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OBJECTIVE

Analysis of spatial and temporal characteristics for the thermal stress index (ITU) over the period 1961-2010. Two parameters are considered: monthly values and frequency of values exceeding 80 units (threshold considered to be responsible for high impact on human health).

DATA AND METHODS

- Monthly mean of the ITU index values for May-September; summer frequency of ITU values exceeding 80 units (Fritu); 87 stations;
- Mann-Kendall and Pettitt tests to estimate the statistical significance of linear trends and shifts in the mean;
- EOF (empirical orthogonal function) analysis to identify the main modes of spatial and temporal variability.

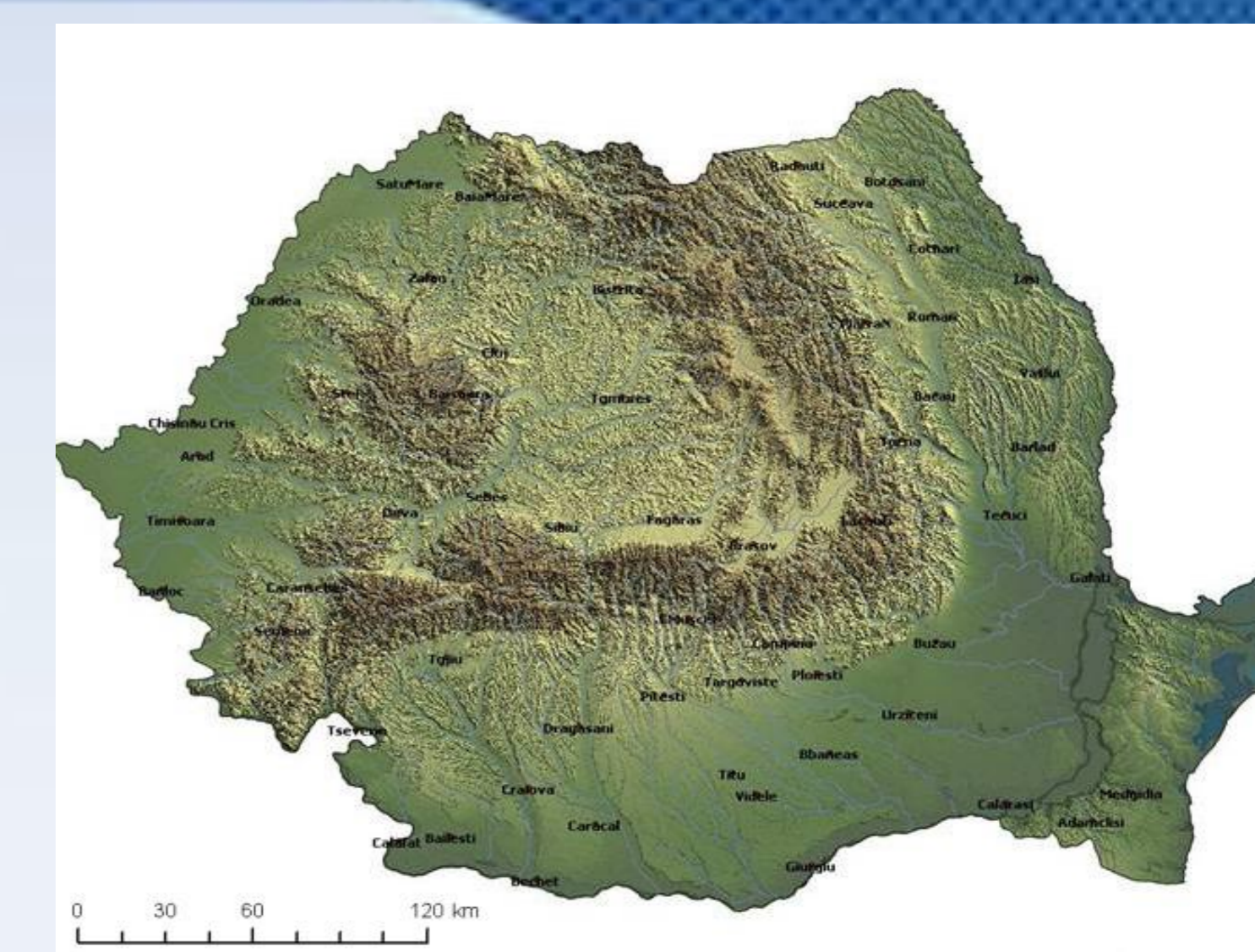


Figure 1. The position of meteorological stations used in the study

RESULTS

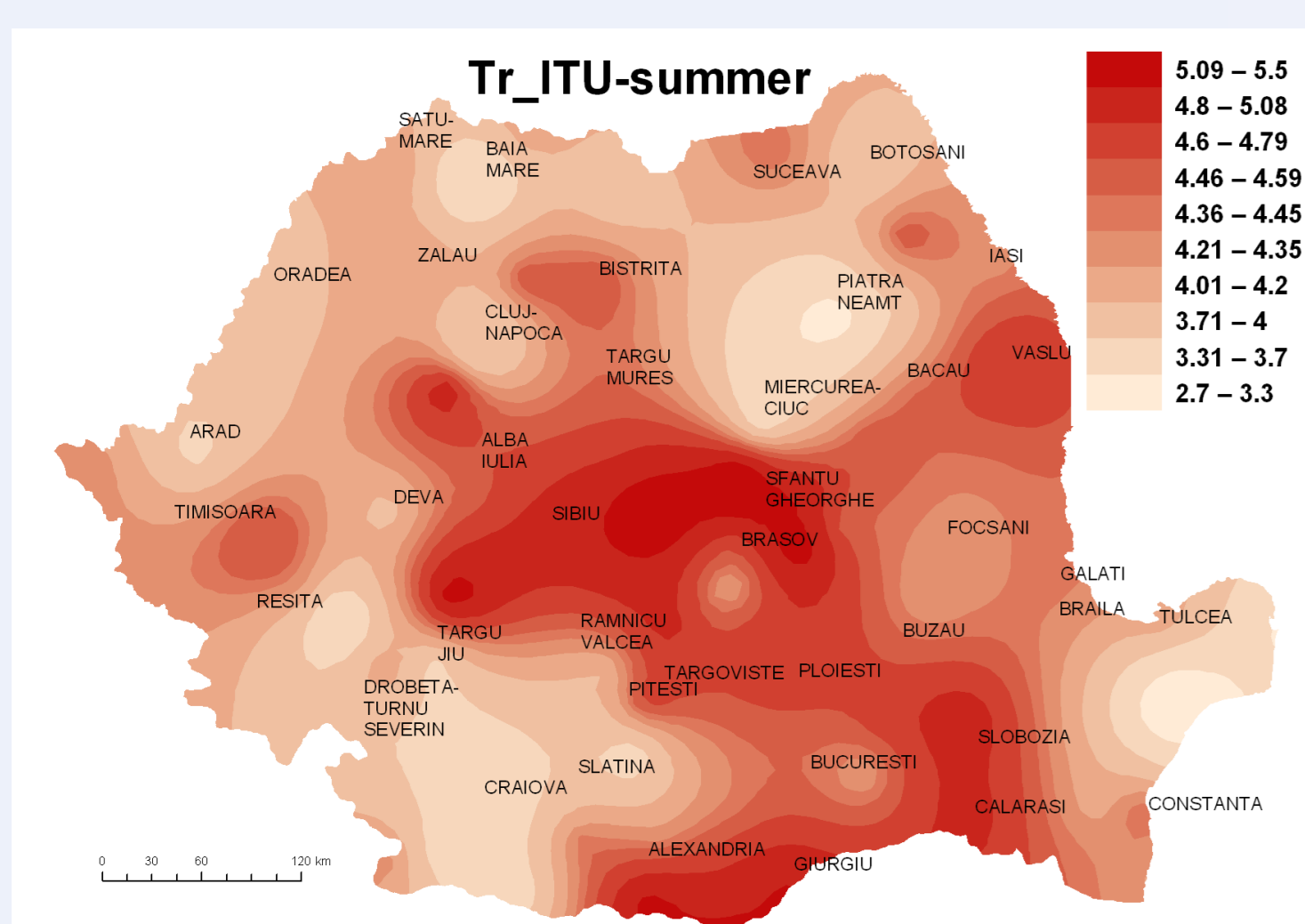


Figure 2. Linear trends (50 years) of summer mean ITU

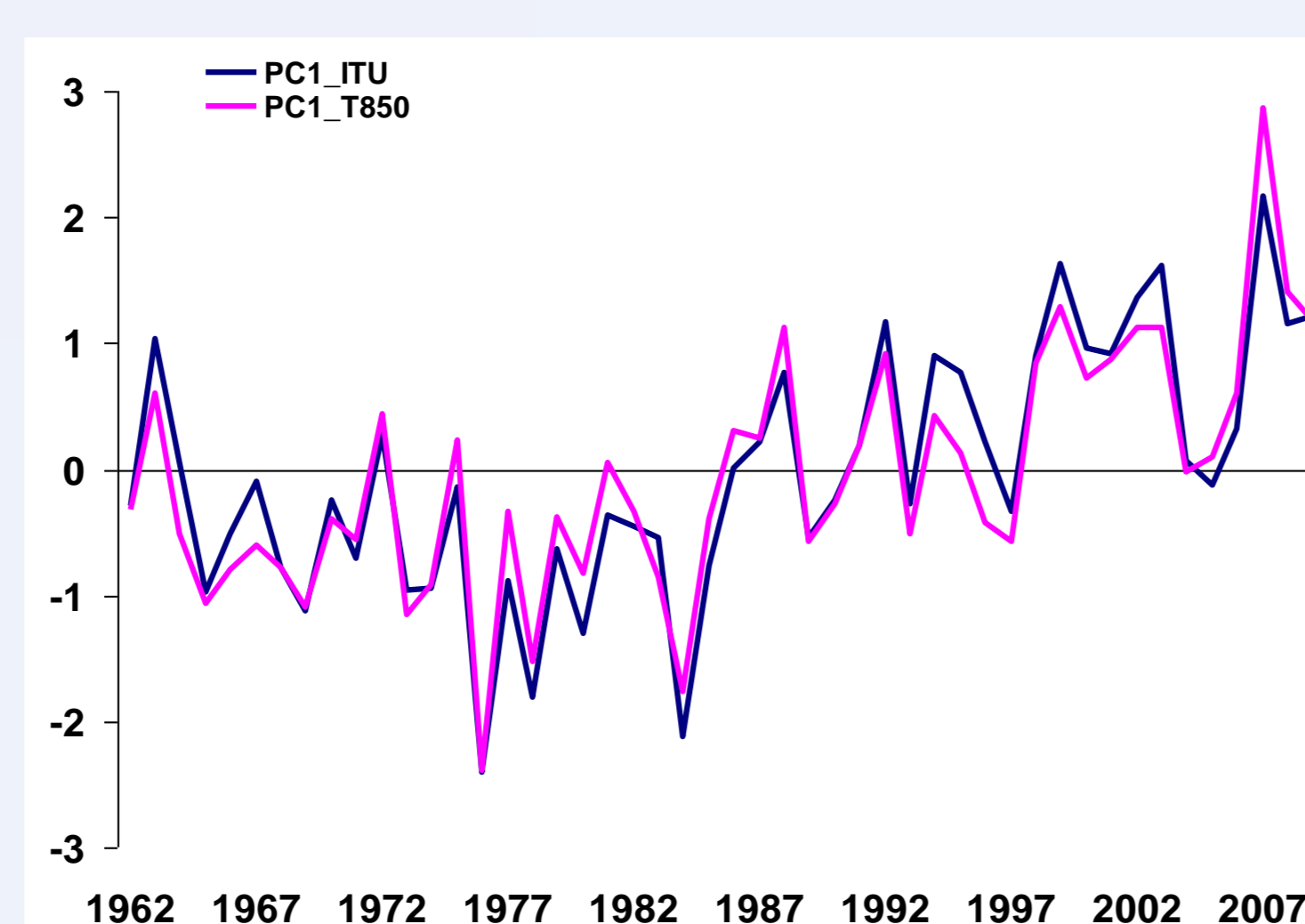


Figure 3. The EOF time series (PC1) associated to the summer ITU and T850. The correlation coefficient between them is 0.91

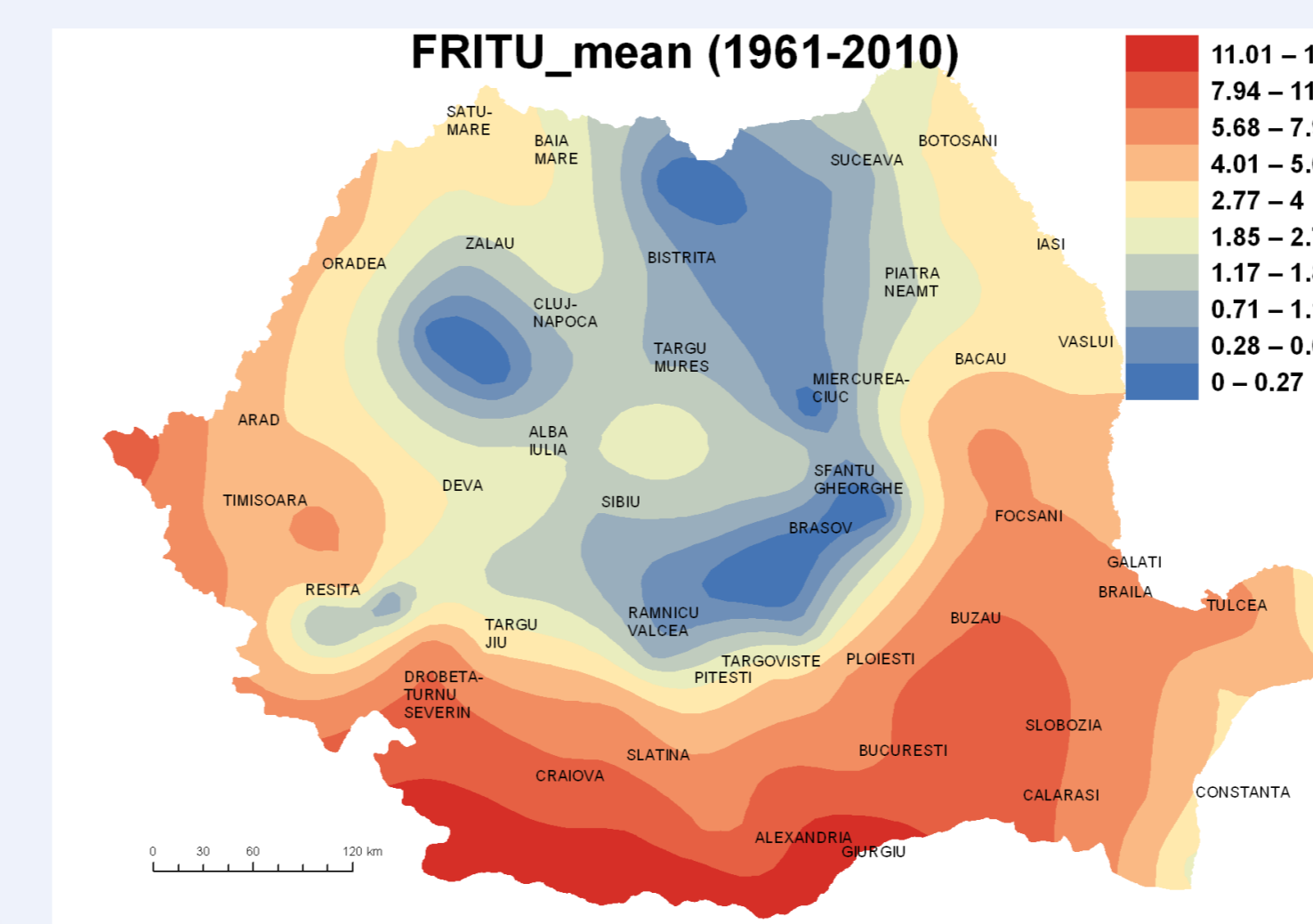


Figure 5. Summer mean Fritu (1961-2010)

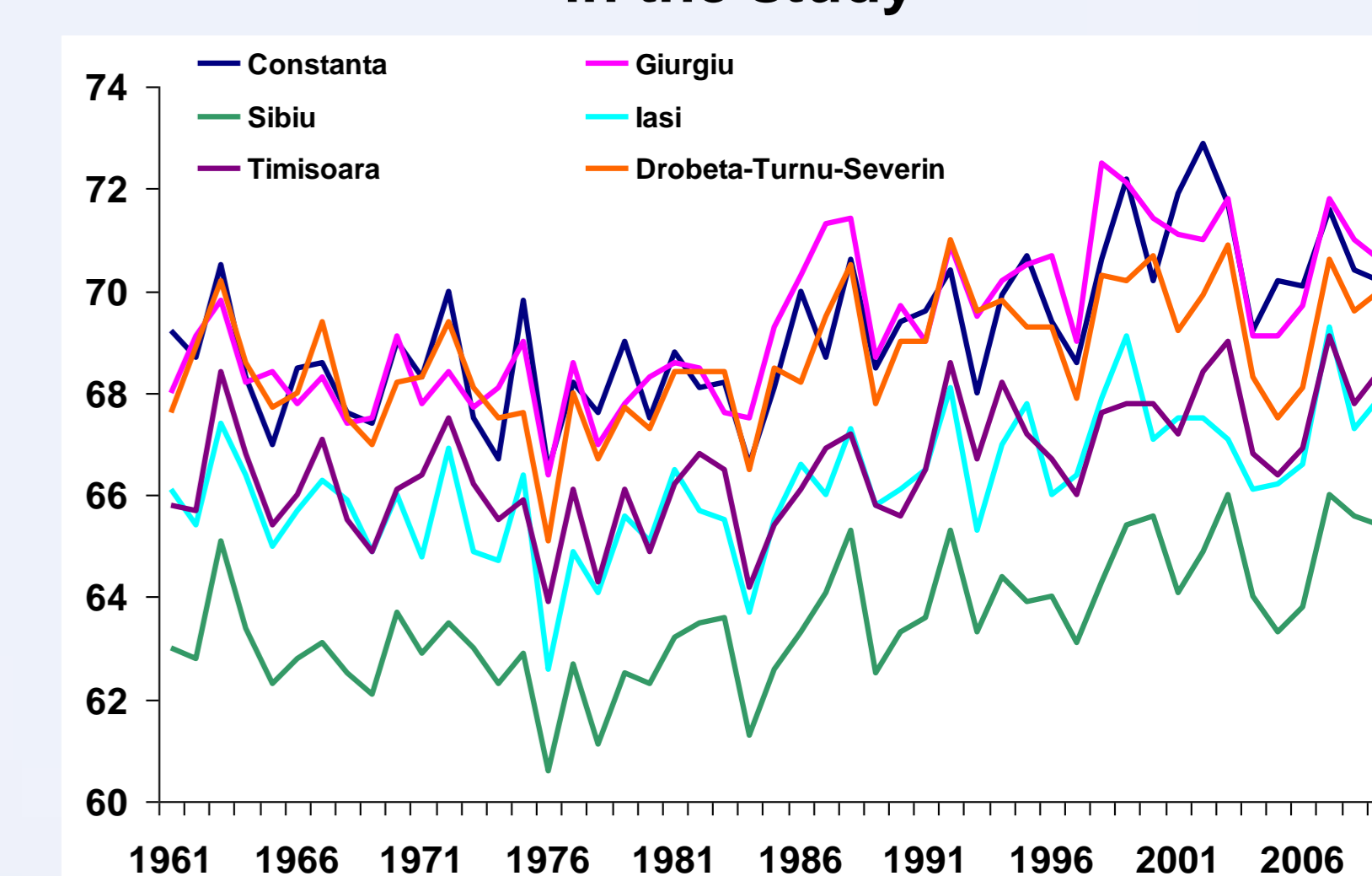


Figure 7. Temporal evolution of the ITU time series for several stations situated in various physico-geographical conditions

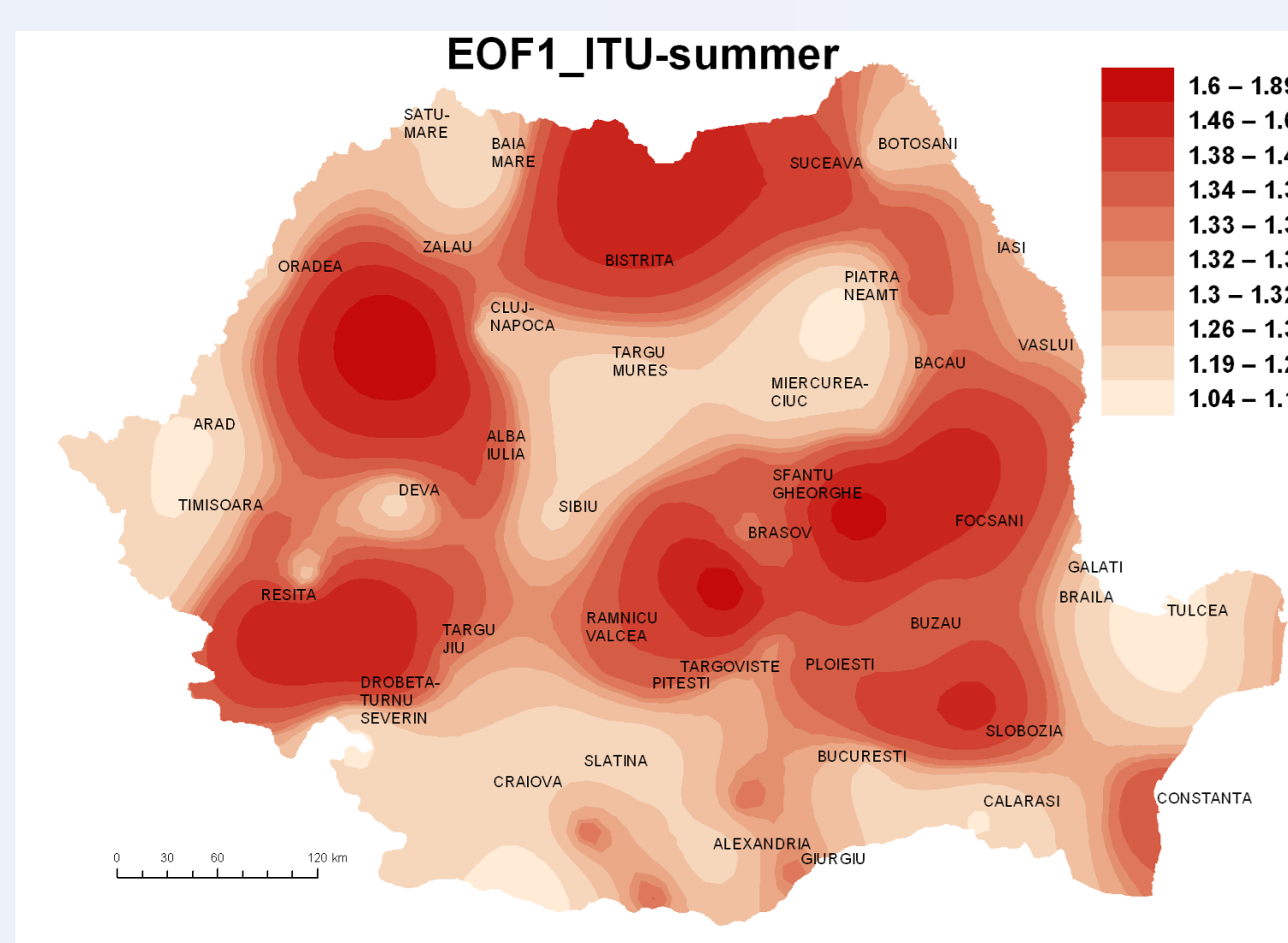


Figure 4. The patterns of the first two EOF's for ITU

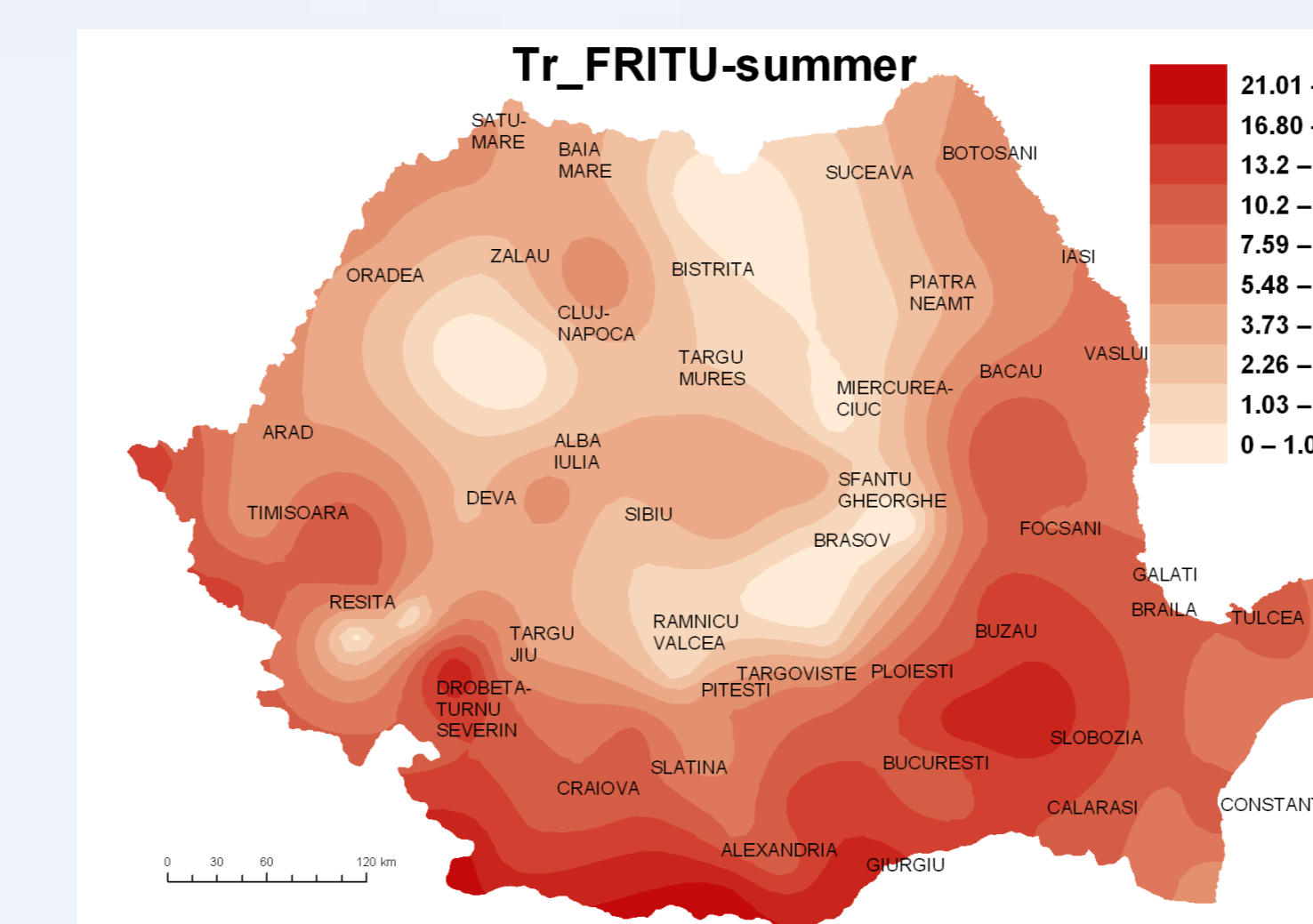
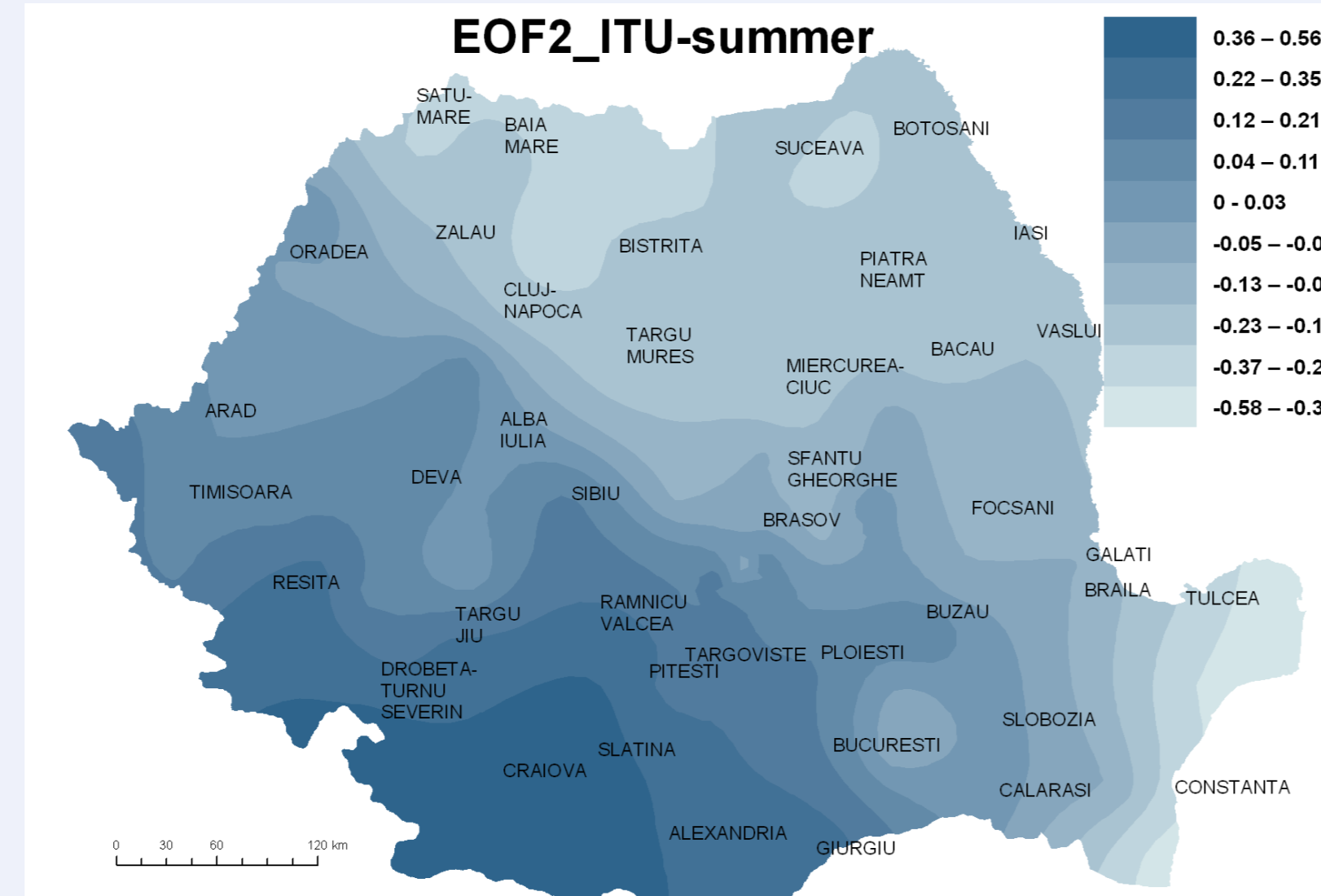


Figure 6. Linear trends (50 years) of summer Fritu

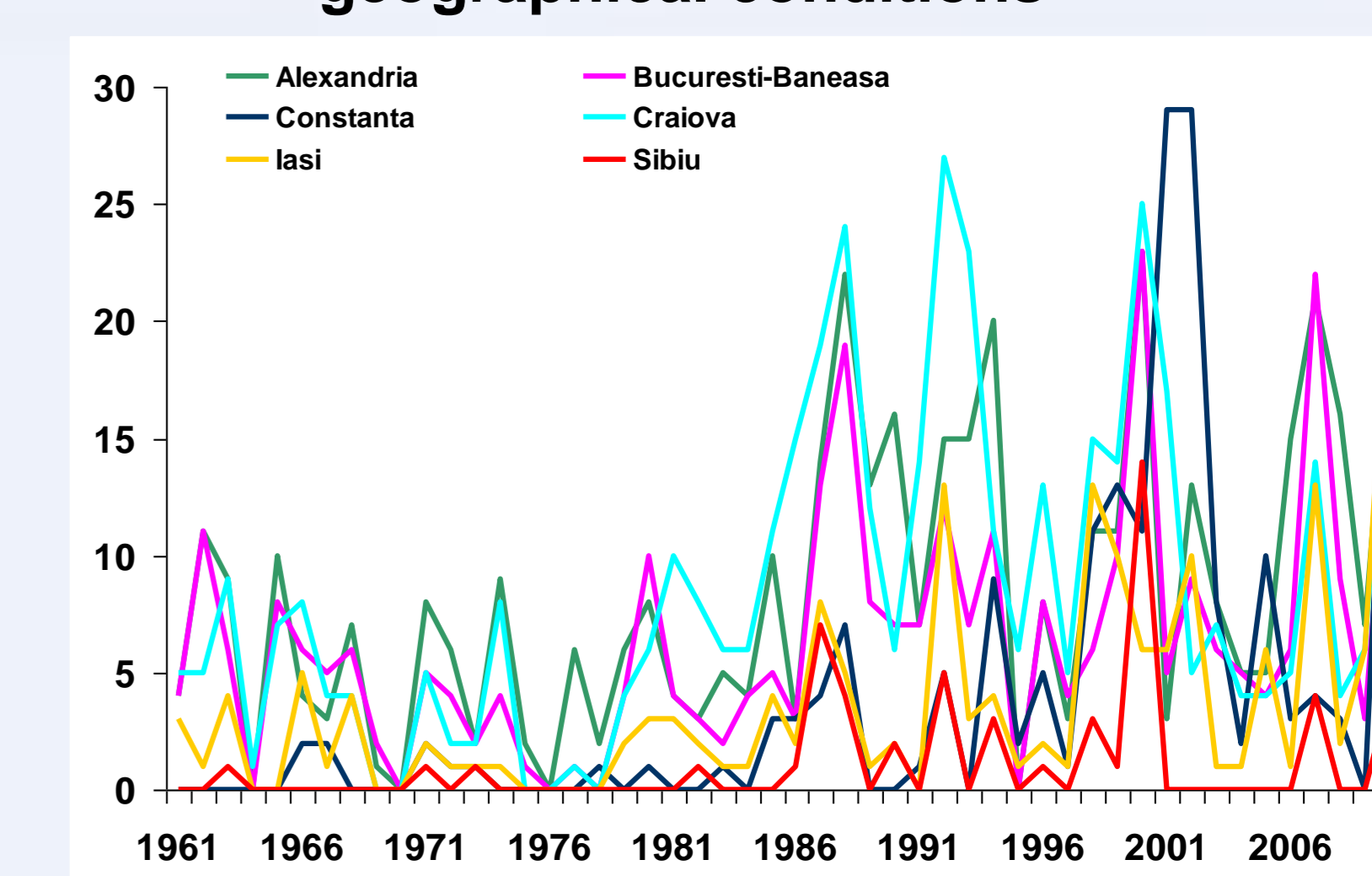


Figure 8. Temporal evolution of the Fritu time series for several stations situated in various physico-geographical conditions

CONCLUSIONS

The results reveal statistically significant increasing trends (5% level) for the monthly ITU averages for May to August over the entire country and slightly decreasing for September (not statistically significant). The highest trends were identified for July (3.12 units/ 50 years) and August (3.25 units/ 50 years). An increasing trend was also identified for the summer frequency of ITU values exceeding 80 units with highest values over the extra-Carpathian regions, reaching 16-25 days/ 50 years in the South of Romania (Danube Plain). A strong increase shift was identified around 1987 year, which is in agreement with the shift in the extreme temperature indices in Romania (presented in other study). The EOF analysis reveals that EOF1 pattern, showing same sign over the entire country, explains 89% from the total observed variance. This result shows that a large-scale mechanism is responsible for the summer ITU variability. The correlation between the time series associated to EOF1 (PC1) of the summer ITU and (PC1) of the T850 (large-scale temperature at 850 hPa) was performed, showing a significant strong correlation, as found for the extreme temperatures. This result shows a possible physical explanation of the ITU increasing trend.

ACKNOWLEDGEMENTS

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