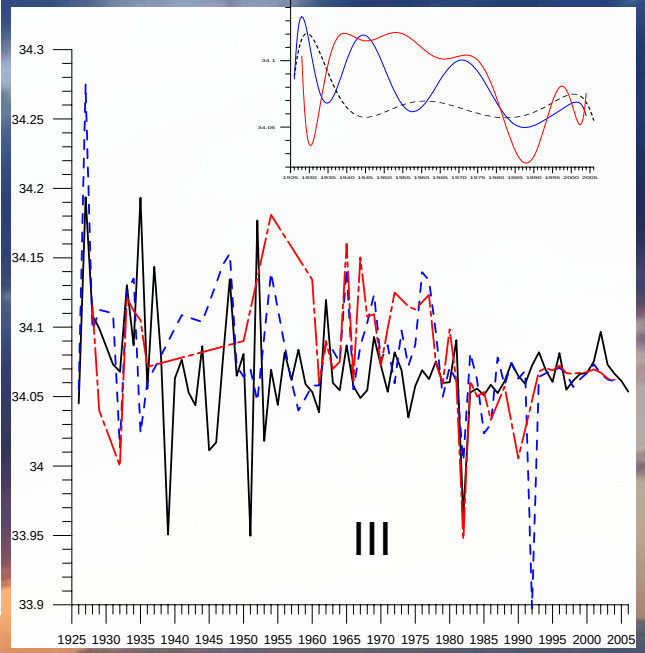

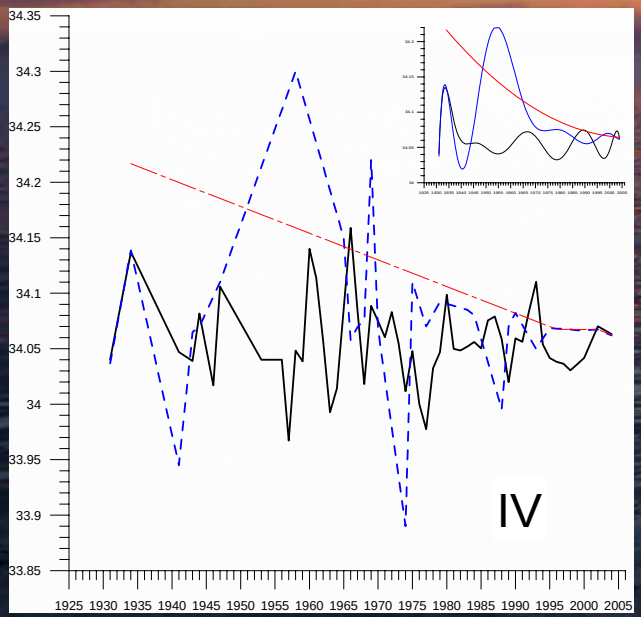

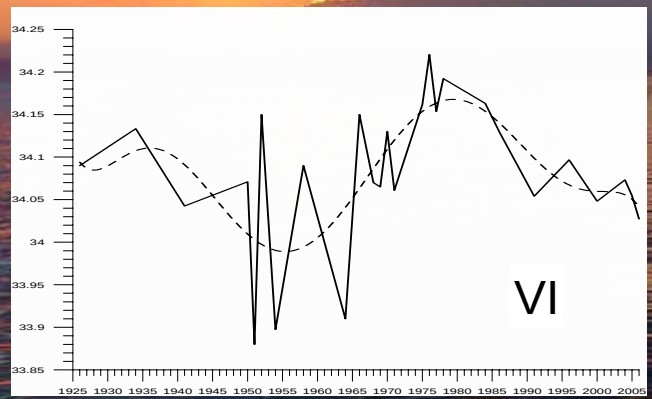

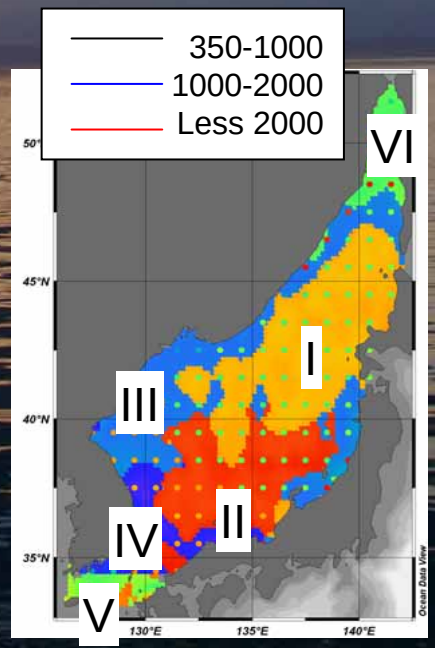

Year-to-Year deeper layer water salinity variability in Japan/East Sea subregions with polynomial fitting