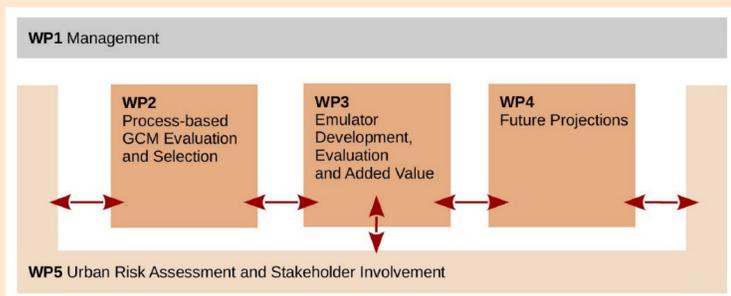# The CHIANTI Project
Current Status & First Results

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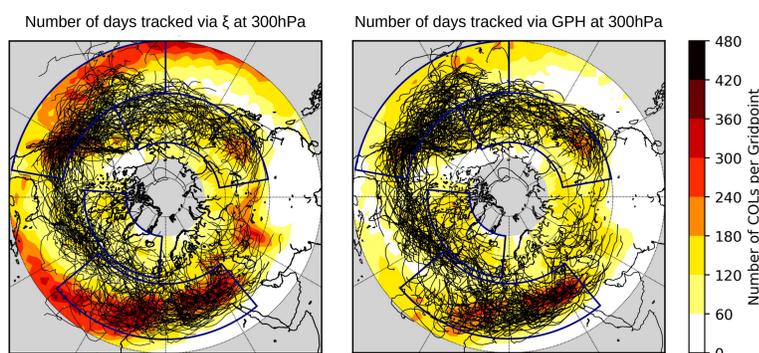
Project Overview

WP1 Management

WP2 Process-based GCM Evaluation and Selection

WP3 Emulator Development, Evaluation and Added Value

WP4 Future Projections

WP5 Urban Risk Assessment and Stakeholder Involvement

Objectives

O1 Genua-low and cut-off low evaluation;
O2 emulator development and evaluation;
O3 emulator-based projections;
O4 publication of generated model data;
O5 model the Graz sewer system in a future climate;
O6 assess role of climate change, land use changes and urbanisation;
O7 added value assessment of emulator.

Accomplished Tasks

T1.1 Kick-off meeting
T2.1 Literature review
T2.2 Data acquisition
T2.3 Cyclone tracking and detection **(ongoing)**
T3.1 Literature review
T3.2 Data acquisition
T3.3 Emulator development and testing **(ongoing)**
T5.1 Literature review
T5.2 Stakeholder meeting
T5.3 Build-up of sewer model
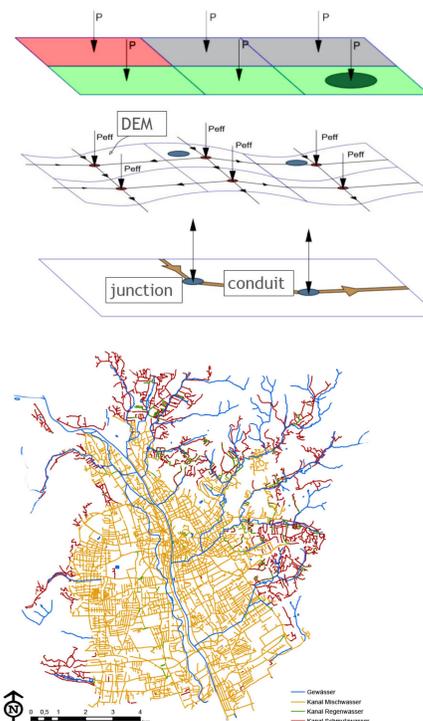**T5.4** Build-up of integrated model **(ongoing)**

Cyclone Tracking (WP2)

Aim: To assess the representation of extreme rainfall causing weather systems such as cut-off lows and Genua lows in driving GCMs for process-based model selection.

Number of days tracked via ξ at 300hPa

Number of days tracked via GPH at 300hPa

Number of COLs per Gridpoint

The tracking algorithm TRACK (Hodges, Mon. Wea. Rev. 1994) detects a substantially different number of cut-off lows depending on the chosen diagnostic, including different long-term trends. We are currently developing a new diagnostic with Kevin Hodges considering the most severe jointly tracked events.
Tracking of Genua lows in collaboration with Giuseppe Zappa (ACRP EASICLIM project).

Emulator Development (WP3)

Aim: To combine more realistic large-scale weather sequence from CMIP6 GCMs with more realistic local-scale weather from (CMIP5-based) CORDEX-FPS convection permitting RCMs.

GCM day

Emulated day

Pick most similar CPS day according to chosen large-scale predictors

CPS day 1

analog

Predictors:
SLP,
T2m,
T500+700+850,
Q500+850
Z500

(San-Martin et al., J. Climate, 2017; Maraun et al., Int. J. Climatol., 2019)

We are currently developing the code for training the analog method on CMIP6 and CORDEX-FPS model simulations.

Sewer System Model (WP5)

Aim: To develop a model for sewer system spill over and urban flooding for the city of Graz that is fit for future projections.

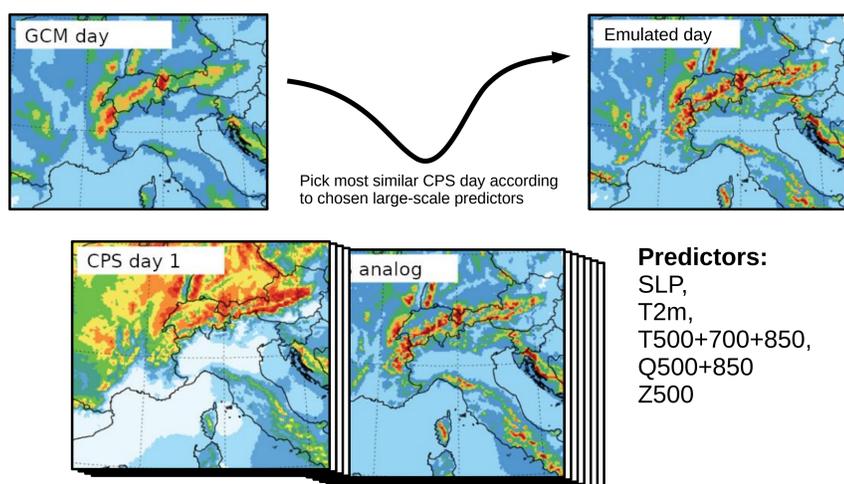Hydrological model SWMM5.1

2D flood model CA

1D sewer model SWMM5.1

Vulnerability hotspots have been identified.

Based on a detailed model from 2018, we are developing an aggregated model (hydrology ~100m; flood ~10m) fit for long-term ensemble simulations. This model includes updated terrain, land-use and the new central sewer storage canal ("Zentraler Speicherkanal").

Stakeholder Workshop (WP5)

Aim: To obtain feedback on the chosen sewer system model setup, target variables, time horizons, scenarios, return levels etc. to optimize the relevance of the project results for Holding Graz (H.G.).

Target variables: surcharge volume, discharge volume of a combined sewer overflow, flooding areas, inflow to treatment plant
Time horizon: 2070-2100
Scenarios: RCP6.0, RCP4.5
Return levels: 5, 10 (and 50) years, stress tests irrelevant
Further remarks:
• Critical locations should not be aggregated (list provided by H.G.)
• Change factor for design values would be a key practical result
• Subsequent modeling of individual houses in critical areas by H.G. would be required.

References
Hodges, K. I. (1994). A general method for tracking analysis and its application to meteorological data. Monthly Weather Review, 122(11), 2573-2586.
Maraun, D., Widmann, M., & Gutiérrez, J. M. (2019). Statistical downscaling skill under present climate conditions: A synthesis of the VALUE perfect predictor experiment. International Journal of Climatology, 39(9), 3692-3703.
San-Martín, D., Manzanas, R., Brands, S., Herrera, S., & Gutiérrez, J. M. (2017). Reassessing model uncertainty for regional projections of precipitation with an ensemble of statistical downscaling methods. Journal of Climate, 30(1), 203-223.

3 GOOD HEALTH AND WELL-BEING

6 CLEAN WATER AND SANITATION

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

13 CLIMATE ACTION