Self-Organization Maps for Analyzing the Black Sea Bio-Physical Variability and Surface Wind

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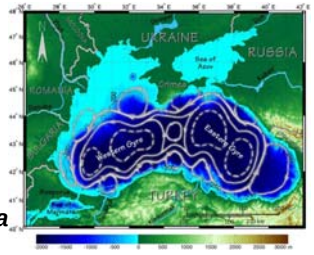
1. INTRODUCTION

Spatial and temporal variability of the Black Sea surface circulation and chlorophyll-a concentration with the link to the surface winds is investigated using the self-organizing maps (SOMs) on the satellite data from AVISO, SeaWiFS, and QuikSCAT. Six spatial patterns with temporal variability are identified for the surface currents. The bi-modal characteristics has been changed in 1999-2009 with the fall bloom being more significant than the spring bloom. Possible connection of these patterns to the climatological indices, such as the North Atlantic Oscillation (NAO) and the East Atlantic/West Russian (EAWR), oscillation are investigated.

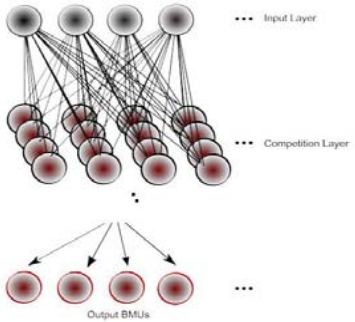
2. THE BLACK SEA



(Oguz et al. 1993)

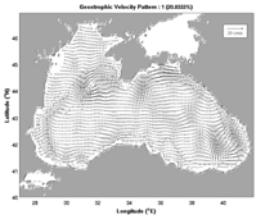
Ba

3. SOM

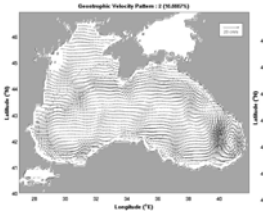


4. SIX SURFACE CURRENT PATTERS

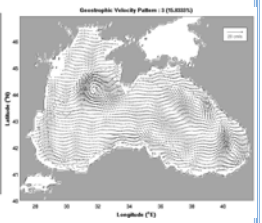
SOM-1 ***Sevastopol and Batumi Eddies (21%)***



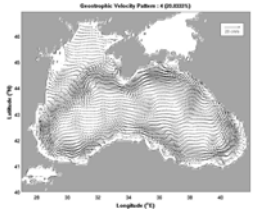
SOM-2 ***Cyclonic RIM and Anti-cyclonic Batumi Eddy (17%)***



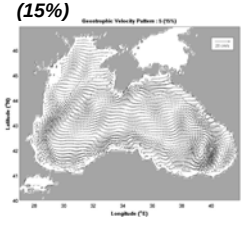
SOM-3 ***Multi-Eddies (16%)***



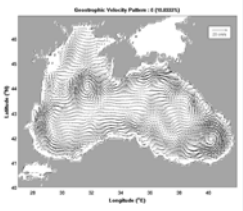
SOM-4 ***Cyclonic RIM and Batumi Eddy (21%)***



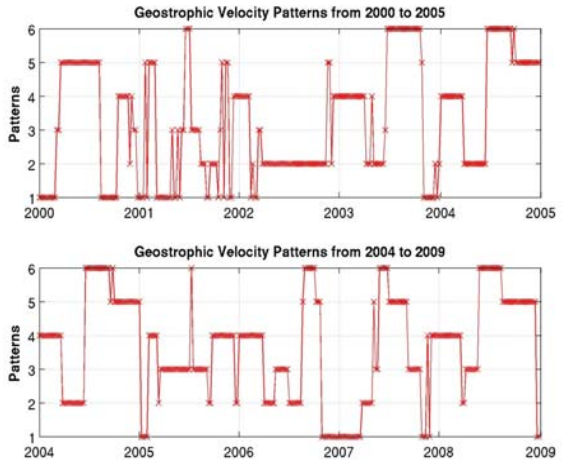
SOM-5 ***Anticyclonic RIM and Batumi Dual Eddies (15%)***



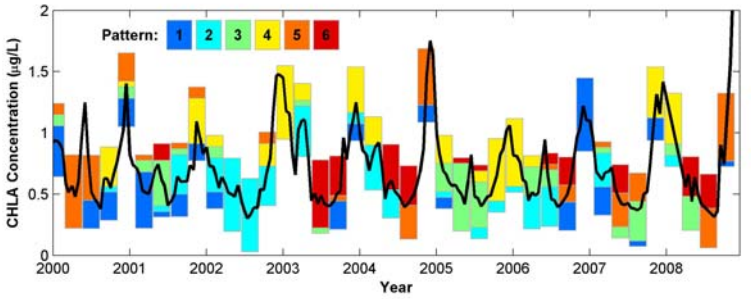
SOM-6 ***Anticyclonic RIM and multi Eddies (10%)***



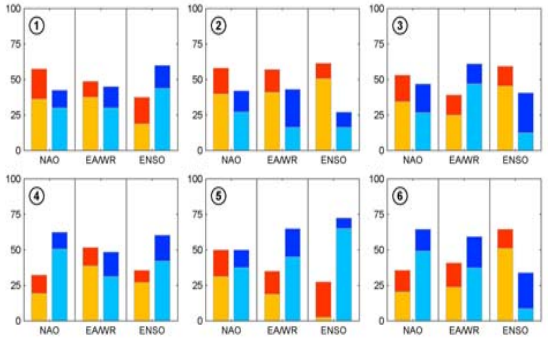
5. INTERANNUAL VARIABILITY OF THE SIX PATTERNS



6. TELECONNECTION TO CHLOROPHYLL-A



7. TELECONNECTION TO CLIMATE INDICES



8. SUMMARY

Our studies show the change of the bi-modal characteristics in 1999-2009 with the fall bloom being more significant than the spring bloom. The surface circulation pattern-4 (cyclonic RIM current and Batumi eddy) is associated with the occurrence of the fall bloom. Evident connection of negative NAO and negative ENSO to the pattern-4 circulation implies the large-scale atmospheric effect.

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