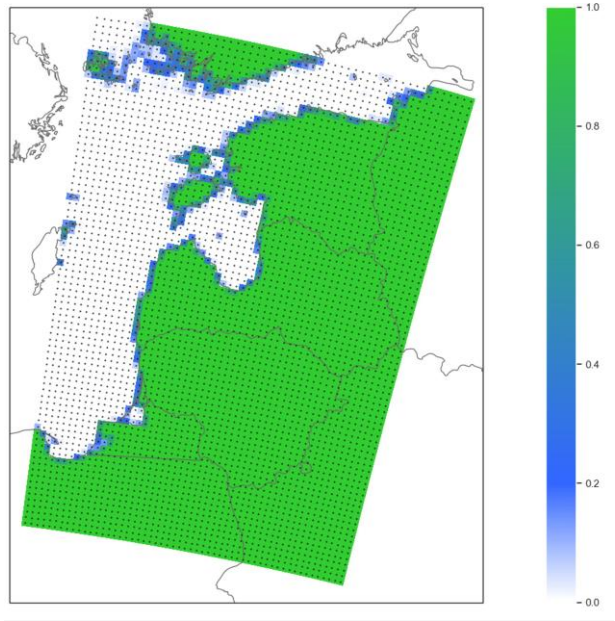
Quantifying the Wind Direction Climate over the Baltic States using Principal Component Analysis

Tija Sīle, Maksims Pogumirskis, Juris Seņņikovs, and Uldis Bethers

- When we want to analyze temperature in some specific region, we plot the maps of average temperature
- What to do about **wind direction**? No such a thing as "average wind direction"
- We use Principal Component Analysis (PCA) to have an overview of the wind direction in Baltic States
- We do PCA on both observations and reanalysis (UERRA) data and compare the results

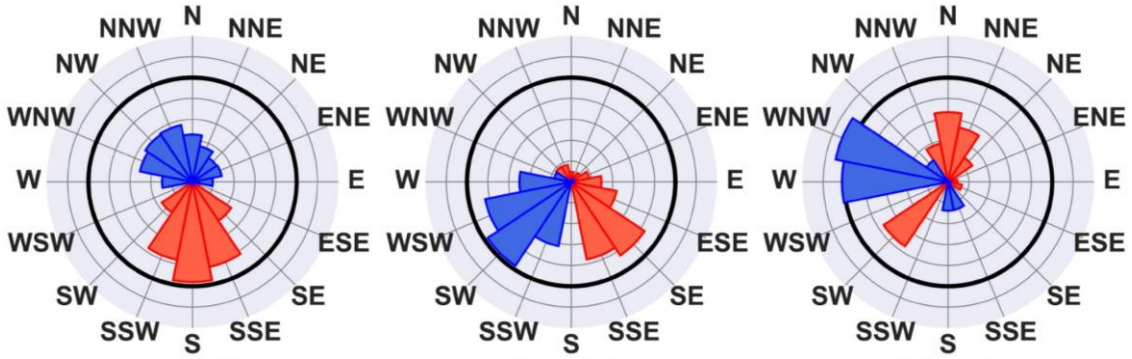


study region

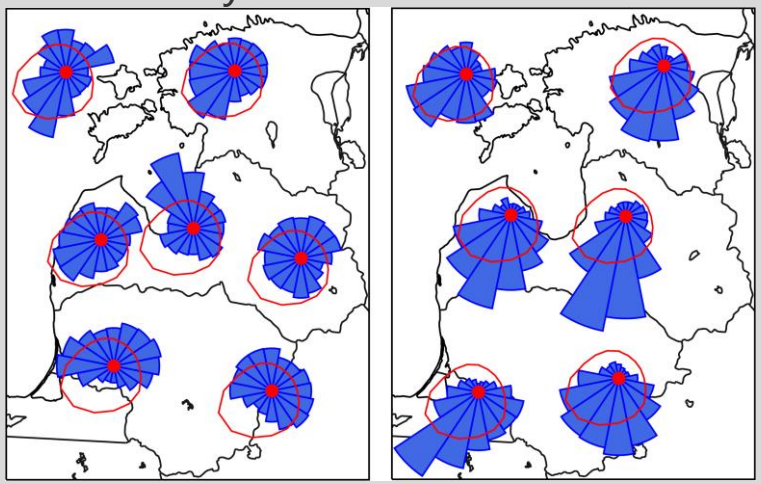
T.S. acknowledges the financial support of the project 'Mathematical modelling of weather processes - development of methodology and applications for Latvia (1.1.1.2/VIAA/2/18/261)

"PCA analysis of wind direction climate in the Baltic states." *Tellus A: Dynamic Meteorology and Oceanography* 73, no. 1 (2021): 1-16. https://www.tandfonline.com/doi/full/10.1080/16000870.2021.1962490

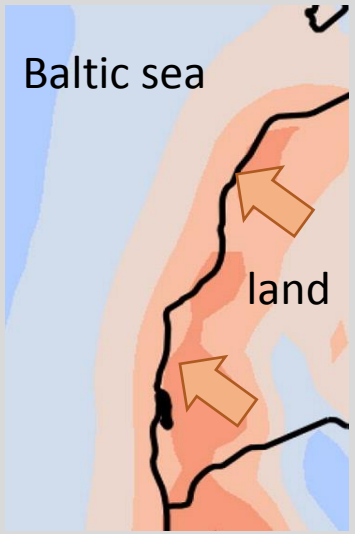
Using PCA we identified main correlations between wind directions.
We linked the groupings of wind directions (Principal Components) with meteorological processes.
Examples are shown below.



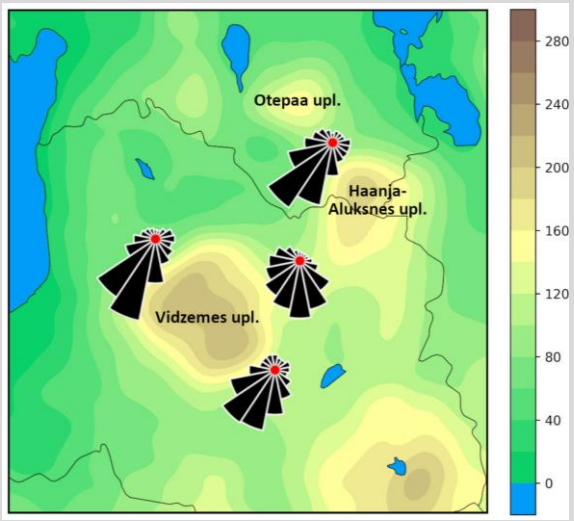
Directions shown in red are correlated with other red directions and anti-correlated with directions in blue.



Wind roses:
northerly winds in Summer,
southerly winds in Winter (synoptic scale).



PC2 map: SE winds present when the sea is warmer than the land.



Wind flows modified by orography (hills with height up to 300 m)