

UNCERTAINTY OF LOW FLOW PROJECTIONS IN AUSTRIA

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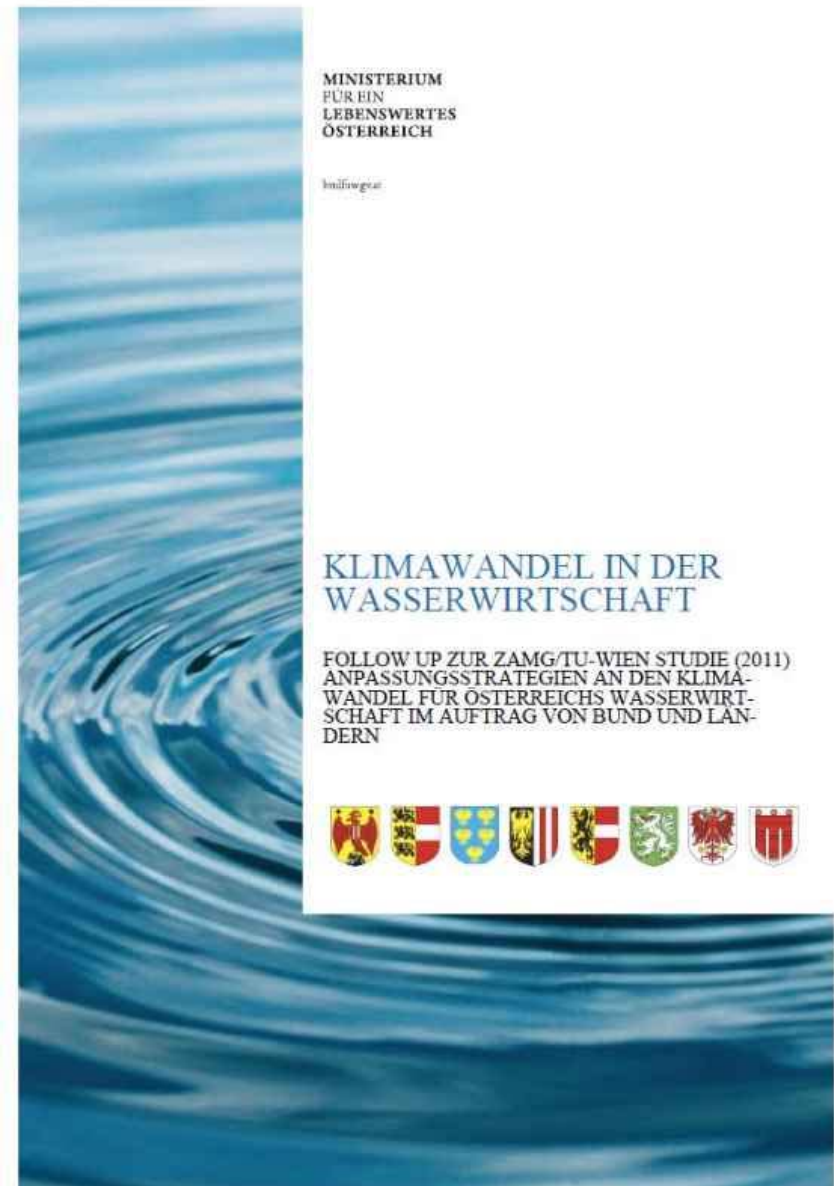
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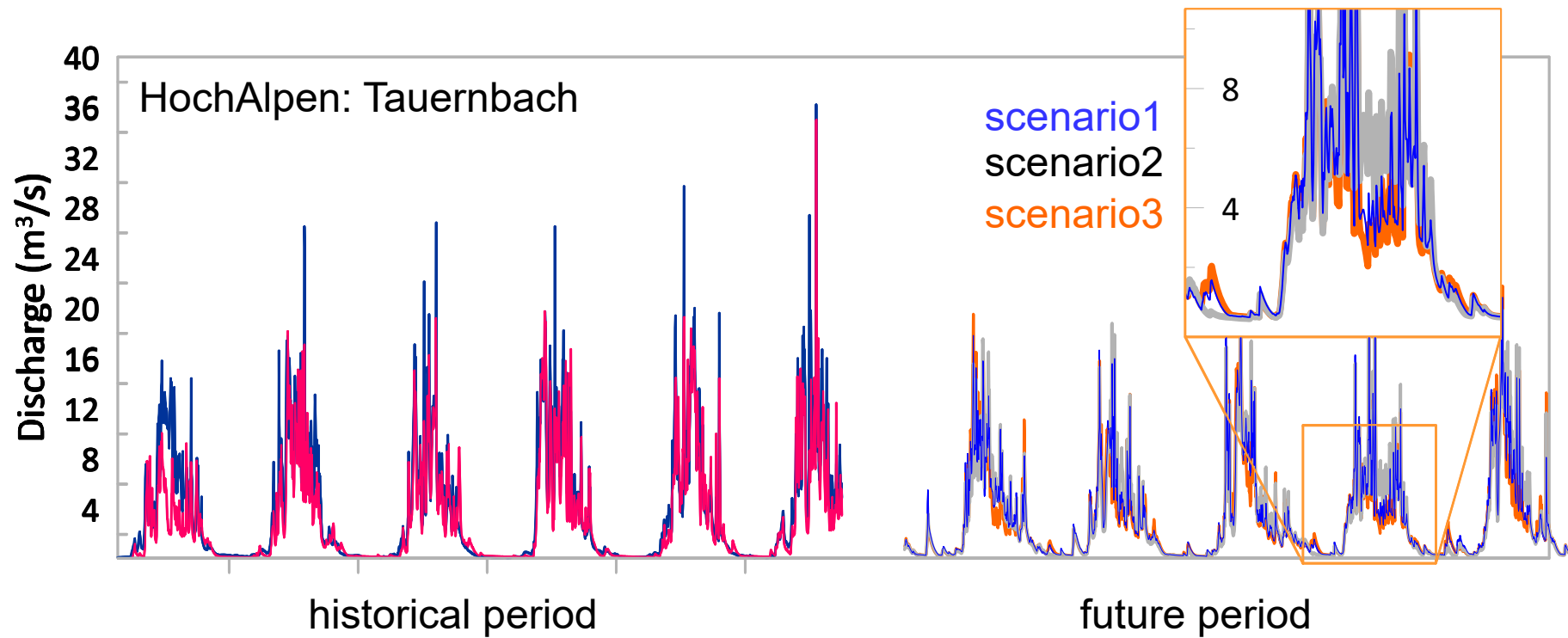


Climate change impact studies on water resources: Climate report

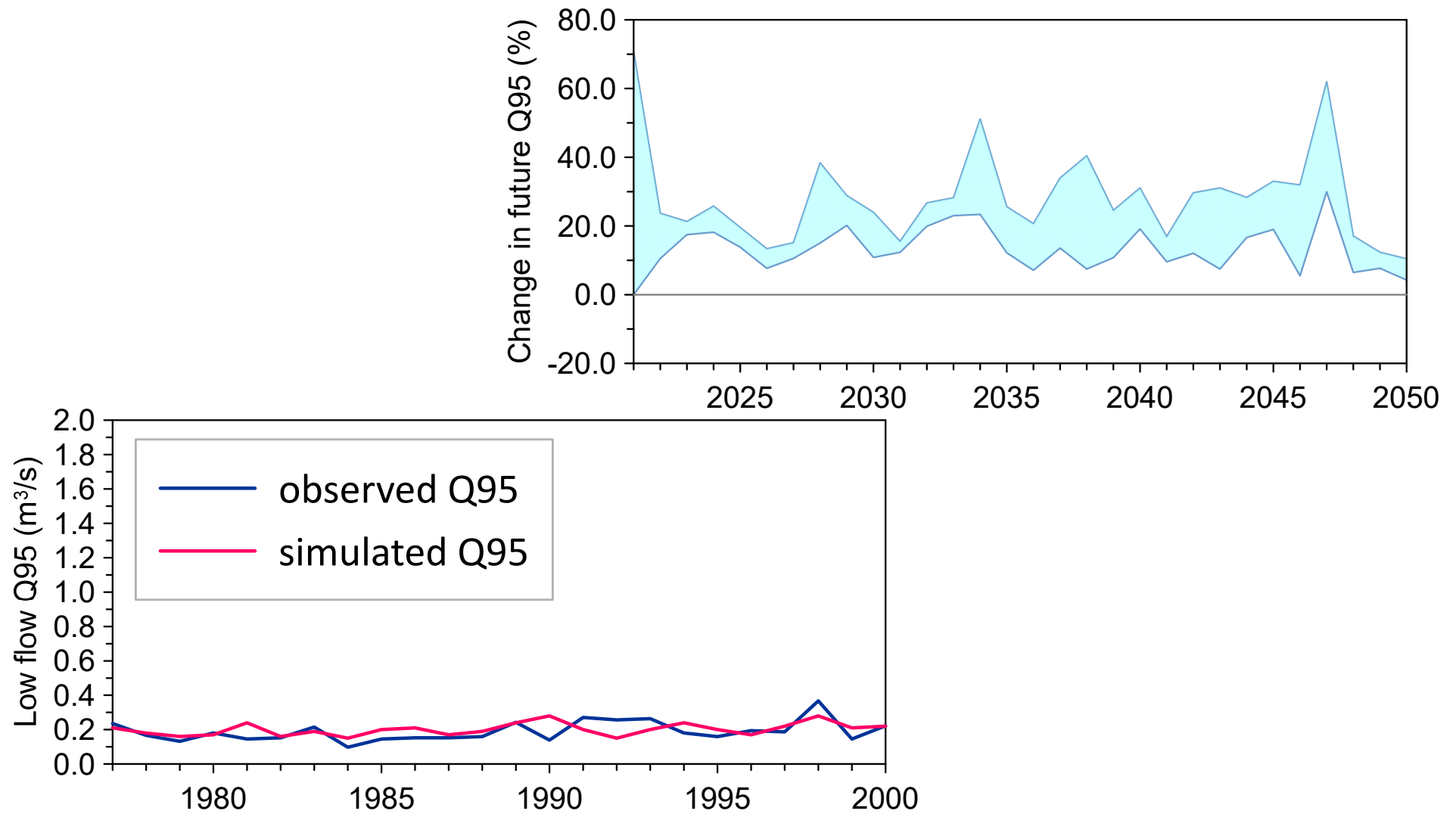
Low flow:
ACRP projects
CILFAD,
AQUASTRESS,
DALFPRO



Uncertainty of low flow projection



Uncertainty of low flow projection

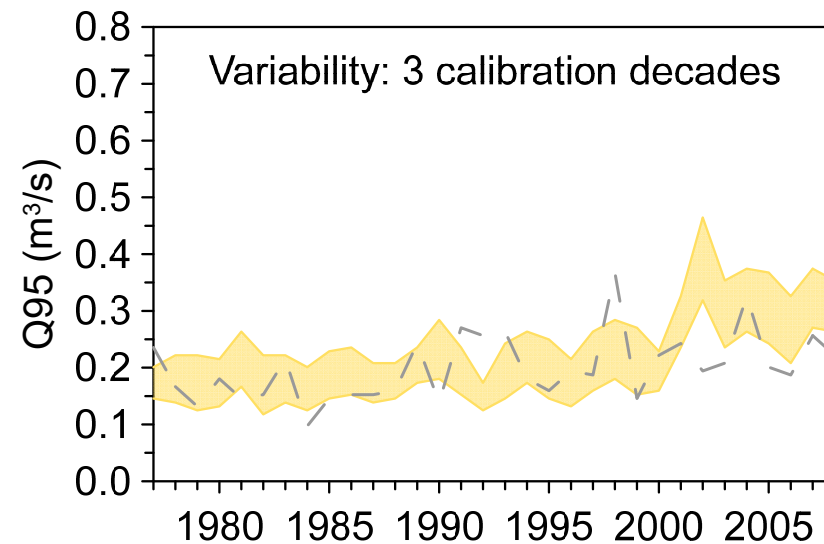
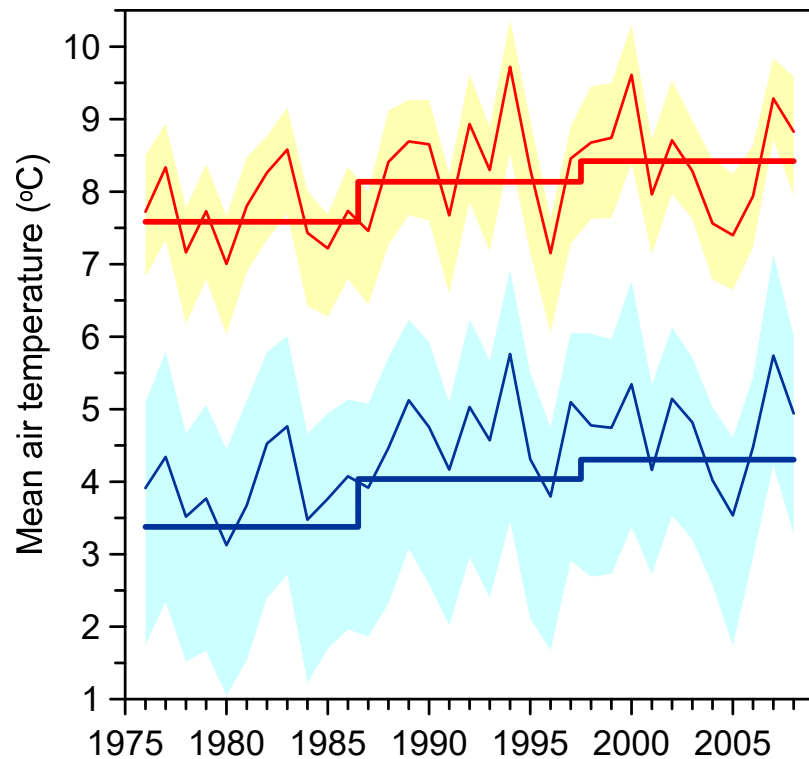


Uncertainty of low flow projection due to:

1) Climate scenarios

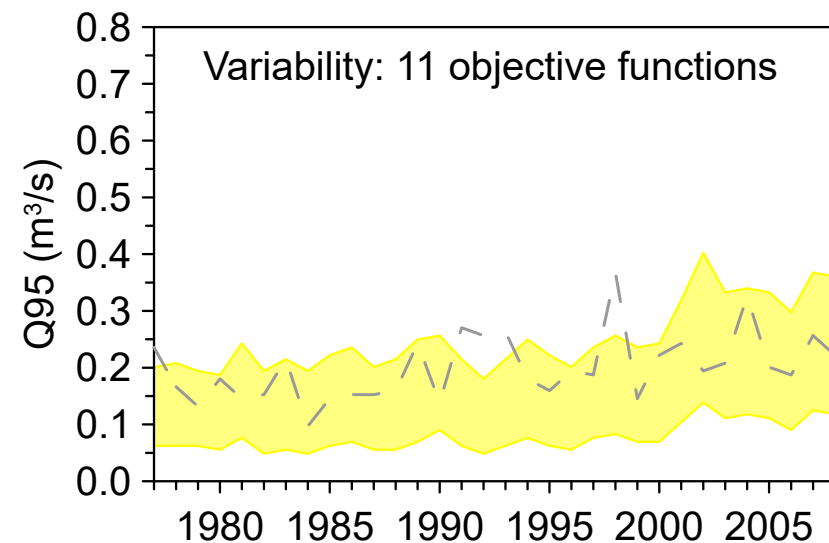
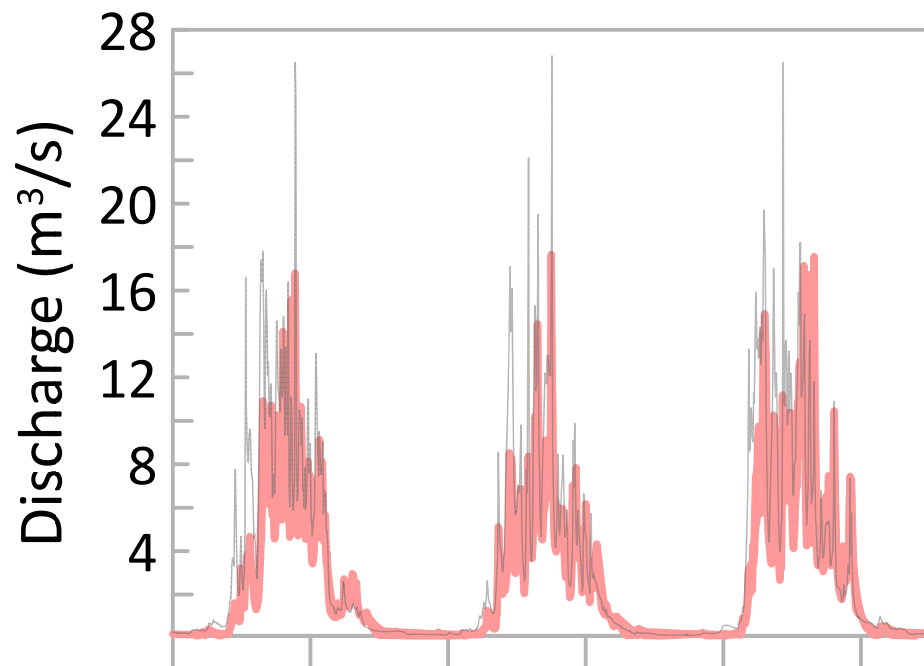
2) Decade used for model calibration

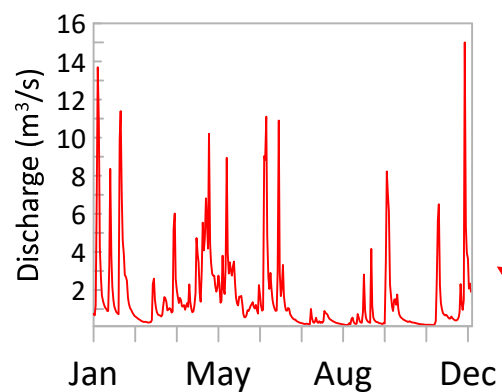
3) Objective function used for model calibration



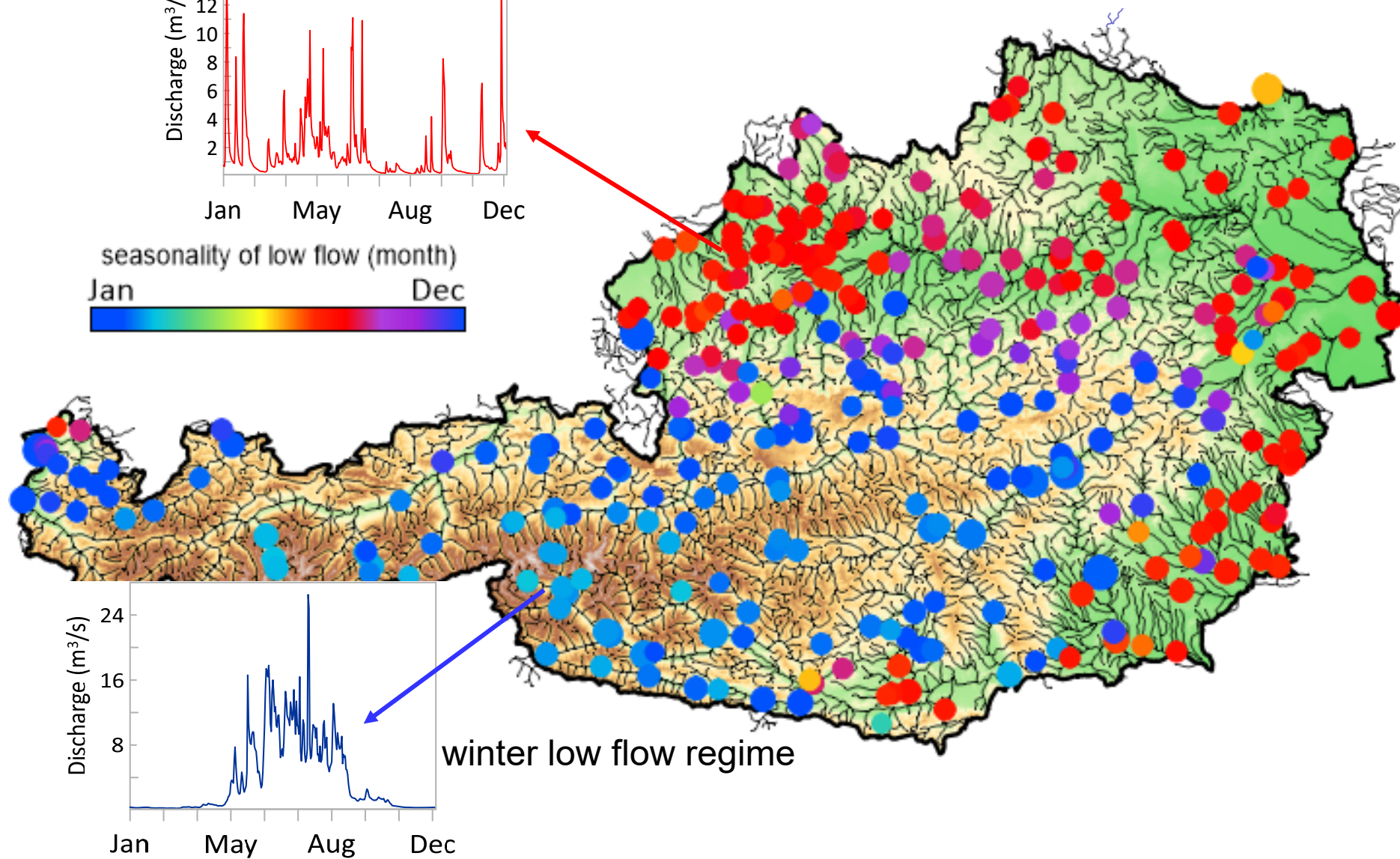
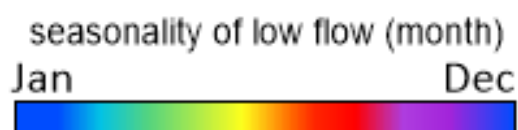
Uncertainty of low flow projection due to:

- 1) Climate scenarios
- 2) Decade used for model calibration
- 3) Objective function used for calibration





summer low flow regime



Methodology

1) Hydrologic model (TUWmodel) calibration)

- 15 model parameters
- Model input: daily precipitation, air temperature
- Calibration in 262 catchments

2) Future climate projections

- 4 scenarios: ECHAM5-A1B, A2, B1 and HADCM3-A1B
- Delta change approach for the period 2021-2050
- Evaluation of Q95 and low flow seasonality

Assessment of low flow simulations

262 catchments x 3 calib.decades x 11 obj.fun. x 4 scenarios

34584 simulations runs

Change of Q95 (%)
2021-2050 vs 1978-2007

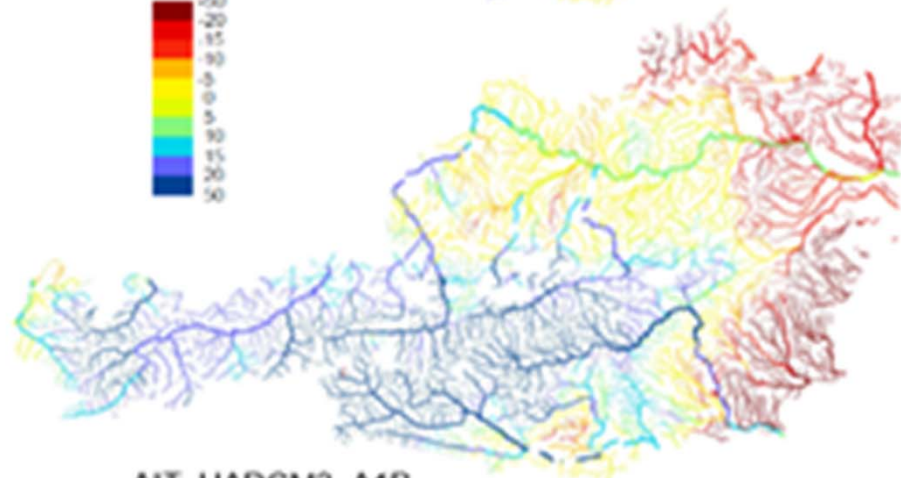
WEGC_ECHAM5_A1B



ZAMG_ECHAM5_A2



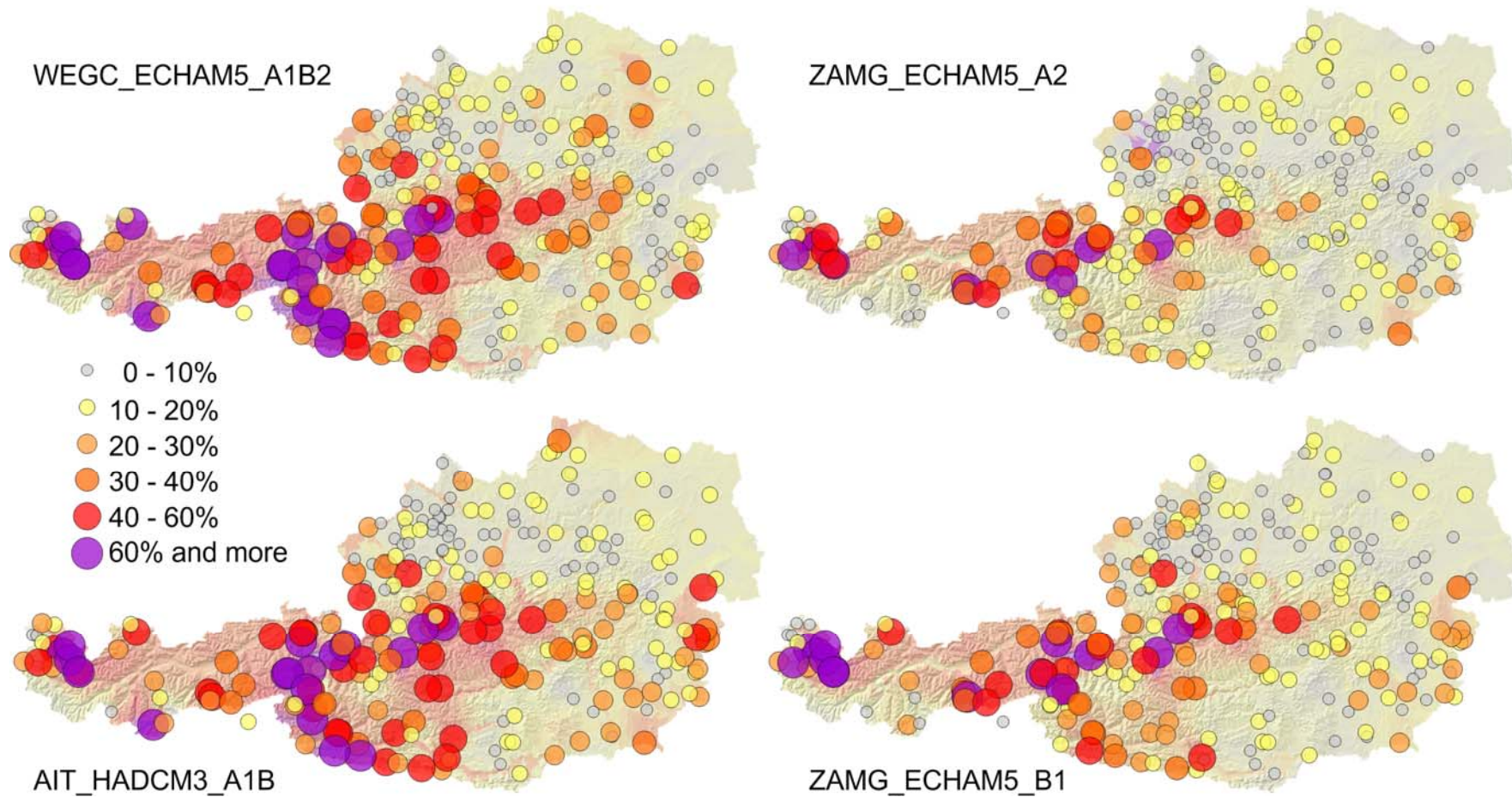
AIT_HADCM3_A1B



ZAMG_ECHAM5_B1

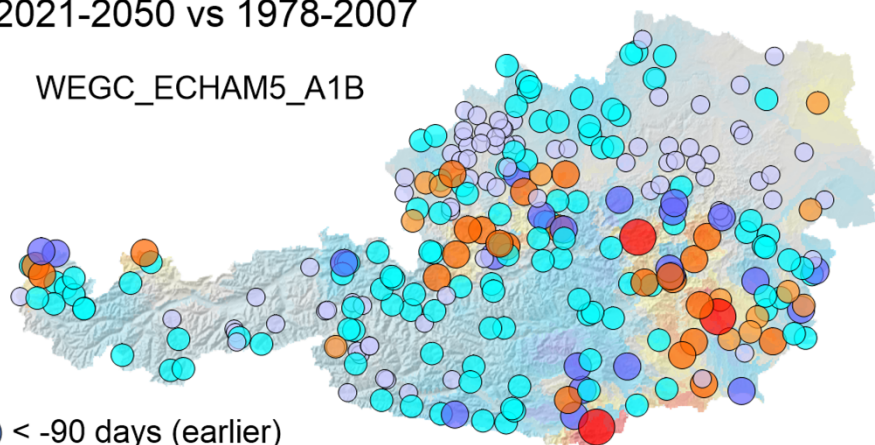


Uncertainty of Q95 projections due to model calibration

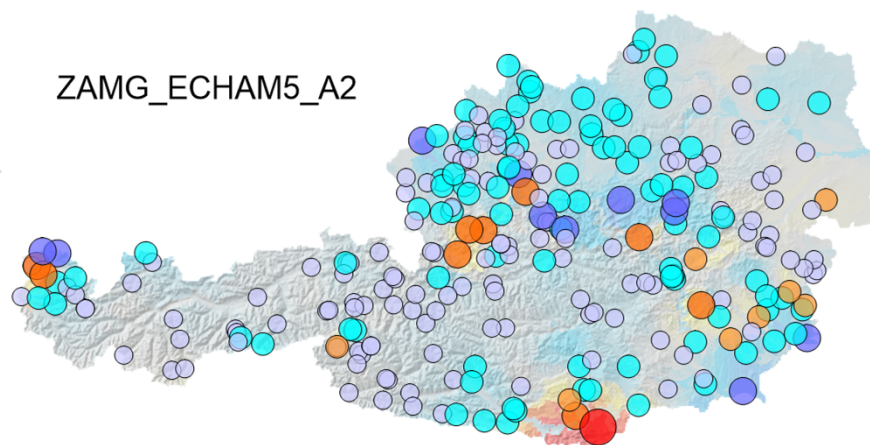


Seasonality change of Q95 2021-2050 vs 1978-2007

WEGC_ECHAM5_A1B

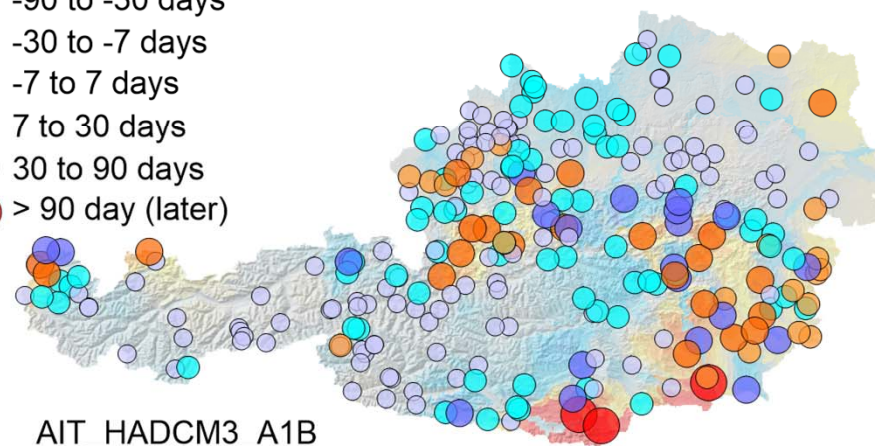


ZAMG_ECHAM5_A2

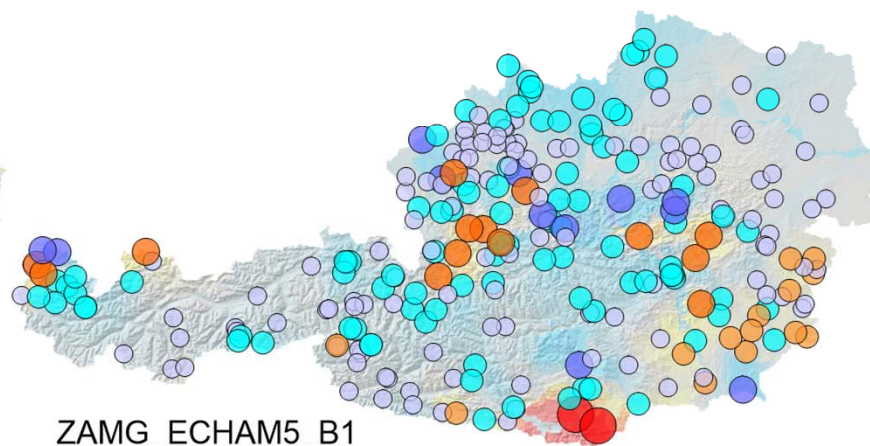


- < -90 days (earlier)
- -90 to -30 days
- -30 to -7 days
- -7 to 7 days
- 7 to 30 days
- 30 to 90 days
- > 90 day (later)

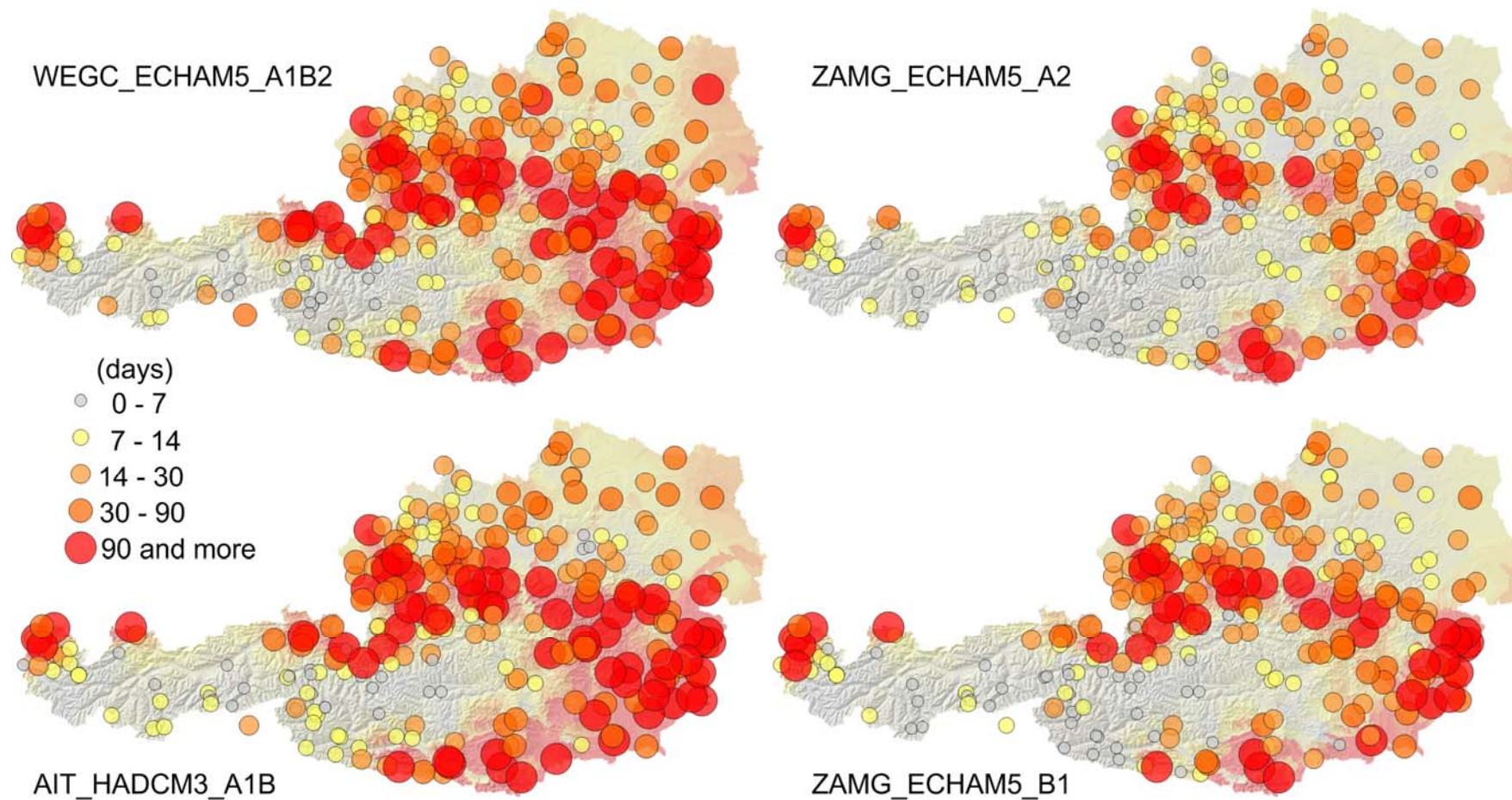
AIT_HADCM3_A1B



ZAMG_ECHAM5_B1



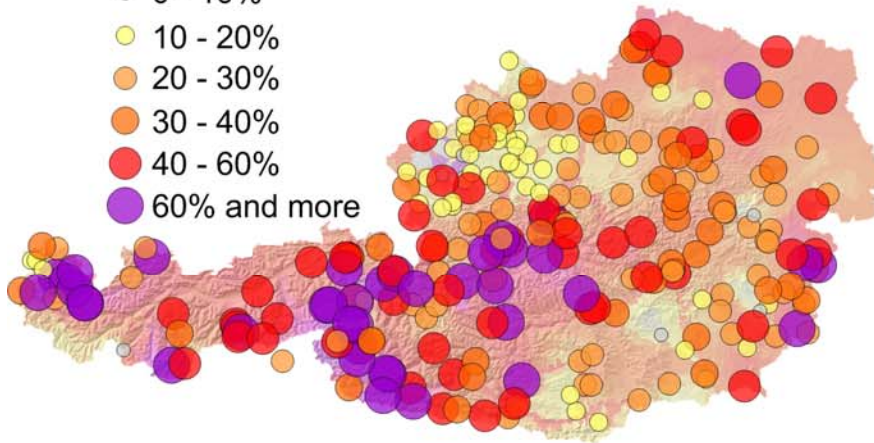
Range of low flow seasonality change due to model calibration



Total uncertainty of low flow projections

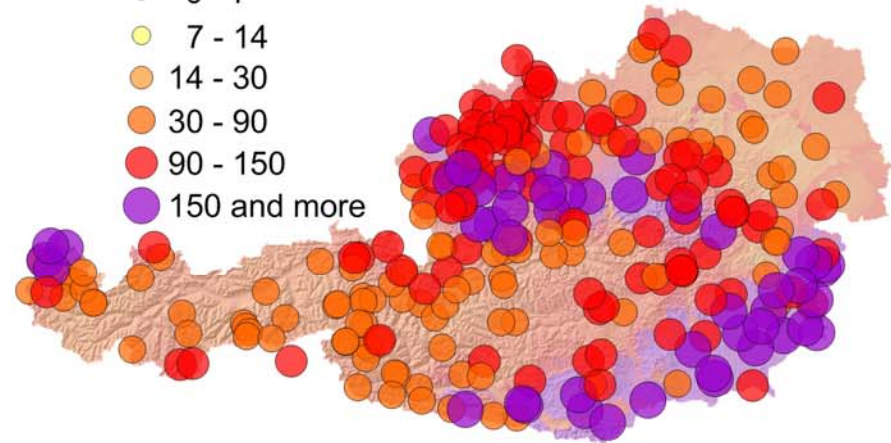
Total range: Q_{95} projections (%)

- 0 - 10%
- 10 - 20%
- 20 - 30%
- 30 - 40%
- 40 - 60%
- 60% and more



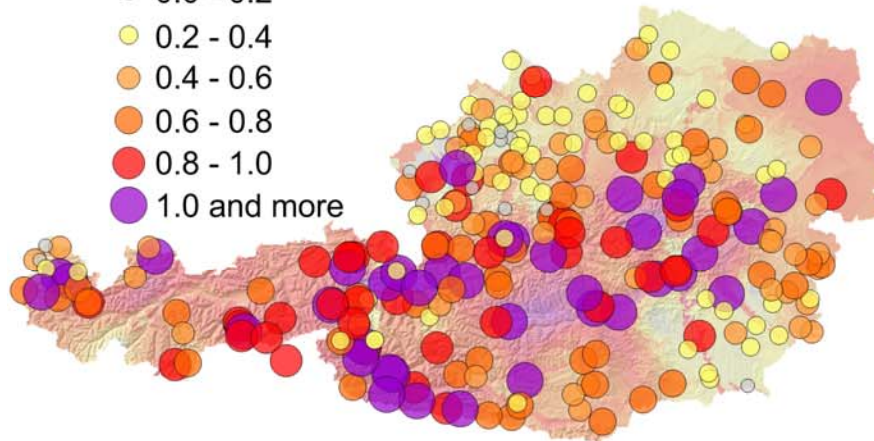
Total range: SI projections (days)

- 0 - 7
- 7 - 14
- 14 - 30
- 30 - 90
- 90 - 150
- 150 and more



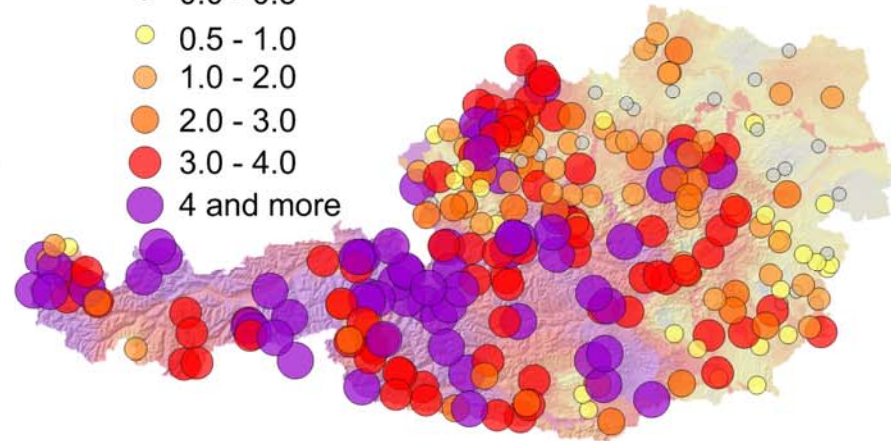
Range projections / Range calibrations

- 0.0 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 and more

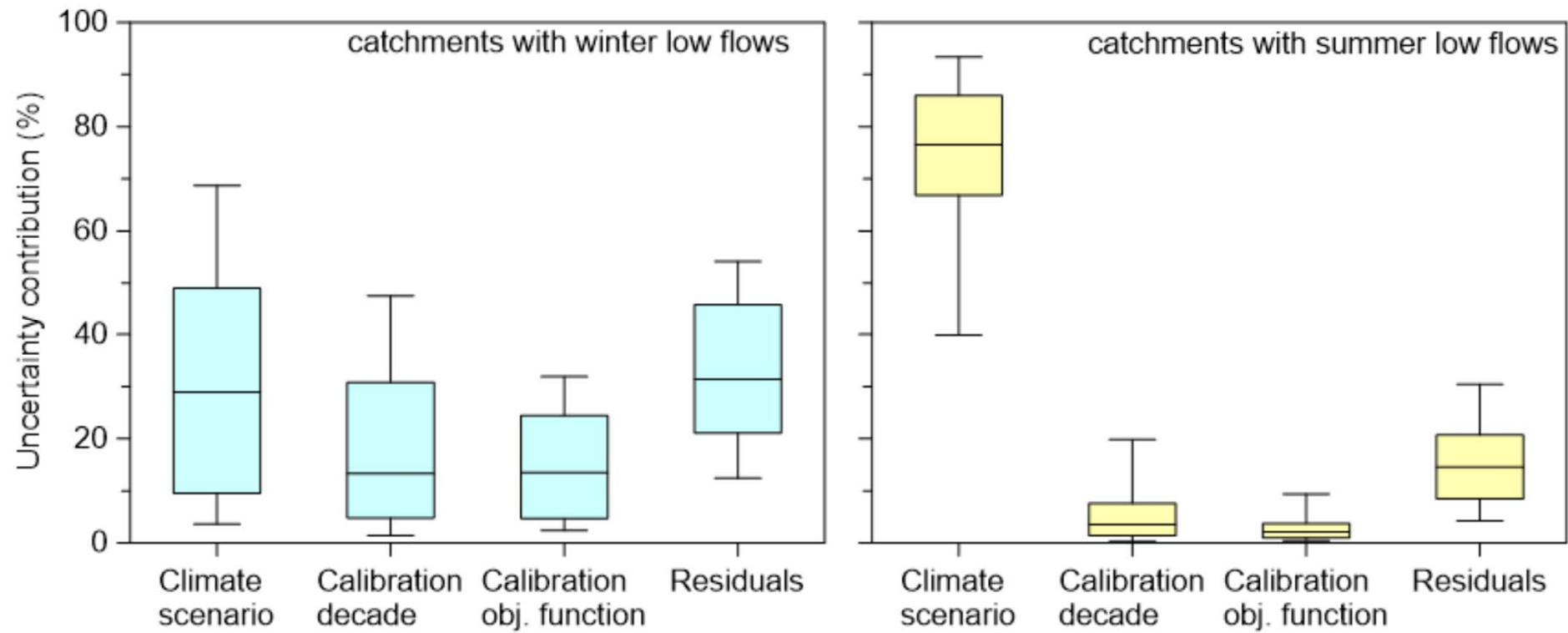


Range projections / Range calibrations

- 0.0 - 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- 2.0 - 3.0
- 3.0 - 4.0
- 4 and more



ANOVA decomposition of total uncertainty



Conclusions

- seasonality of the low-flows is an important factor affecting simulation performance and uncertainty;
- the range of simulated Q95 in historical period is larger in basins with summer than winter low-flows;
- total uncertainty of Q95 projections is the largest in basins with winter low-flows (can exceed 60%);
- climate scenarios contribute more than 75% to total projection uncertainty in basins with summer low flows;
- In basins with winter regime - contribution of climate scenario, decade and objective function is 29%, 13% and 13%.