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Multi-decadal changes in the Far East salmon stocks in relation to climate regime shifts in the Northern Hemisphere

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THE MAIN PURPOSE

To consider, how the multi-decadal changes in the state of Far East salmon stocks are related to the large-scale climatic patterns in the Northern Hemisphere and their shifts, taken West Kamchatka pink salmon stock as an example.

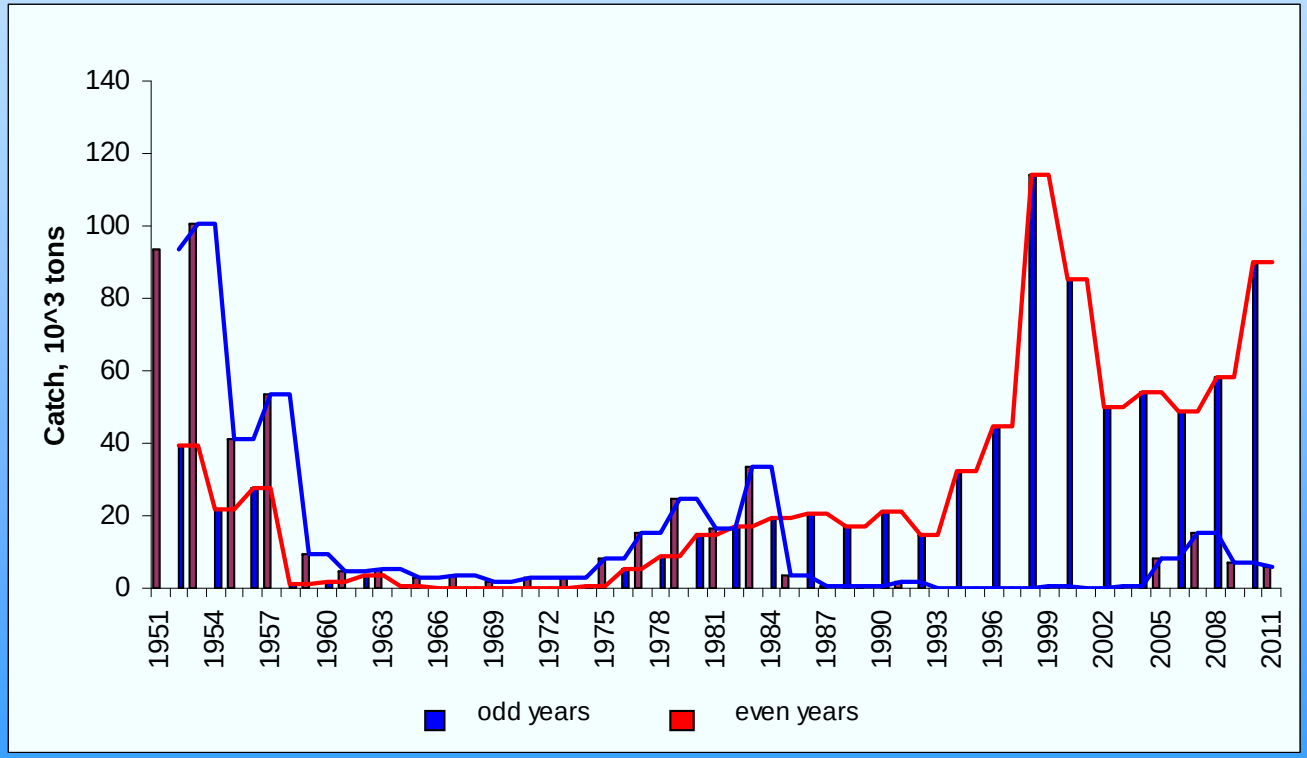
Data for 1951-2010

- ERSST v.3b (www.ncdc.noaa.gov/ersst/)
- H_{500} (NCEP/NCAR Reanalysis; www.esrl.noaa.gov/psd/data/gridded/data.ncep.reanalysis.html)
- Climatic indices (www.esrl.noaa.gov/psd/data/climateindices/)
- West Kamchatka pink salmon catches:

  1951-1970 (Dynamics…, 1989)

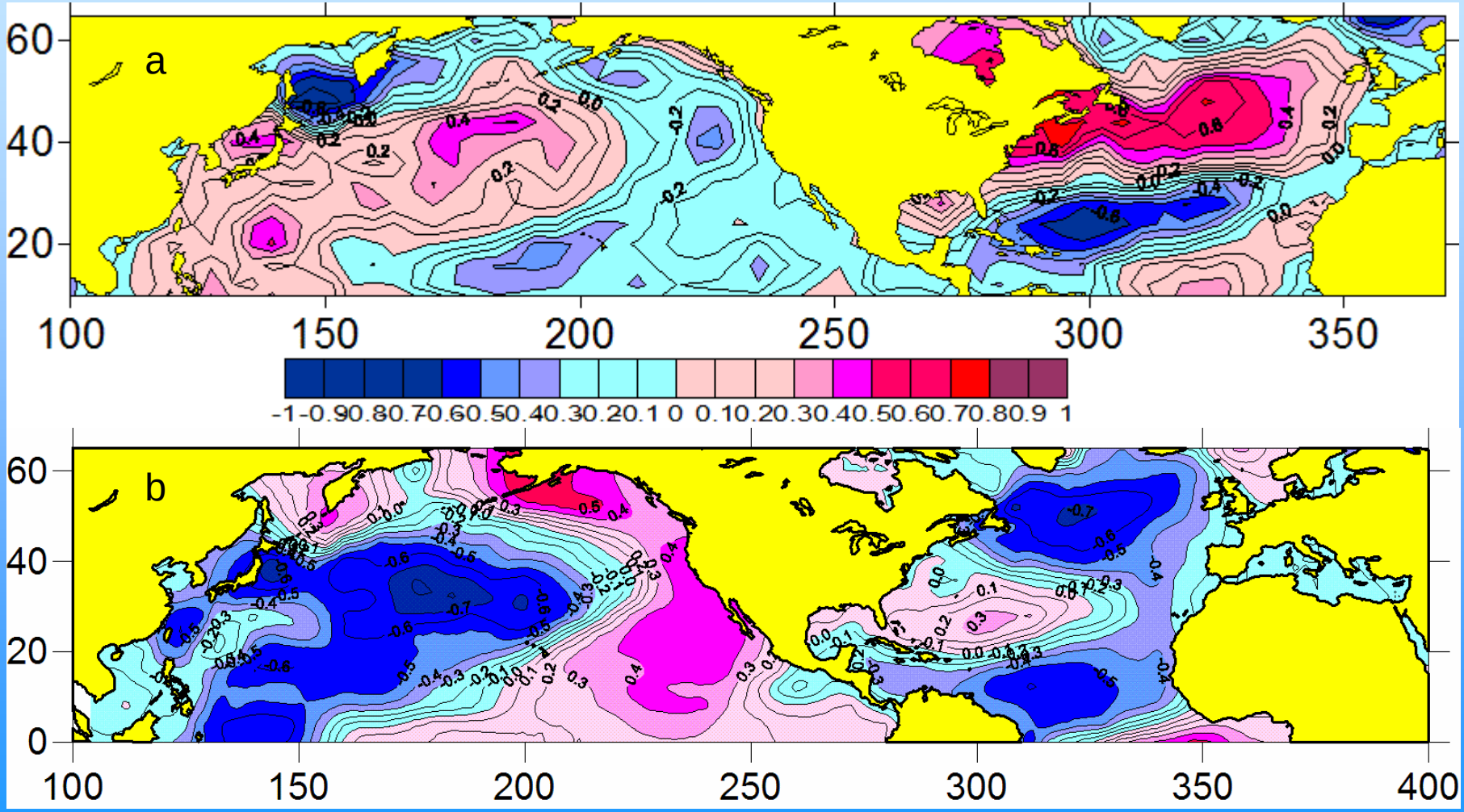
  1971-2010 (NPAFC Reports)

West Kamchatka pink salmon catches in 1951-2011

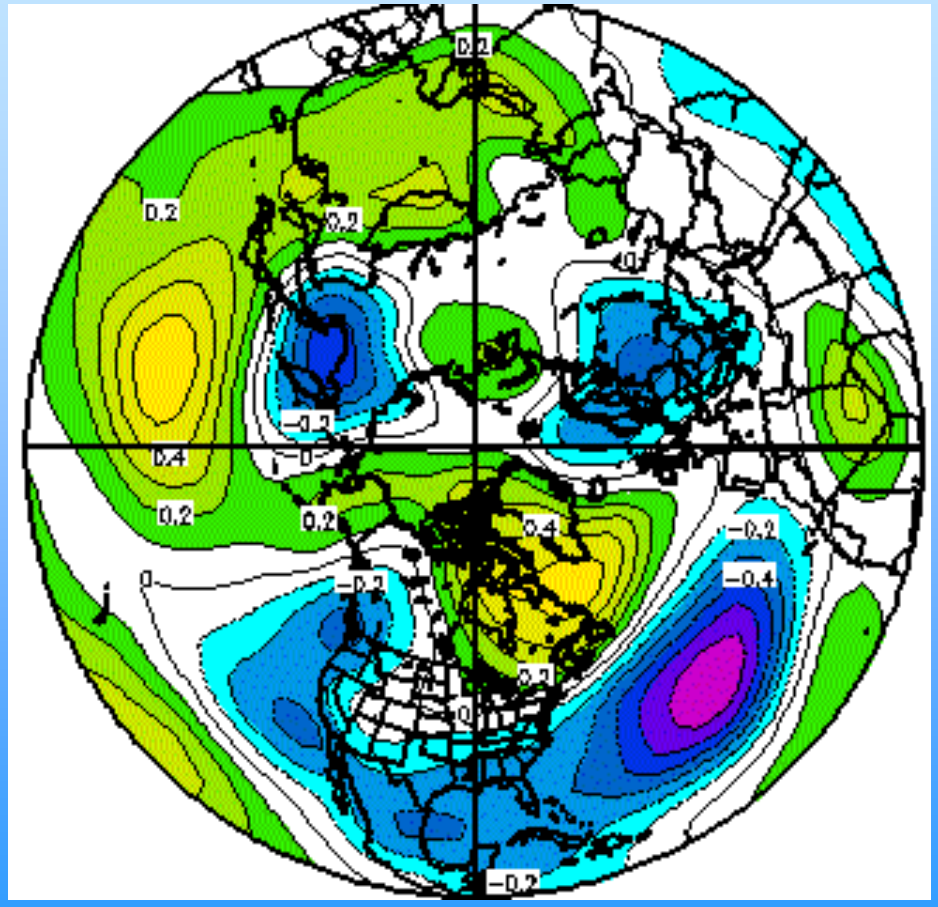


Two periods of analysis: 1951-1988 (odd years) and 1972-2010 (even years).

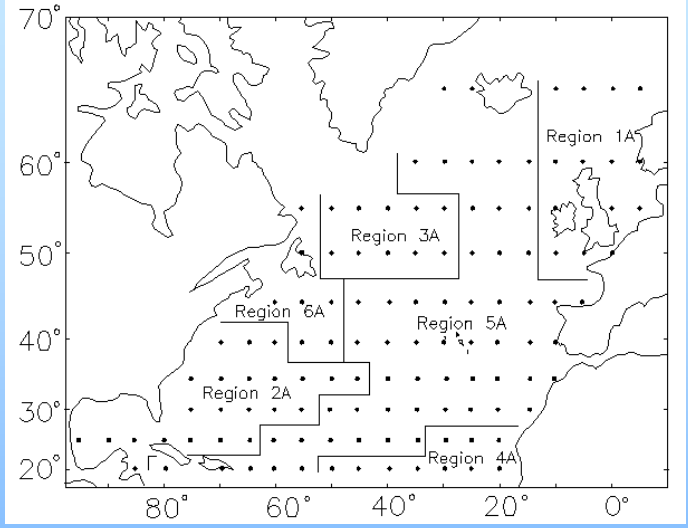
Correlation pattern between WK pink salmon catches (odd years) and SSTA field in the NP and NA (a); EOF2 (10%) of SSTA (b) during 1951-1988

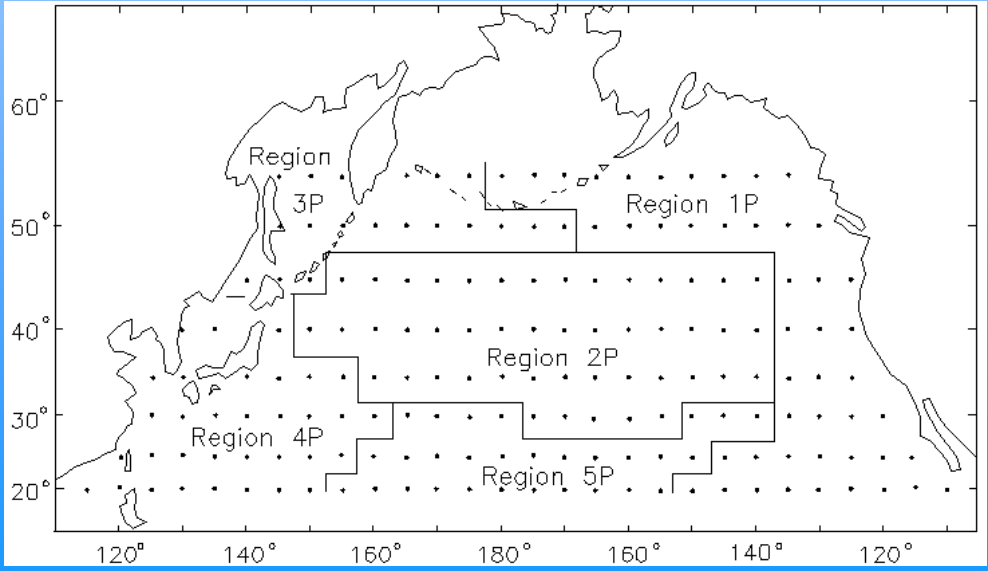


Correlation pattern between EOF2 PC and mean winter H_{500}



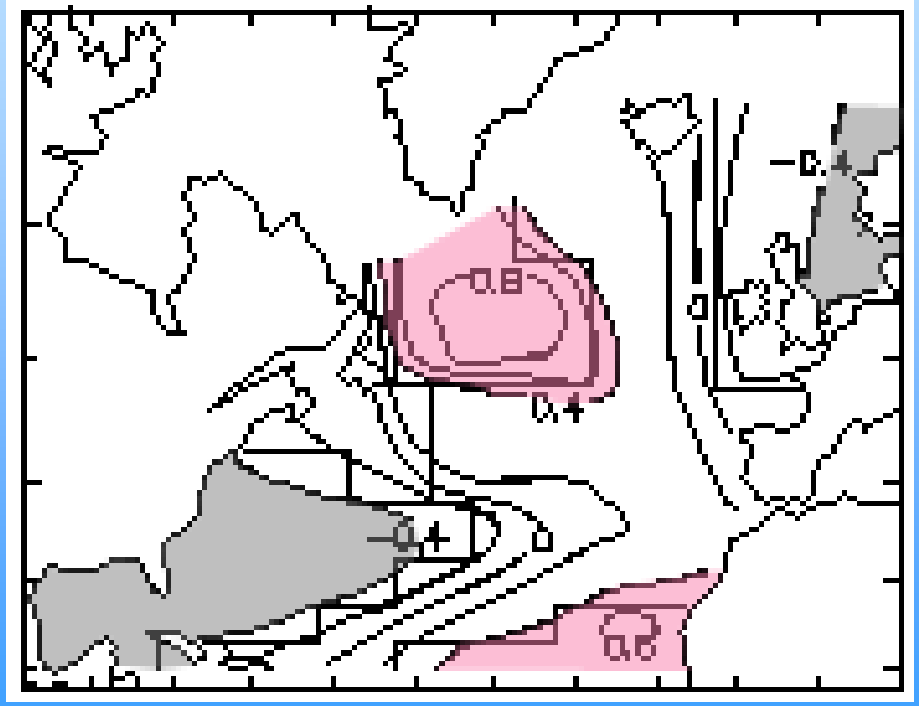
Results of the cluster analysis for the SST anomaly field for 1957-1991





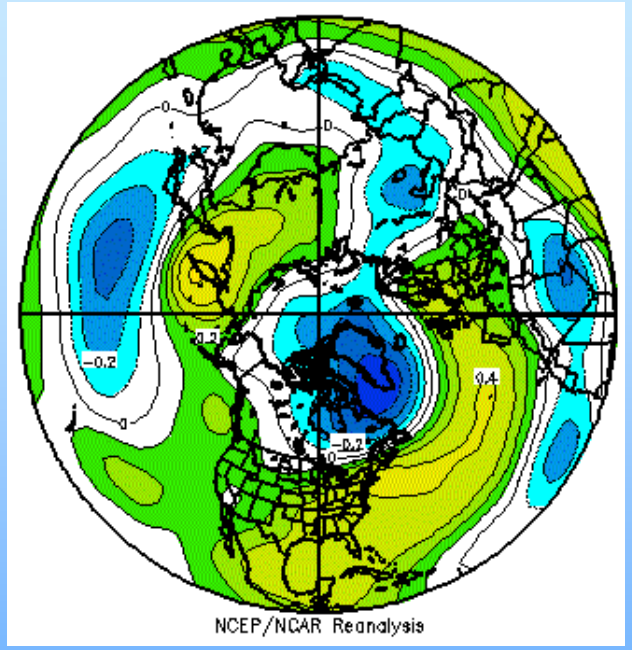
(Krovnin, 1995)

Correlation coefficients between the area-averaged SSTA for Region 3A (NWA) and SSTA field in North Atlantic

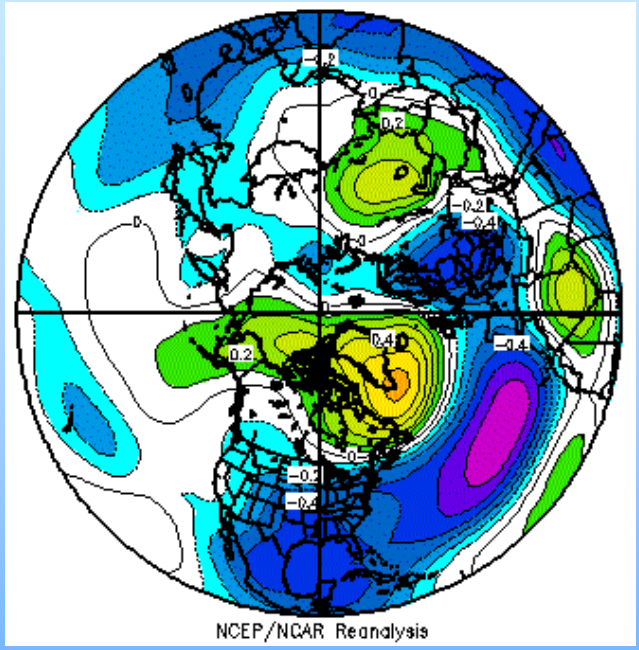


1957-1987: R (PC1 (2A, 3A); WK pink catch) = -0.58 (p < 0.05)

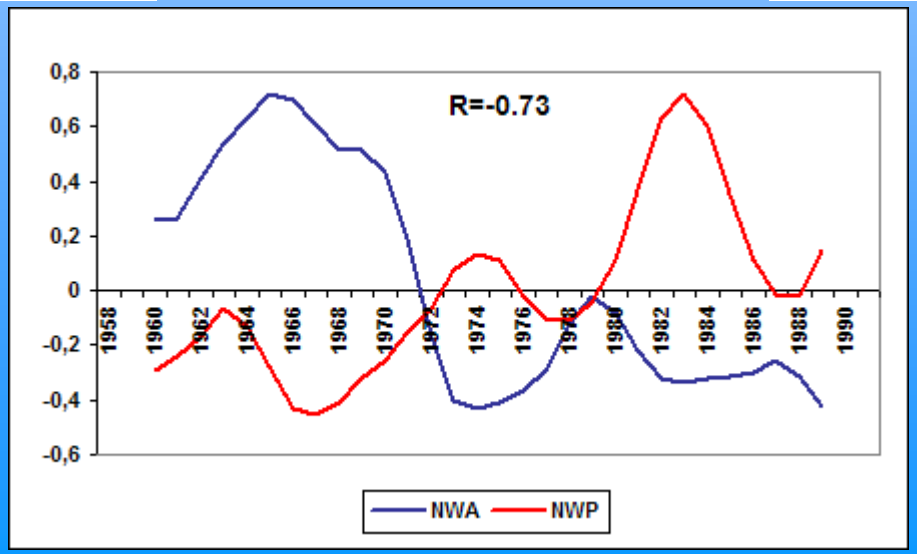
Association between NWP and NWA (1958-1991)



5-yr running SSTA means

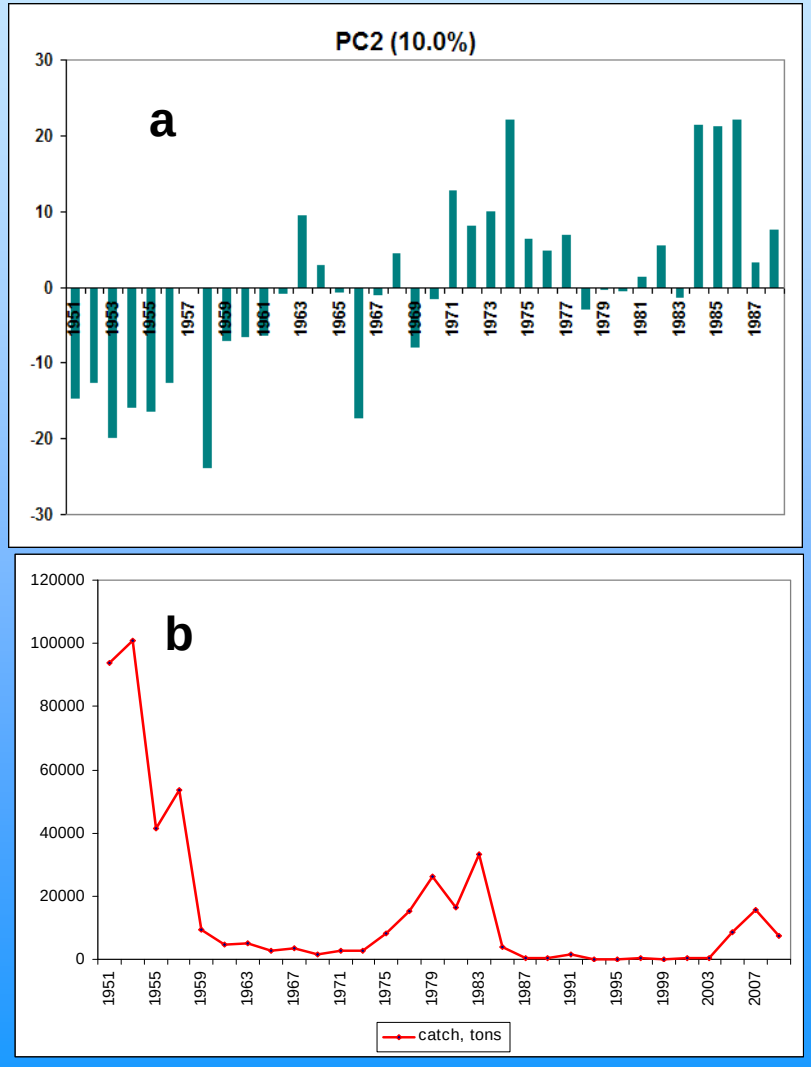


Correlation:
NWP (region 3P)
to H500

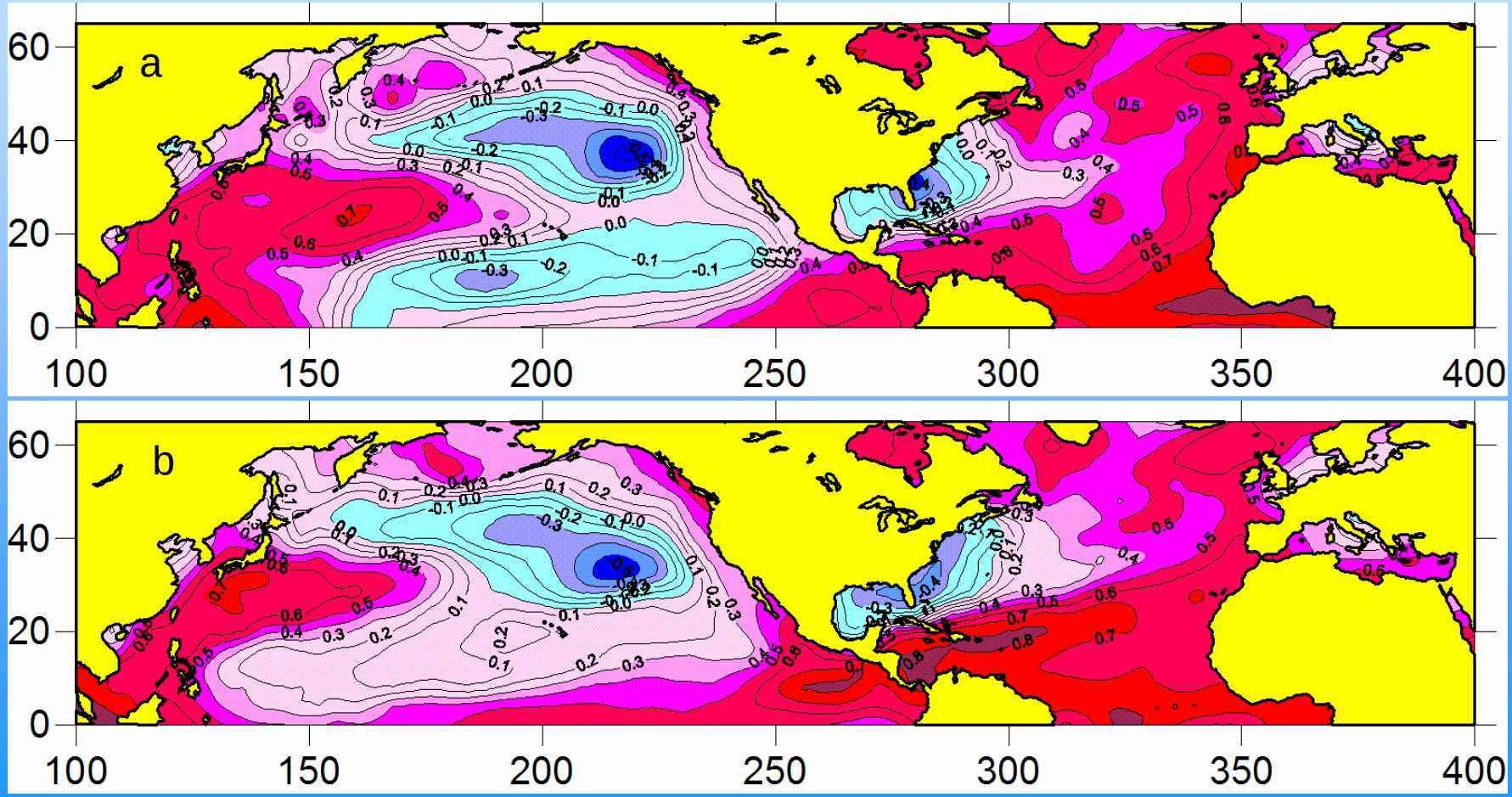


Correlation:
NWA (region 3A)
to H500

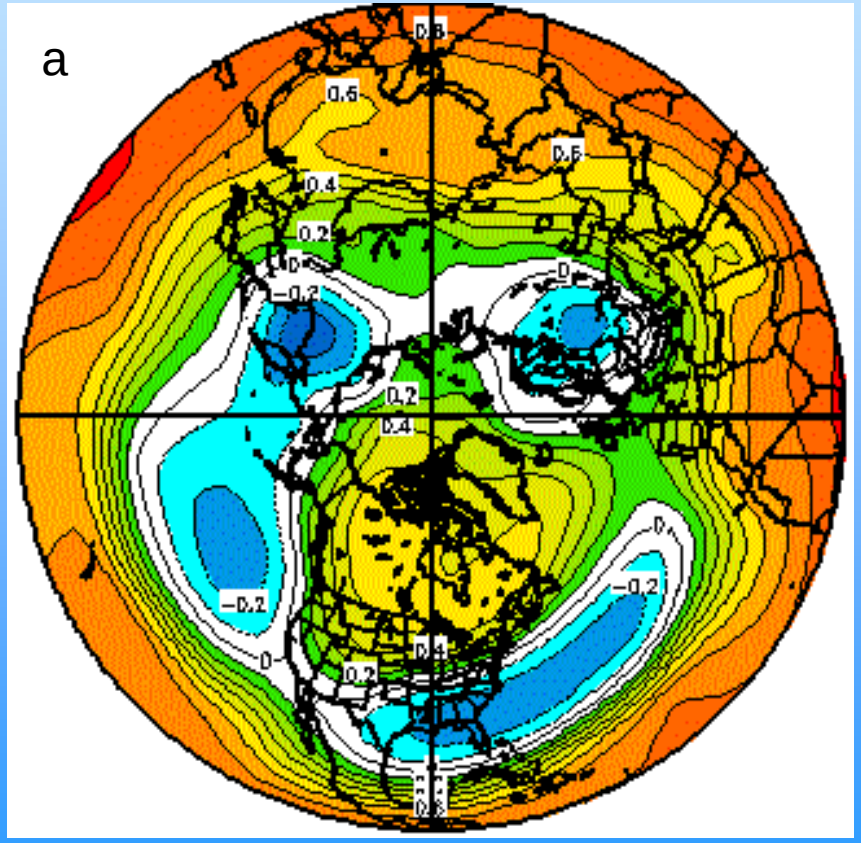
PC2 scores (a) and WK pink salmon catches in odd years (1951-1988) (b)

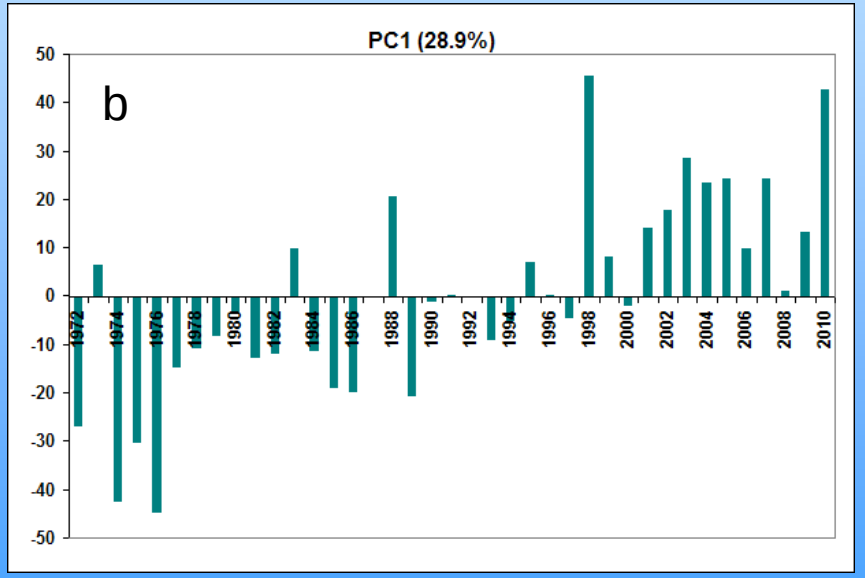


Correlation pattern between WK pink salmon catches (even years) and SSTA field in the NP and NA (a); EOF1 (29%) of SSTA (b) during 1972-2010

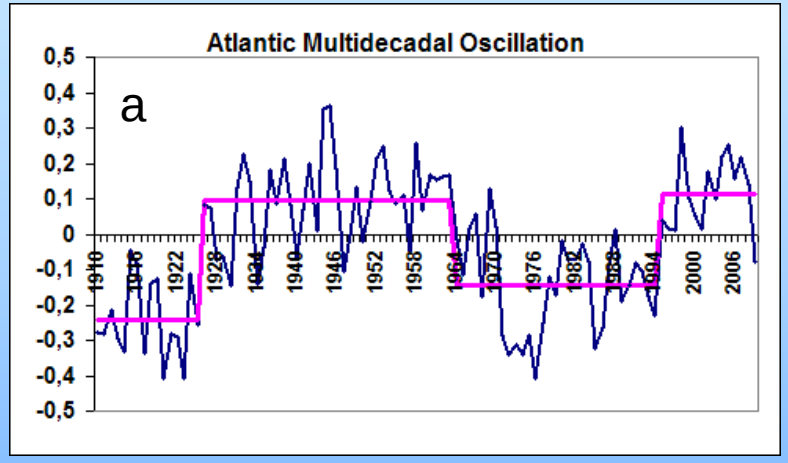


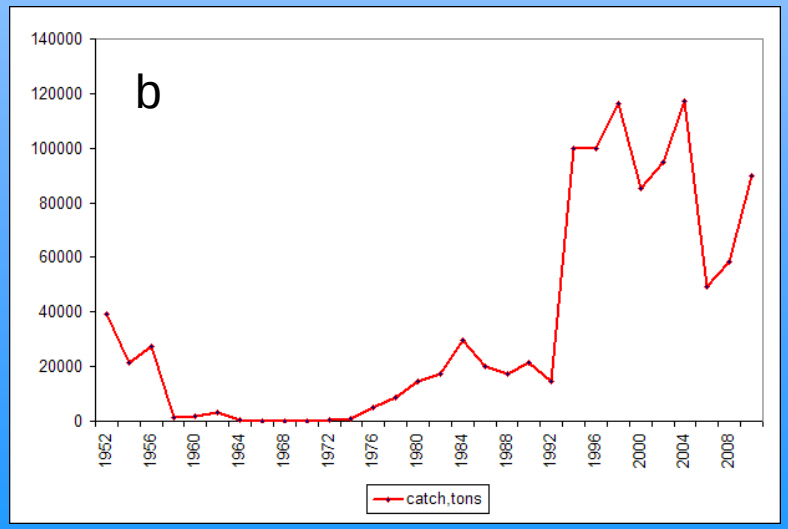
Correlation pattern between EOF1 PC and mean winter H_{500} (a); PC1 scores (b) for 1972-2010

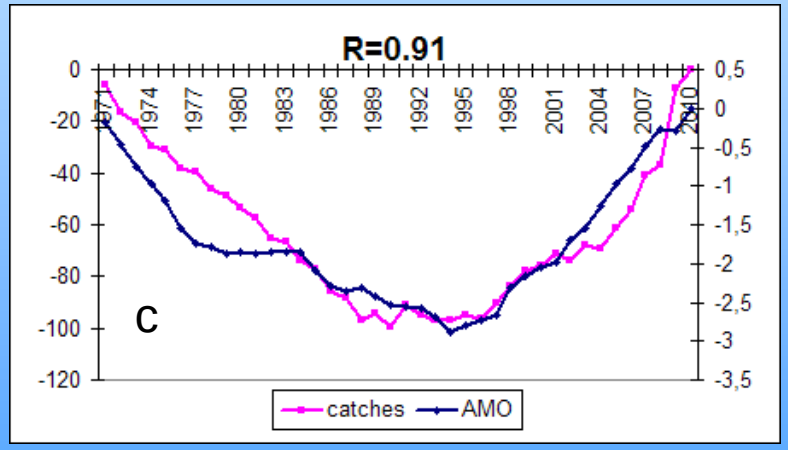




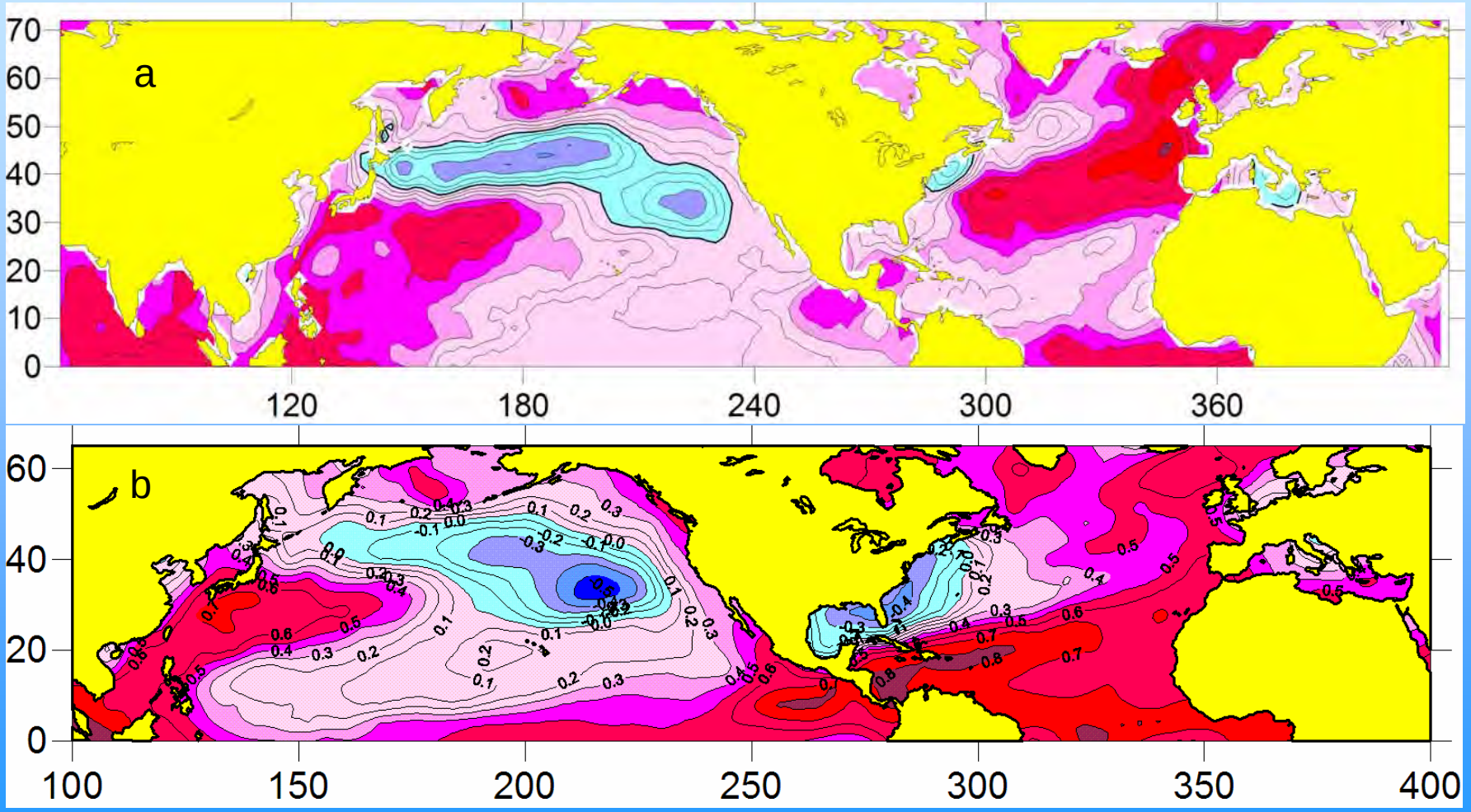
Variations in AMO index (a) and WK pink salmon catches (even years) (b); CS of total FE pink salmon catches and AMO index (c)



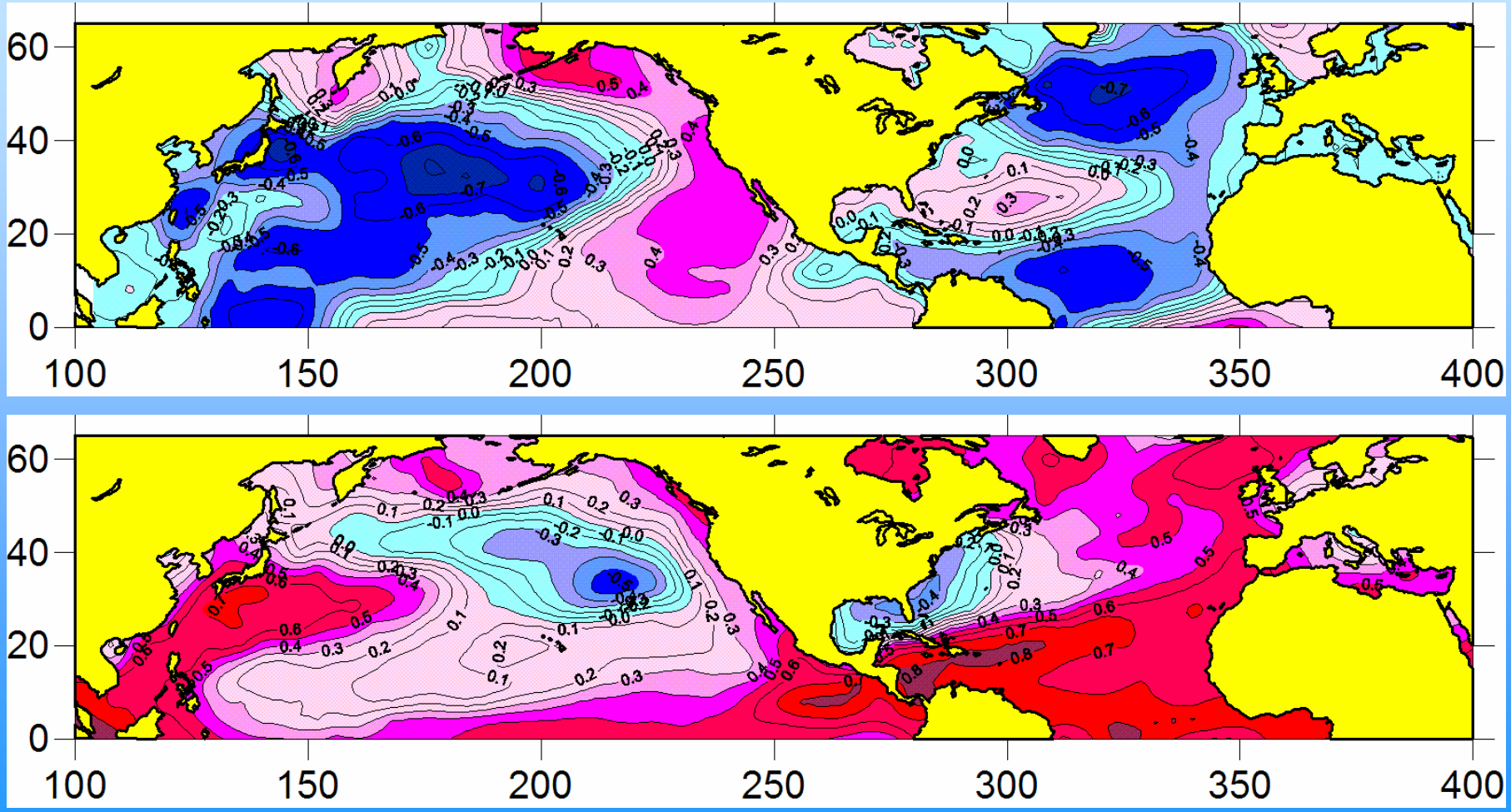




Correlation pattern between WK sockeye salmon catches (with lag of -3 years) and SSTA field in the NP and NA (a); EOF1 (29%) of SSTA (b) during 1972-2010



EOF2 (10%) (top) and EOF1 (29%) (bottom) of combined SSTA field in the NP and NA for 1951-1988 and 1972-2010, respectively.



Conclusions

- **Multi-decadal dynamics of both odd and even dominant generations of West Kamchatka pink salmon is well associated with the observed large-scale SSTA patterns in the Northern Hemisphere.**
- **Recent rise of abundance and biomass of Far East salmon stocks and WK pink salmon stock in particular, may be related to the shift of dominant modes of SST variability in the North Pacific and North Atlantic in the second half of the 1990s.**
- **It seems reasonable to conduct the same analysis for the earlier period of high Far East salmon catches (1920s-1930s).**