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1. Objective

- A region with the climatic conditions expected in future in the viticultural region in Lower Franconia, Germany, is sought (Fig. 1)
- Goal: Test scions of the typically Franconian grapevine variety Silvaner in a field study conducted by the Bavarian State Institute for Viticulture and Horticulture

2. Background

- The grapevine variety Silvaner is a prominent part of the local culinary culture [1]
- Hillside locations of the vineyards create a specific microclimate [2]
- Franconia as 'hotspot of climate change' [3]

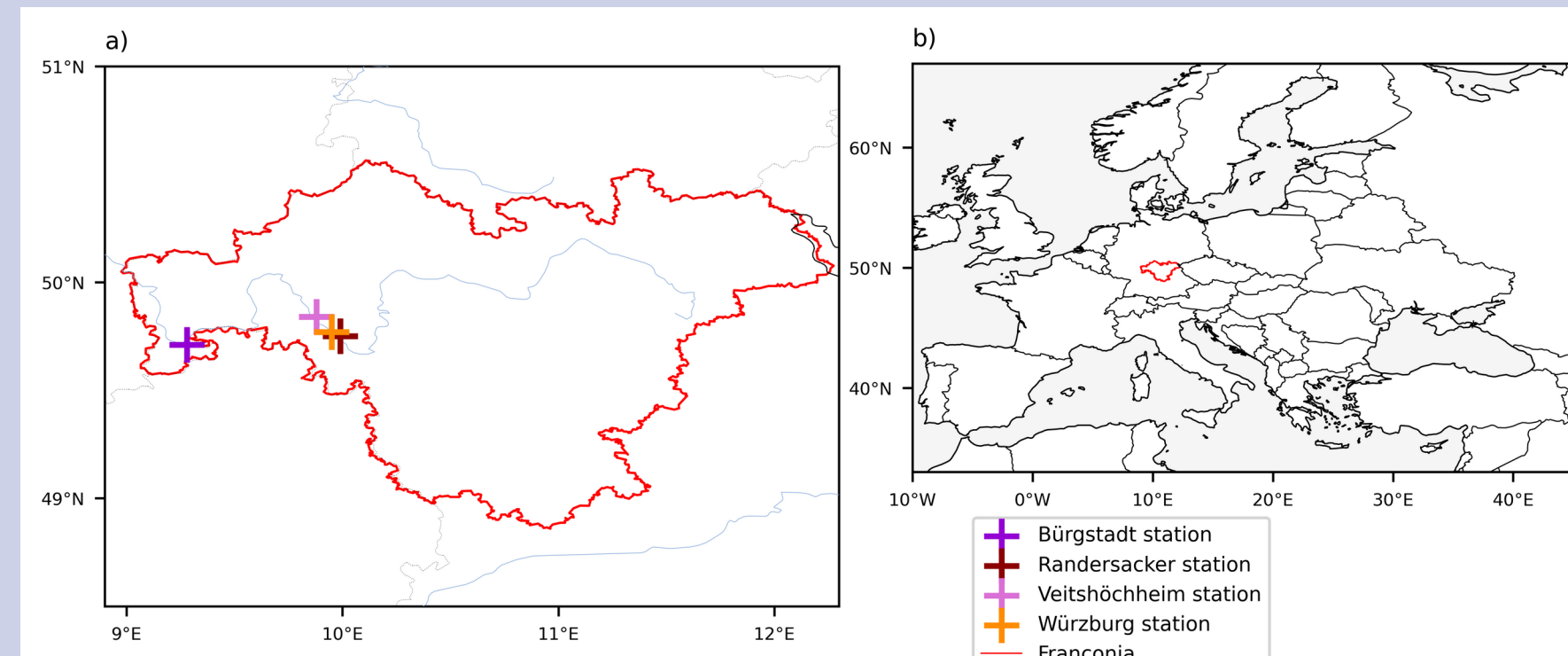


Fig. 1: Locations of the vineyard stations in Franconia (a) and location in Europe (b).

Huglin index examples [8]:
1500–1600: Müller-Thurgau
1600–1700: Pinot Blanc
1600–1700: Silvaner
1800–1900: Cabernet Franc
1900–2000: Cabernet Sauvignon
2000–2100: Ugni Blanc
2100–2200: Cinsaut
2200–2300: Carignan
2300–2400: Aramon

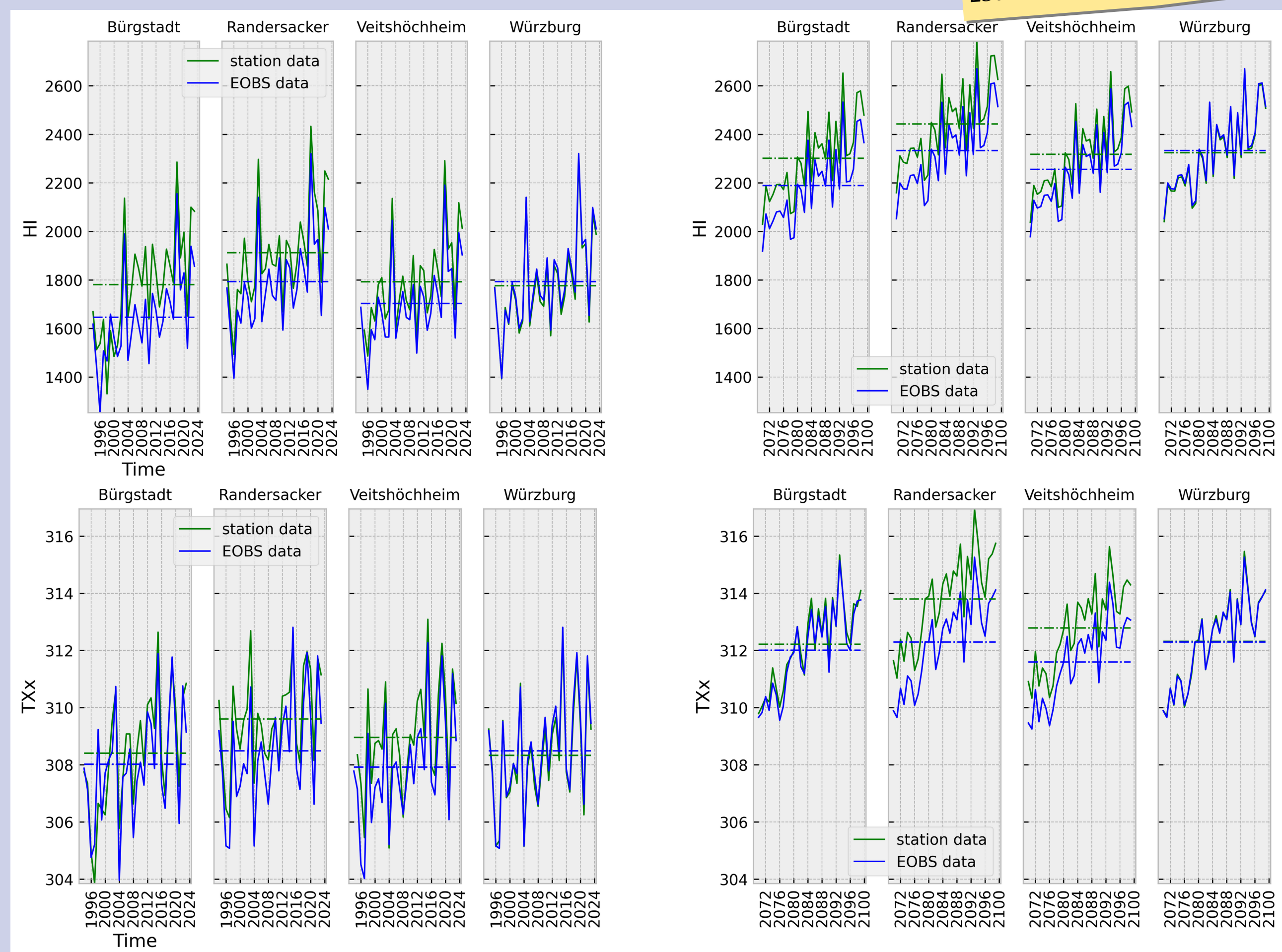


Fig. 2: Comparison of in-vineyard and raster data for the four locations in recent times (left). Comparison of future model data bias-corrected with station vs. raster data (right). Huglin index (HI): latitude-dependent temperature sum (top). TXx: yearly maximum of the maximum temperature (bottom). Dash-dotted lines represent 30-year mean values.

3. Analysis

- Analogue climate search with standardised Euclidian distance and Euclidean distance on leading principal components (Fig. 3)
- Candidates: rasterised European observation data E-OBS [4]
- Franconian targets: EURO-CORDEX RCP8.5 multi-model ensemble [5] for the years 2070–2099, bias corrected with detrended quantile mapping with in-vineyard station data [6,7] and nearest neighbour interpolated E-OBS data [4] for comparison
- Index set curated by Bavarian State Institute for Viticulture and Horticulture: 30 bioclimatic and vine-specific indices calculated from daily mean, maximum and minimum temperature and daily precipitation
- Optional weighting by expert knowledge

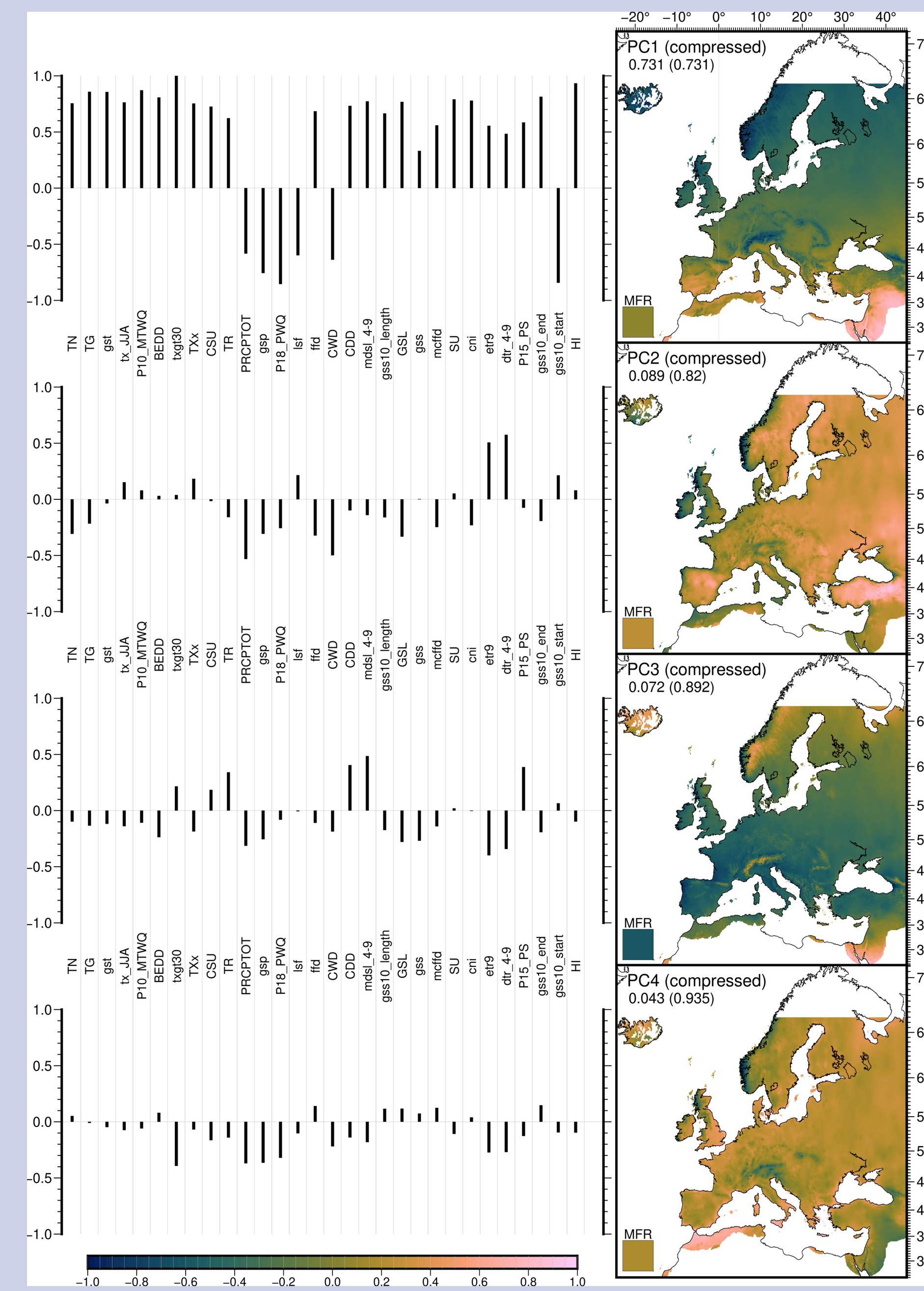


Fig. 3: Leading principal components of the indices' temporal means. Contribution for each index as represented by the empirical orthogonal function (left) and spatial visualisation of the first four principal components (PCs, right). The MFR box indicates the PC value of Randersacker's future data with station data bias correction. The number at the top of each map is the portion of total variance accounted for by the respective PC. The PCs are compressed, i. e. scaled linearly to the interval [-1,1] in order to have a shared colour scale.

4. Results

- Station data significantly ($p > 0.05$) warmer than macroclimate for multiple indices (Fig. 2, Würzburg input for raster)
- Probably suitable experiment sites regarding climate in France, Italy and Portugal (Fig. 4, Fig. 5), for PCA-based calculation additionally Serbia (Fig. 4)
- Weighting in the PCA-based approach results in eastwards shift, e. g. to Hungary (Fig. 6)

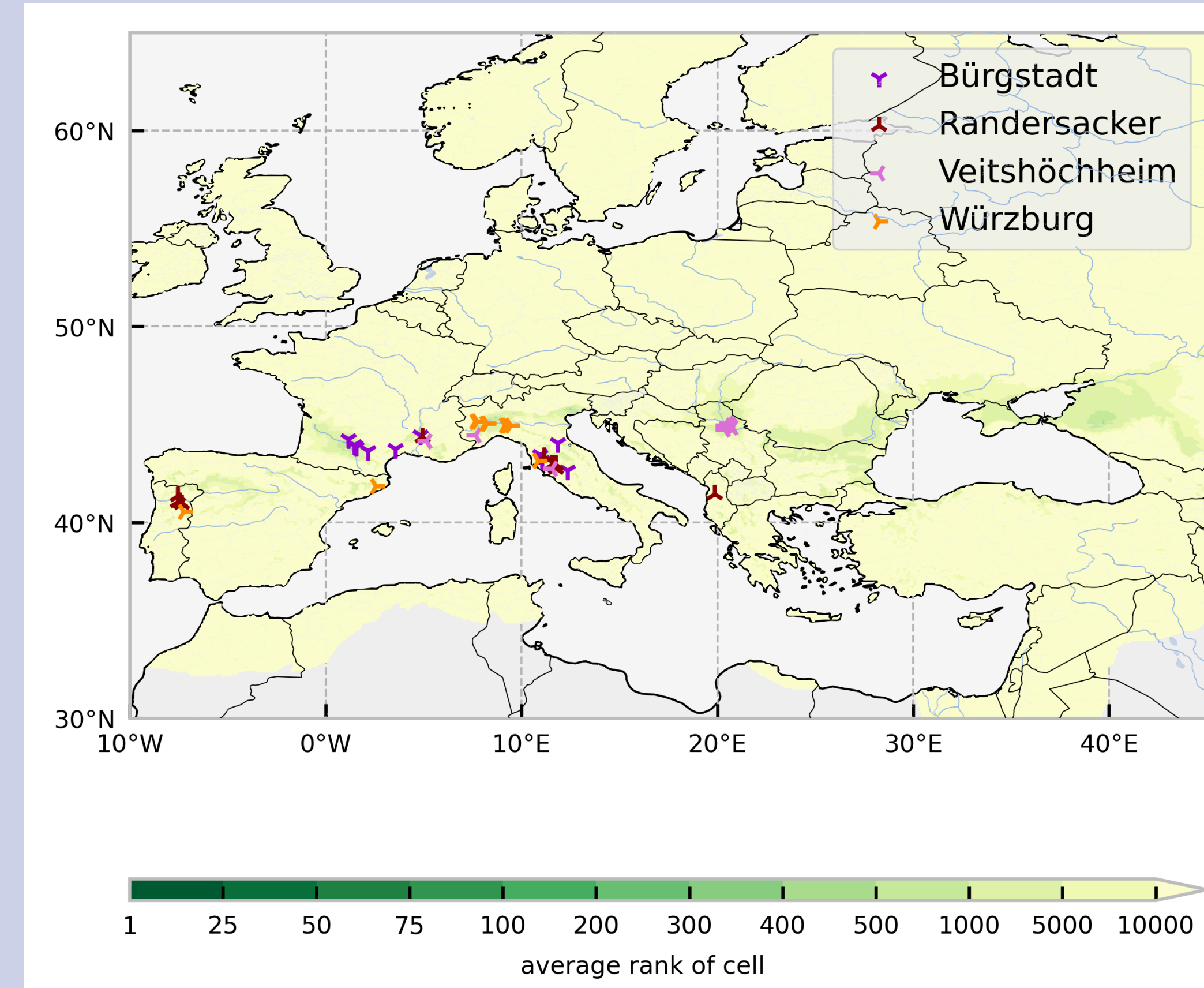


Fig. 4: Future analogue climates calculated using four principal components for vineyard station data, markers display the 10 highest ranked analogue cells for each station. The green shading shows the cell's average ranks. The station's climates differ and lead to different analogue regions.

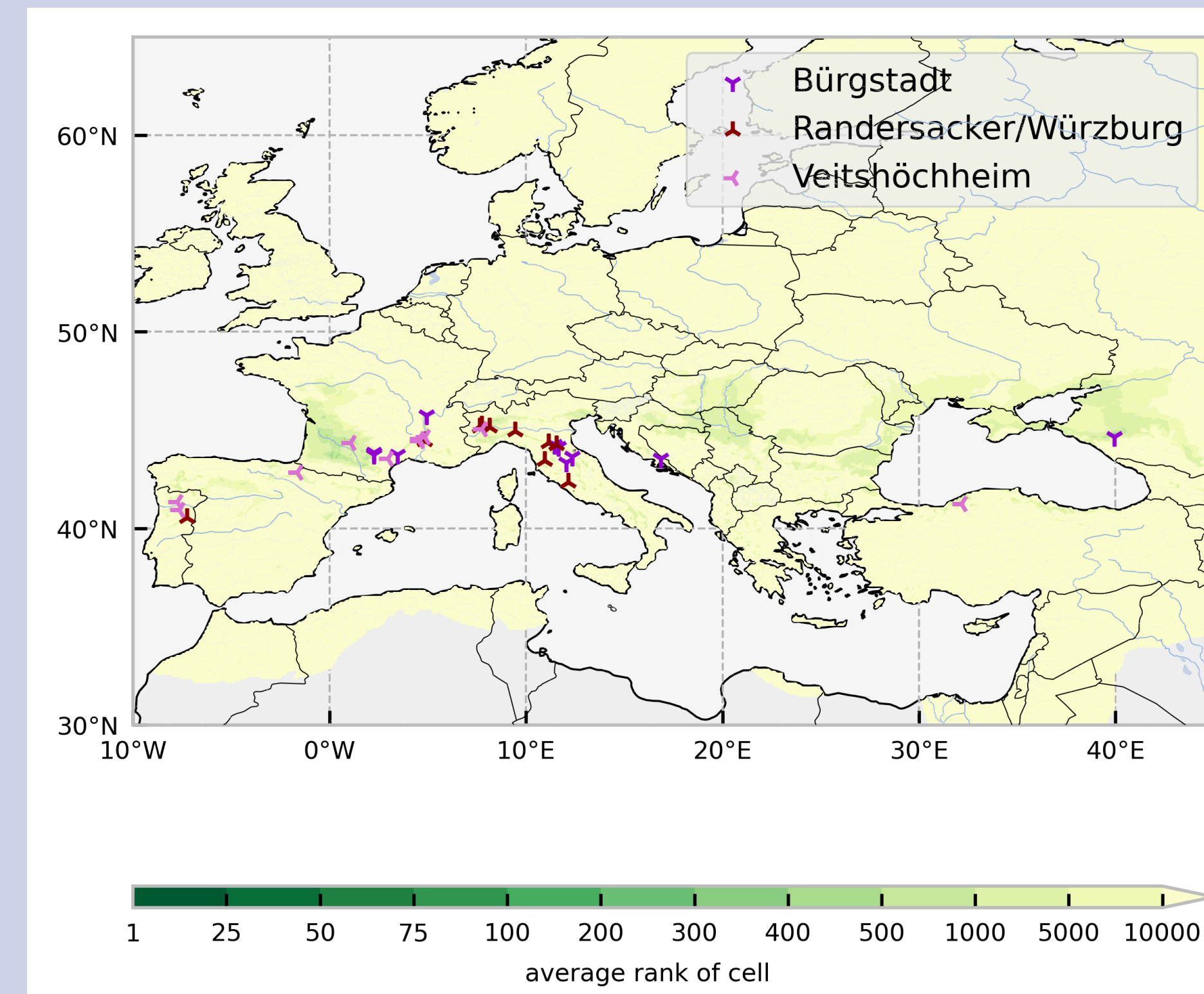


Fig. 5: Expected analogue climates for 2070–2099 calculated using four principal components for raster data (Würzburg and Randersacker share the cell in the E-OBS and EURO-CORDEX grid).

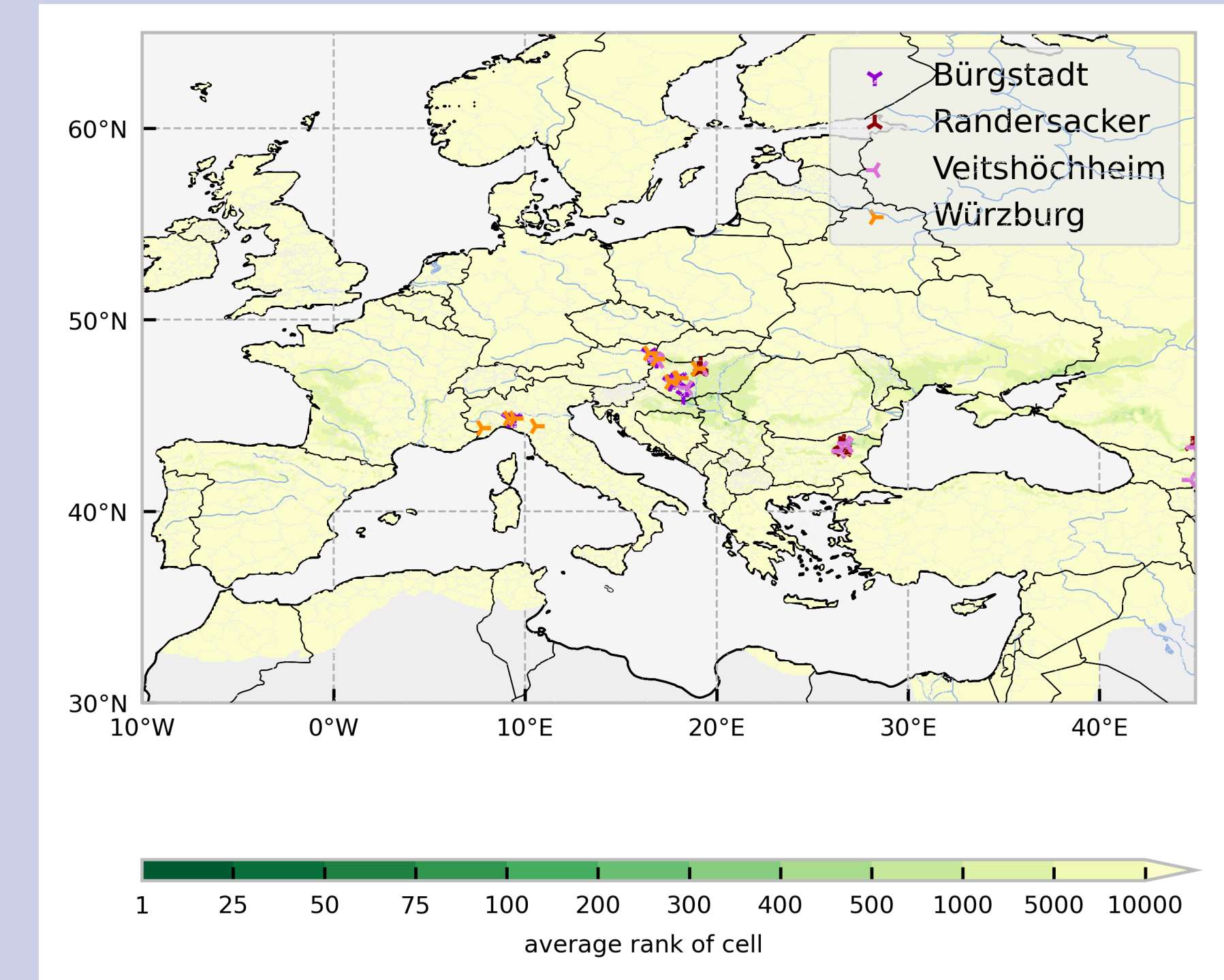


Fig. 6: Future analogue climates calculated using four principal components for vineyard station data, weighting considered.

5. Conclusion & Ongoing Work

- Bias correction with station data allows projection, it hints more heat compared to macroclimate in future
- Site in south-western France chosen for field experiments

Literature

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Link to Abstract

