



# **The influences of sea surface temperature variability and change on extreme precipitation in Romania**

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# Motivation



SPM of AR4 report (2007) – the intensity of precipitation on land is growing under global warming conditions.

What mechanisms might be?

- A long sequence of strong flash flood events occurred in Romania from April 2005 to early October;
  - 70 deaths;
  - ~ estimated costs of around 3 billion Euro.
- Flash floods in July 2006
  - 10 deaths
  - 67 villages from 12 counties
- Flash floods in March 2007
  - 38 villages from 10 counties.



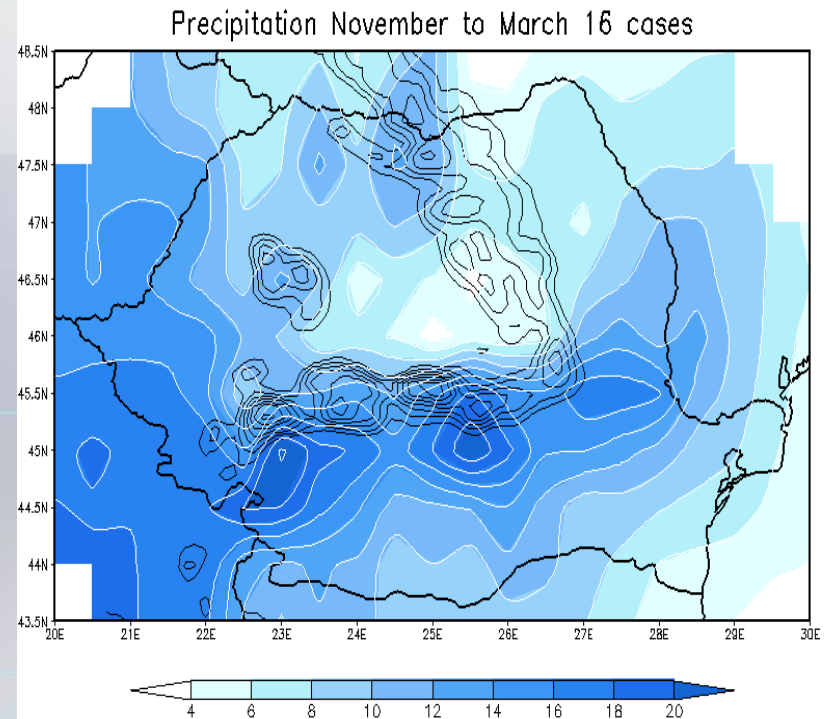
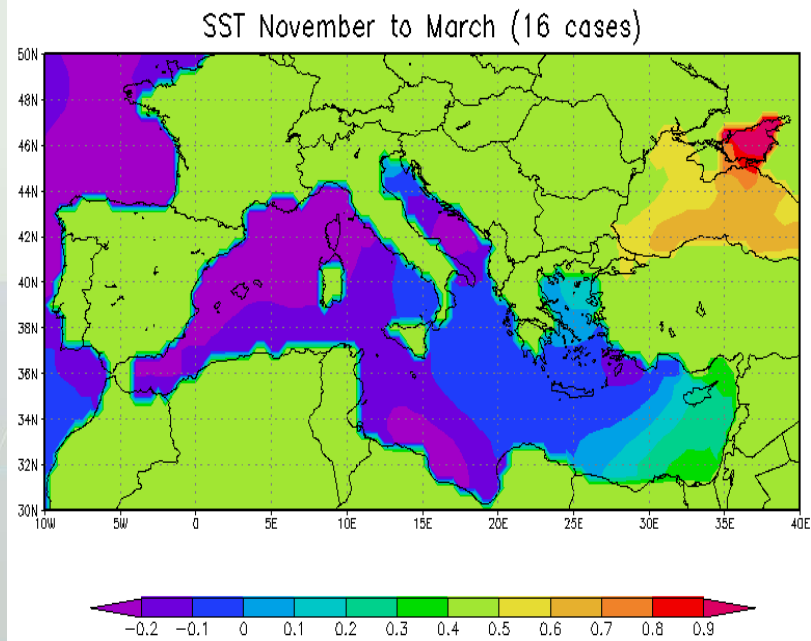
## **Data**

- **Daily Precipitation from 104 Romanian stations (1961-2001) (Source: ANM);**
- **Sea surface temperature (SST) – ERA40 (1961-2001) (source: ECMWF;**
- **Mediterranean Cyclone Catalog (Source: Ecaterina Ion-Bordei, 1997)**

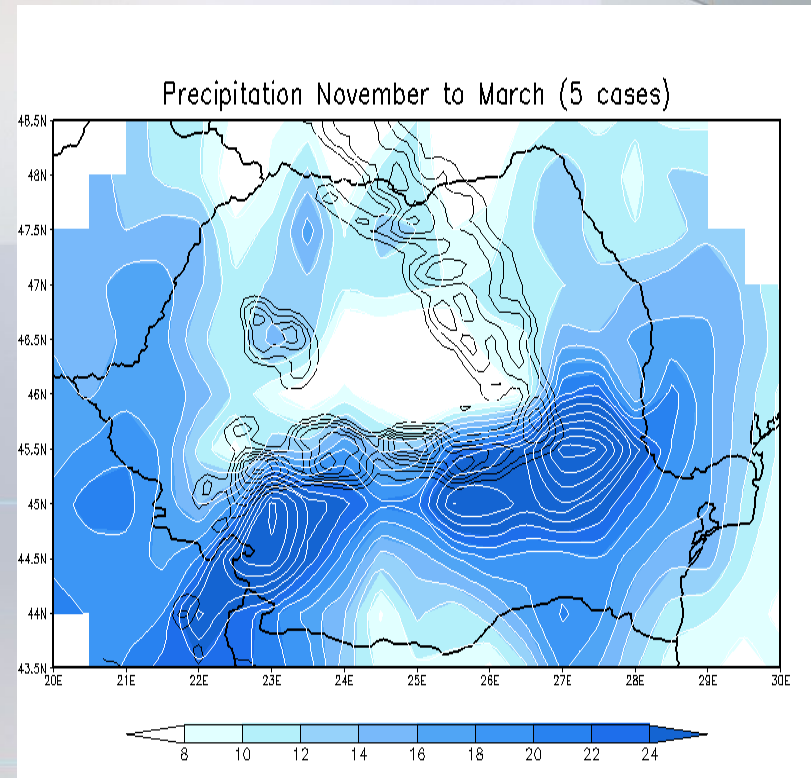
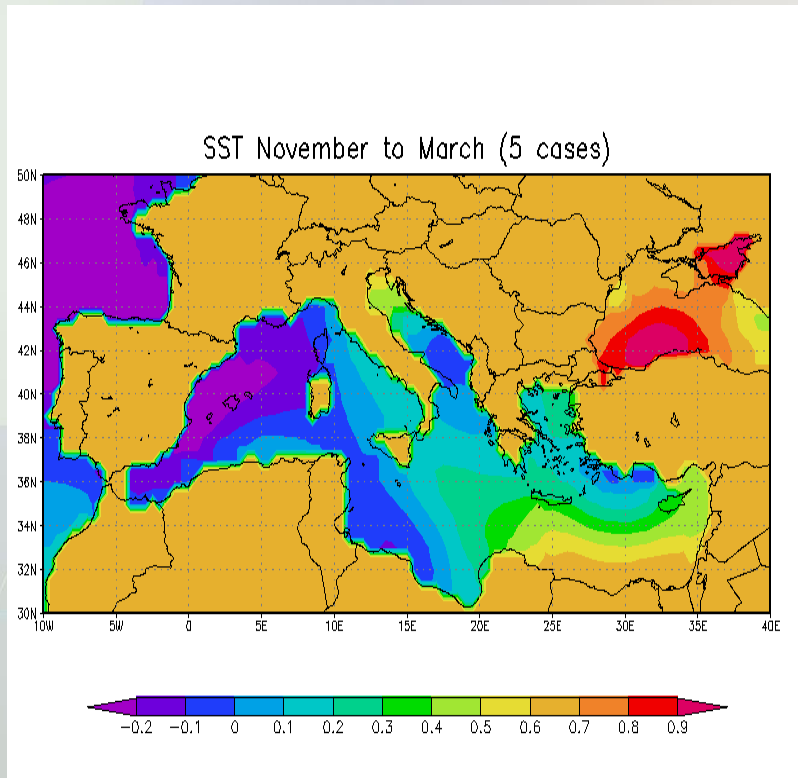
## **Metodology**

- **32 cases of Mediterranean cyclones with trans-Balkan paths have been selected;**
- **Composites maps of Mediterranean/Black Sea SST and daily precipitation amounts have been built for cold season (November to March), using the selected cases of cyclones intersecting Romanian territory to identify the regional mechanism;**
- **Indices of extreme precipitation are computed from daily data for winter:**
  - **R95 (daily amounts equal or above the 95% percentile);**
- **The robustness of the mechanism have been investigating using canonical correlation analysis between R95 and SST.**

# Regional mechanisms - composites



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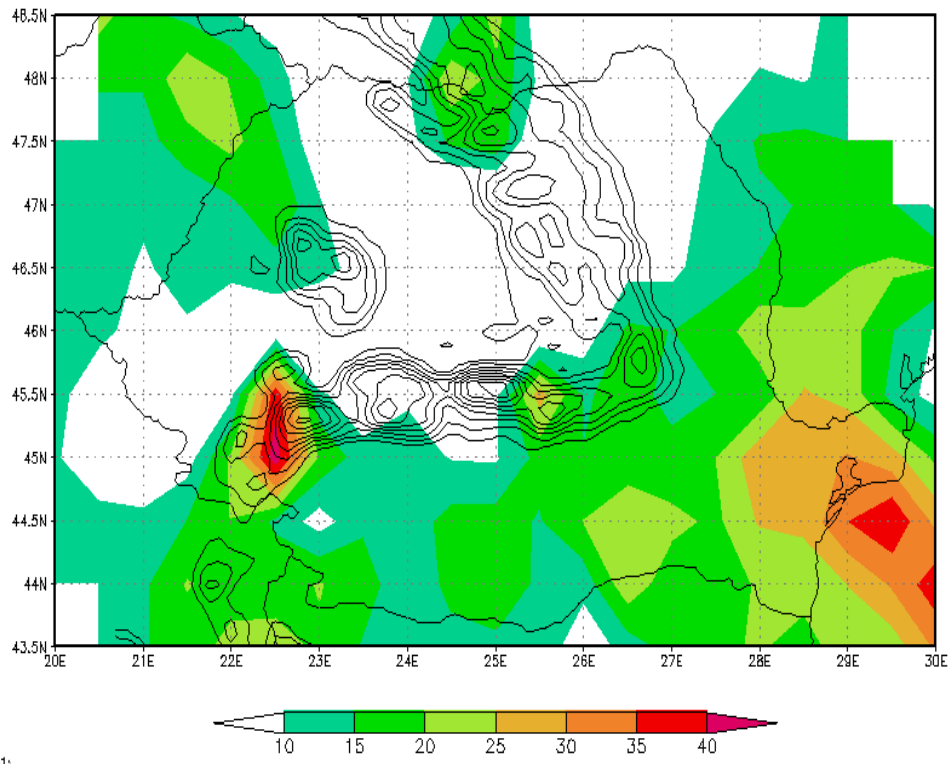
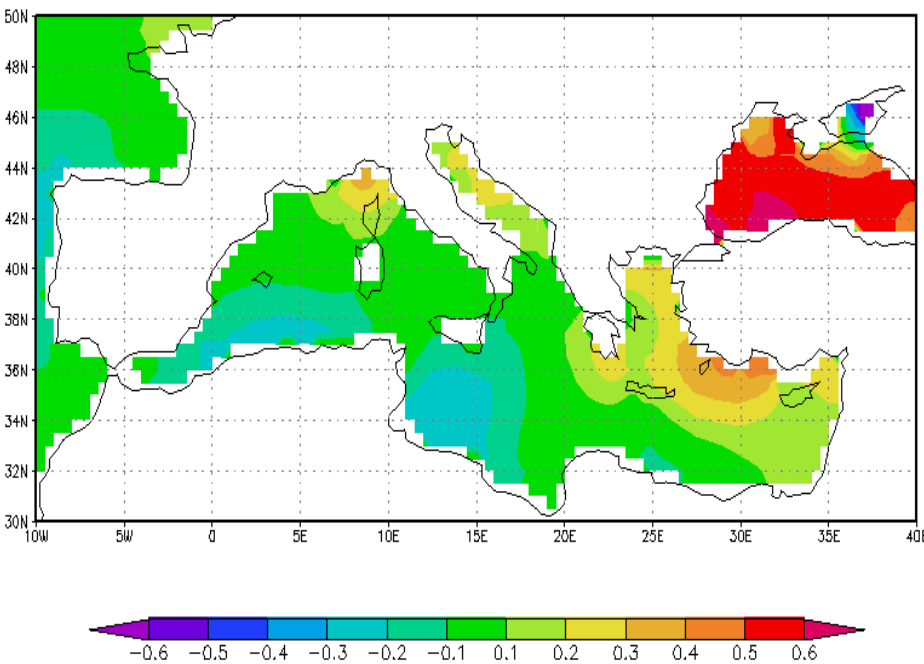


# Regional mechanisms – CCA analysis of PR95 and SST December to February

25 %

**R=0.78**

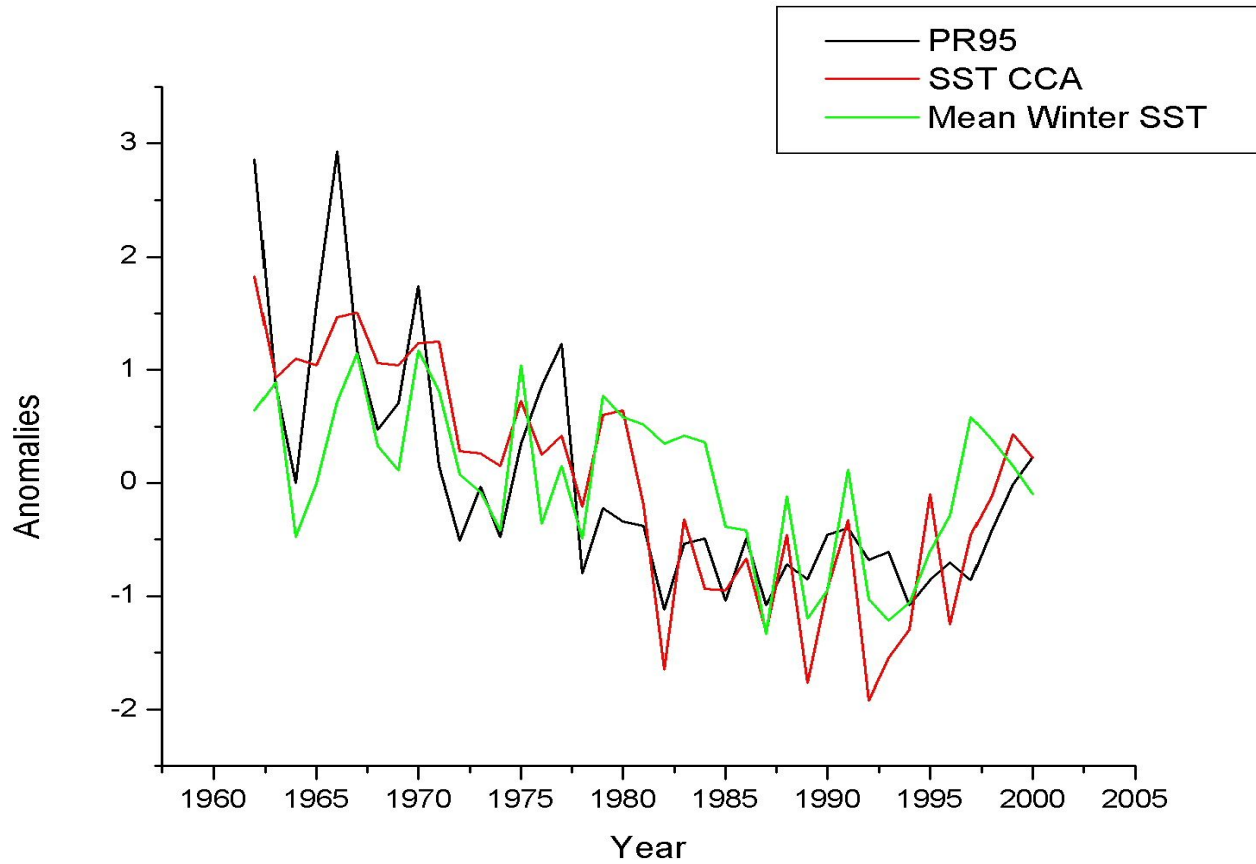
20%



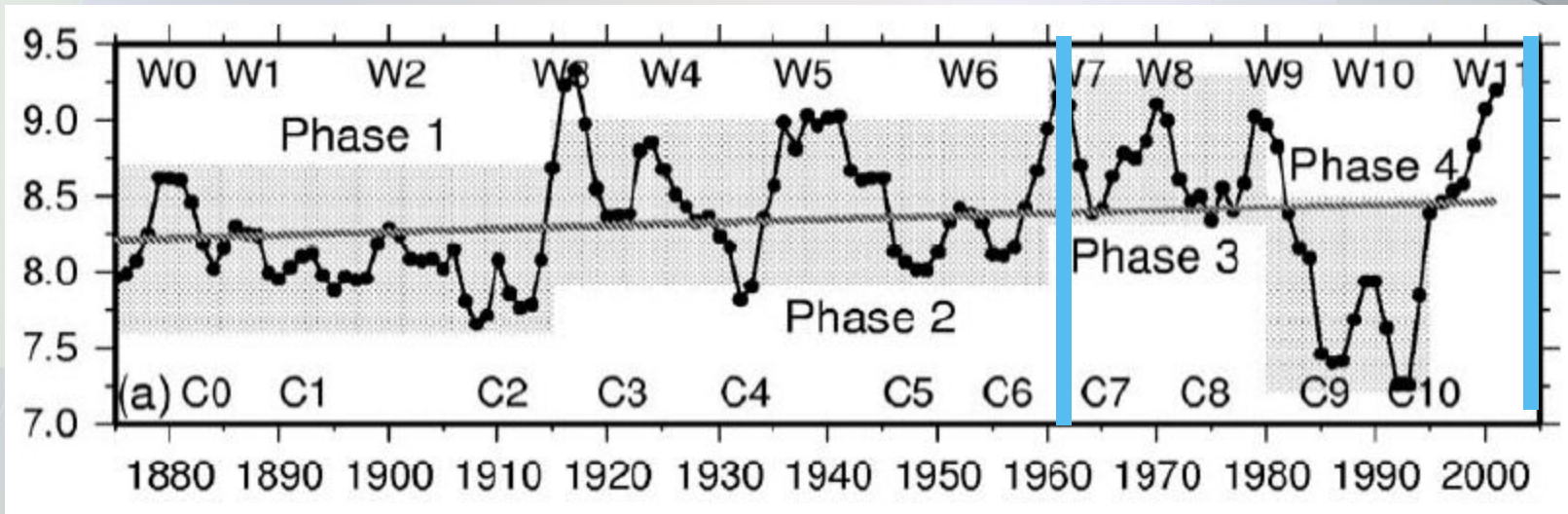
# Regional mechanisms – CCA analysis of PR95 and SST December to February



**R=0.78**



# Regional mechanisms – analysis of December to March SST



**Temel Oguz, Joachim W. Dippner, Zerefsan Kaymaz, 2006: Climatic regulation of the Black Sea hydro-meteorological and ecological properties at interannual-to-decadal time scales. *Journal of Marine Systems* 60, 235–254.**



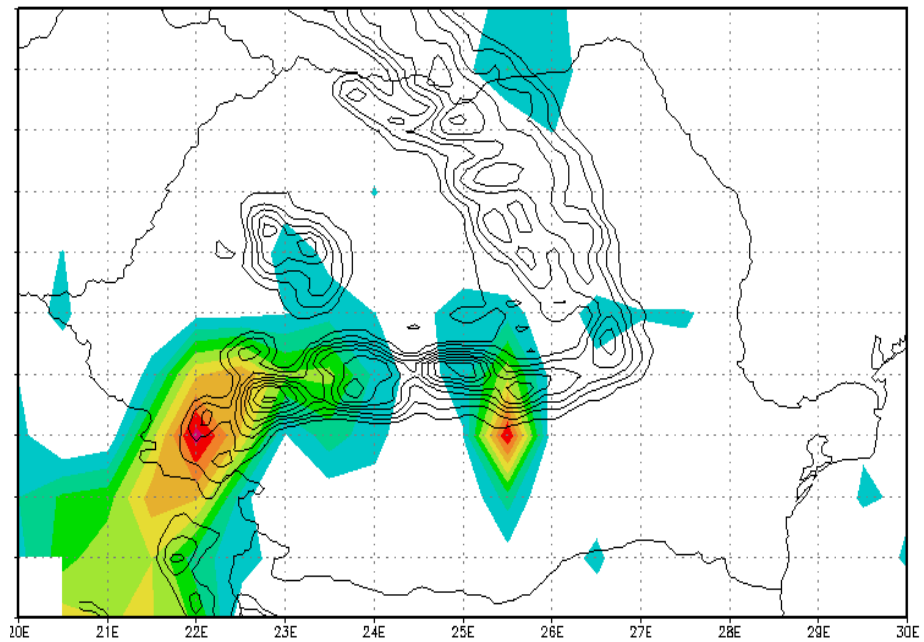
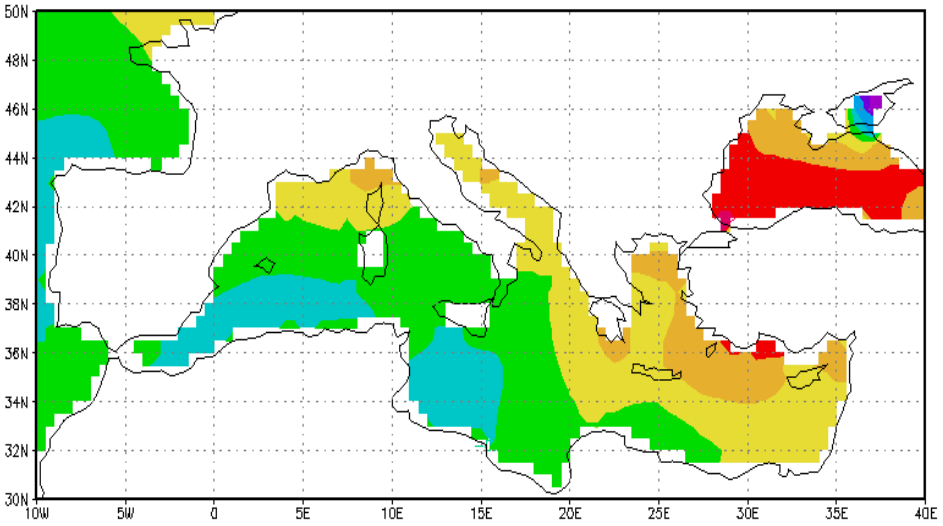
# Regional mechanisms – CCA analysis of PR95 and SST

## DJF SST/MAM PR95

23 %

**R=0.64**

9%





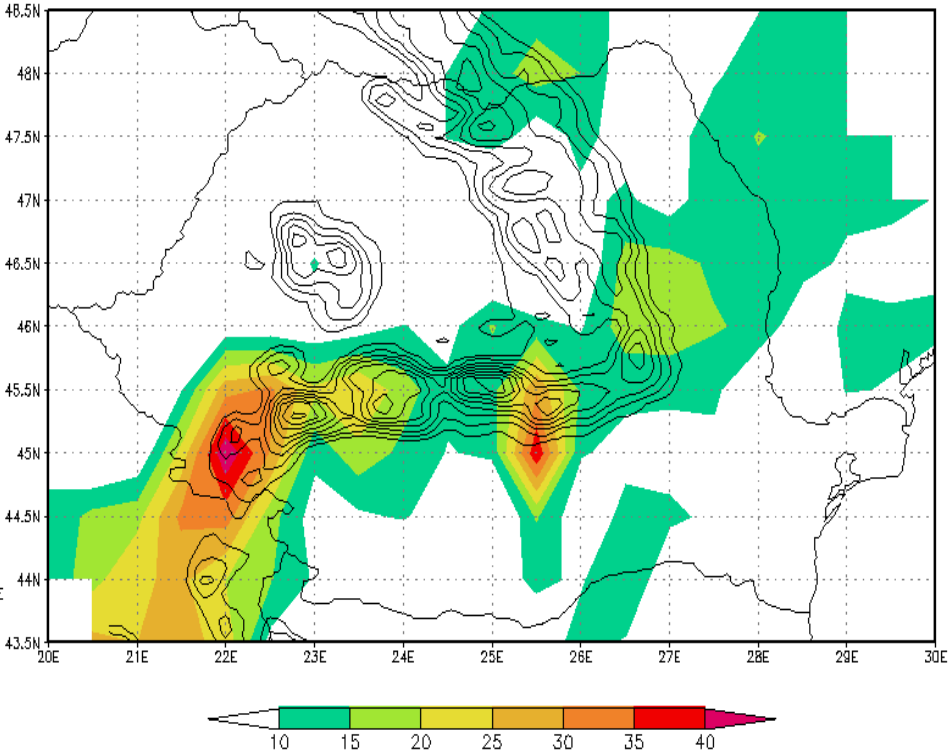
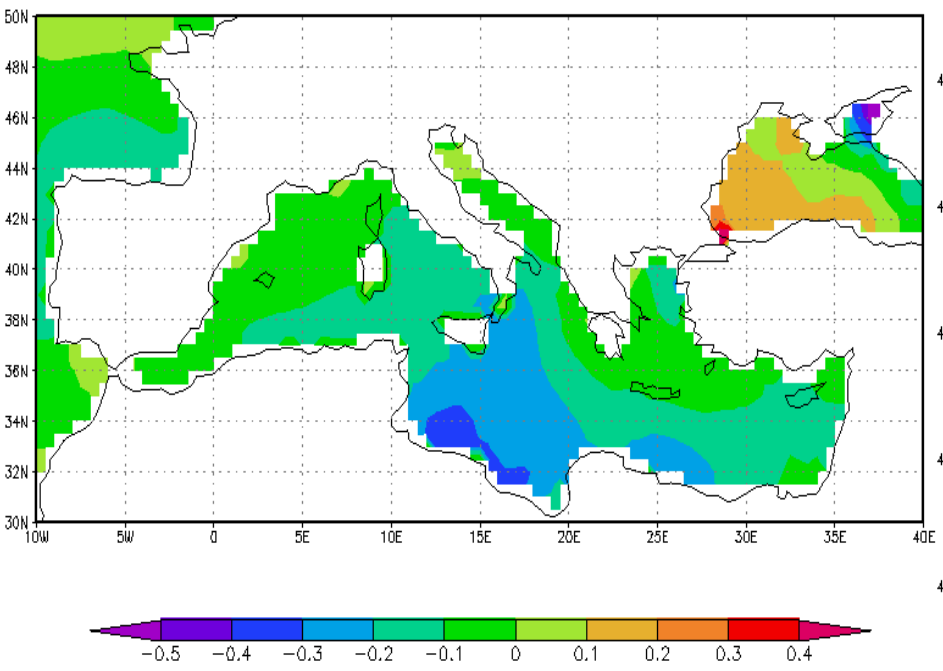
# Regional mechanisms – CCA analysis of PR95 and SST

## March to May PR95

9 %

**R=0.73**

8%



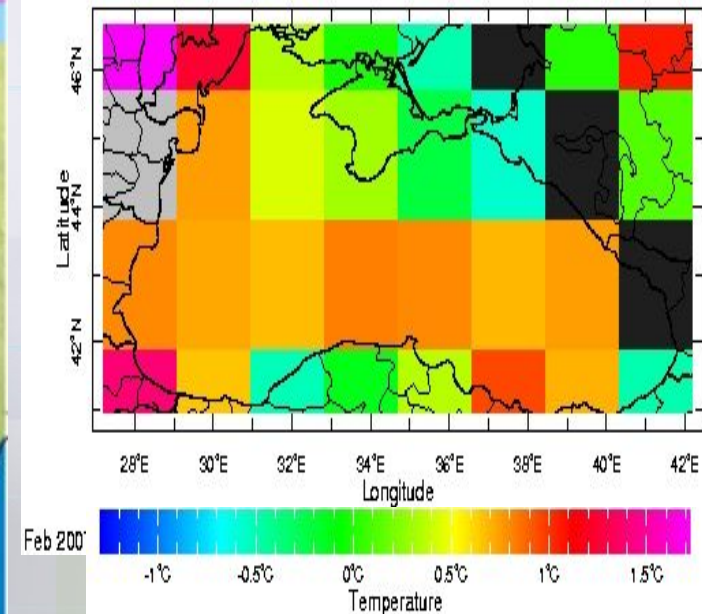


# Flash floods episodes 22-23 March 2007

## Radar data – 23rd of March 2007



## SST data NCEP/NCAR reanalysis



- **38 villages from 10 counties**
- **150 houses**
- **28 persons evacuated**
- **800 de ha of agricultural terrain**
- **21 km of roads**

# Preliminary conclusions



- On regional scale, Black Sea SST seems to modulate extreme precipitation, especially in the cold season; the cold season signal is robust and may be used in predictive methodologies.
- Extreme precipitation variability has a strong interdecadal component.
- Further investigation is needed using both observed data and results from regional climate models to find the cause of the interdecadal component of Black Sea SST variability.