Climate Twins

A Climate Change Exploration Tool

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The Climate Twins Idea

The idea of Climate Twins is to identify regions whose current climate conditions show high similarity to the expected future climate in a point of interest (POI). As the current climate conditions can be observed in real world, the users can discover how the future climate may affect nature and society and which adaptation strategies would be appropriate to cope with those climate conditions. The Climate Twins search tool is a web-based graphical user interface allowing to explore climate change effects based on maps of current and future climate. (http://foresight.ait.ac.at/projects/climatetwins)

Climate Twins Application

The application enables the user to choose a municipality in a map of Austria (holding the future climate indicators as a background layer) → Point of Interest (POI)

Clicking with the cursor on a municipality triggers a Climate Twins search task:

The location is then related to the indicators reflecting future climate conditions.

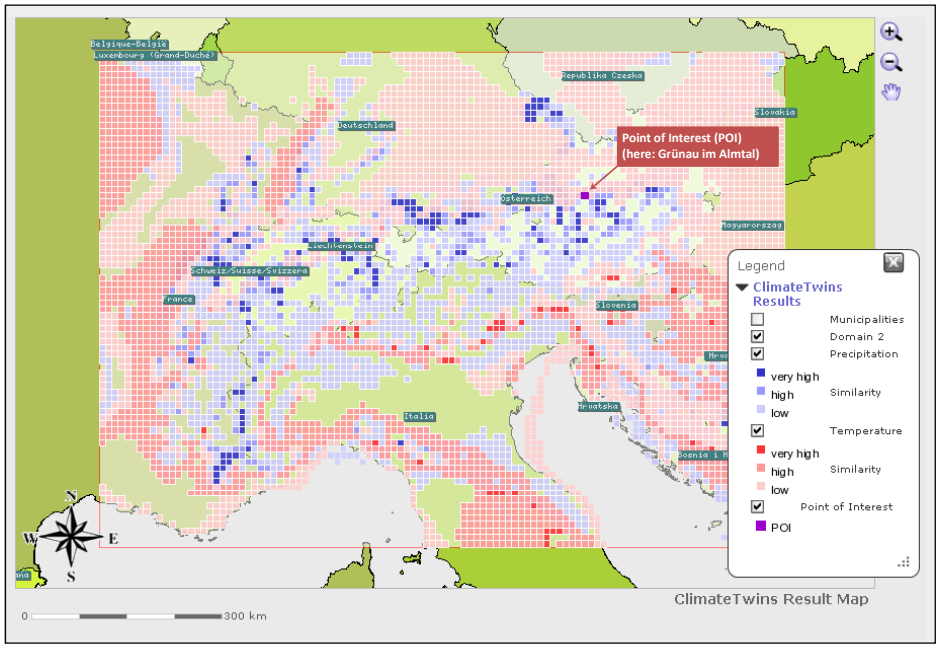
The future climate indicators of the POI are compared with the current climate indicators in other parts of Europe on a cell by cell basis.

Those current climate grid cells which show a certain similarity with future climate conditions in the chosen municipality are identified as Climate Twins and are displayed in a result map (depicted on the right hand side).

The darker the colour, the more similar the region's current climate condition is to the future climate in the chosen municipality (POI) (red: temperature, blue: precipitation)

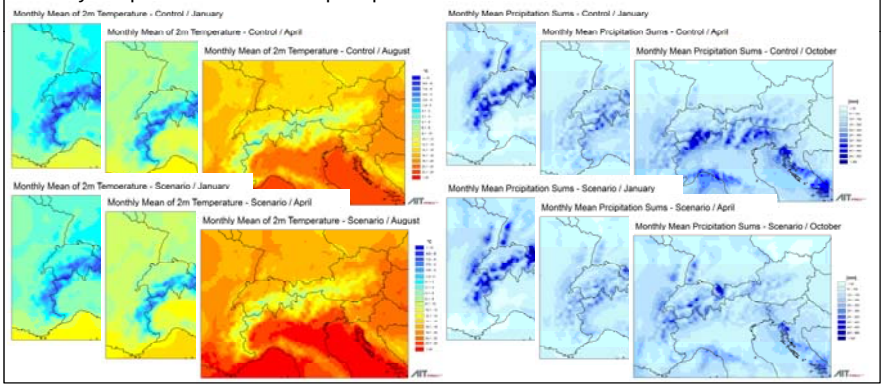
Currently data refer to the reclip:more project providing data from 1981-1990 & 2041-2050 with 10km grid spacing.
The prototype works now for Austrian source locations.

In the future additional model results will be integrated.



Currently applied data to explore climate change

Monthly temperature means and precipitation sums for current and future climate in Austria



Currently a limited indicator set and simple similarity criteria are applied to identify climatic coincidence:

Indicators:

- monthly temperature means and
- monthly precipitation sums.

Coincidence conditions are defined as frequency of similarity of monthly indicator values between those of the source location and identified regions.

Criteria to judge regions as similar: the indicators must not exceed a distinct uncertainty range:

- deviation from monthly mean temperature within +/- 0,4°C
- deviation from monthly precipitation sum within +/- 40 %

In progress: a more advanced similarity judgement

The more detailed the applied data are, the better is the similarity judgement.

To compare climate conditions between two regions we decided to measure the similarity of statistical distributions of daily data and compare on a cell by cell basis.

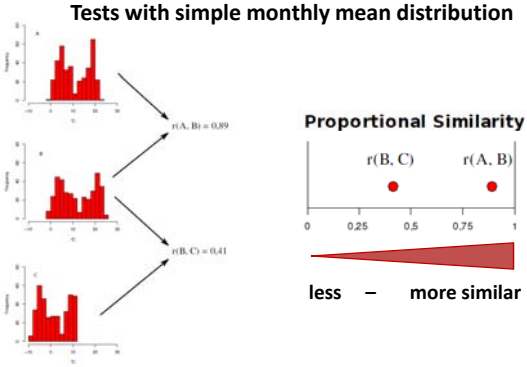
At least two statistical approaches are appropriate and applicable for fast comparison:

The Proportional Similarity (1) $$PD(U,V) = \sum_{i=1}^{C} min(f_{Ui}, f_{Vi})$$

and the Hellinger Coefficient (2). $$r_H(U,V) = \sum_{i=1}^{C} \sqrt{f_{Ui} * f_{Vi}}$$

Both represent the similarity between two distributions as a value ranging from 0 to 1.

Tests with simple monthly mean distribution



Literature: Loibl W et al. (2009), Reclip:more - kleinräumige Klimaszenarien für Österreich, in: Standort 3/2009, Springer
Peters-Anders, J et al. (2010), Climate Twins, in: Conference proceedings - Theorie und Quantitative Methoden in der Geographie, Dresden.2010
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