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Supplement of

Statistical downscaling of a climate simulation of the last glacial cycle: temperature and precipitation over Northern Europe

N. Korhonen et al.

Correspondence to: N. Korhonen (natalia.korhonen@fmi.fi)

SUPPLEMENT to manuscript
"Statistical downscaling of a climate simulation of the last glacial cycle: temperature and precipitation over Northern Europe" by N. Korhonen, A. Venäläinen, H. Seppä, H. Järvinen

To widen the validation of the statistical downscaling we tested the monthly GAMs in predicting other months' temperature or precipitation over Northern Europe. This was done by predicting with the GAM calibrated by the previous month's precipitation the precipitation by CLIMBER (P_{CLI}). The prediction, e.g. in the case of the February precipitation GAM run by January CLIMBER precipitation data was compared to the CRU, simulated 44 kyr BP (Kjellström et al. 2010) and simulated LGM (Strandberg et al., 2011) January precipitation data (reference data). We calculated the Pearson correlation, RMSE and MAD between the predicted and reference data. The results are in Tables S1.1 and S1.2 below.

For the precipitation GAMs and the temperature GAMs for the months May-September the correlations and errors are in the same range as for the fitting data (compare to Table 1 and 2 in the paper), suggesting that these GAMs do predict reasonable also for other than just calibration data. For the temperature GAMs of the months October-April, the month to month test gave higher errors than for the calibration data (Table 2 in the paper) suggesting that these GAMs have problems working outside their calibration domain.

Table S1.1. Validating monthly precipitation GAMs on other months.

Calibration month	Validation month	Cor	RMSE (mm month^{-1})	MAD (mm month^{-1})
January	February	0.84	13	8
February	January	0.88	16	9
March	April	0.61	18	13
April	March	0.65	24	17
May	June	0.61	18	14
June	May	0.59	17	12
July	August	0.68	19	13
August	July	0.75	16	12
September	October	0.73	25	18
October	September	0.69	26	17
November	December	0.82	20	14
December	November	0.79	23	14

Table S1.2. Validating monthly temperature GAMs on other months.

Calibration month	Validation month	Cor	RMSE (˚C)	MAD (˚C)
January	February	0.90	7.98	5.5
February	January	0.97	4.02	3.34
March	April	0.96	8.27	6.93
April	March	0.92	10.33	8.41
May	June	0.97	1.96	1.6
June	May	0.97	1.92	1.56
July	August	0.98	1.99	1.63
August	July	0.98	1.95	1.59
September	August	0.96	2.73	2.33
October	September	0.97	4.42	3.2
November	December	0.93	7.06	5.45

December	November	0.97	5.13	3.98

SUPPLEMENTARY MATERIAL 2 to manuscript
"Statistical downscaling of a climate simulation of the last glacial cycle: temperature and precipitation over Northern Europe" by N. Korhonen, A. Venäläinen, H. Seppä, H. Järvinen

The annual GAMs for Western Eurasia (calibrated only by recent past and LGM data) were used for predicting annual mean temperature and precipitation for 44 kyr BP by CLIMBER-2-SICOPOLIS 44 kyr BP data from the last glacial cycle simulation by Ganopolski et al. (2010). The predictions are plotted below, in Figures S2.1 and S2.2, together with output of CLIMBER-2 and RCA3 regional climate model simulation output by Kjellström et al. (2010) representing 44 kyr BP annual mean temperature and precipitation.

Figures S2.1 b) and c) show that over Eastern Europe the GAM predicts similar temperature spatial patterns as the RCA3, whereas over Western Europe, there are more differences in details. The differences between RCA3 and GAM temperature over Finland mainly result from the difference of ice sheet extent in SICOPOLIS and RCA3: the Fennoscandian ice sheet in SICOPOLIS reaches Central Finland during 44 kyr BP, whereas in the RCA3 simulation the ice sheet reaches only some parts of Northern Finland (Figure 1 in paper).

The GAM predictions of precipitation in Fig. S2.2 c) are similar to the RCA3 simulation output (Fig. S2.2 b) in many parts of Eastern and Central Europe, however, not predicting as high precipitation amounts in mountain regions.

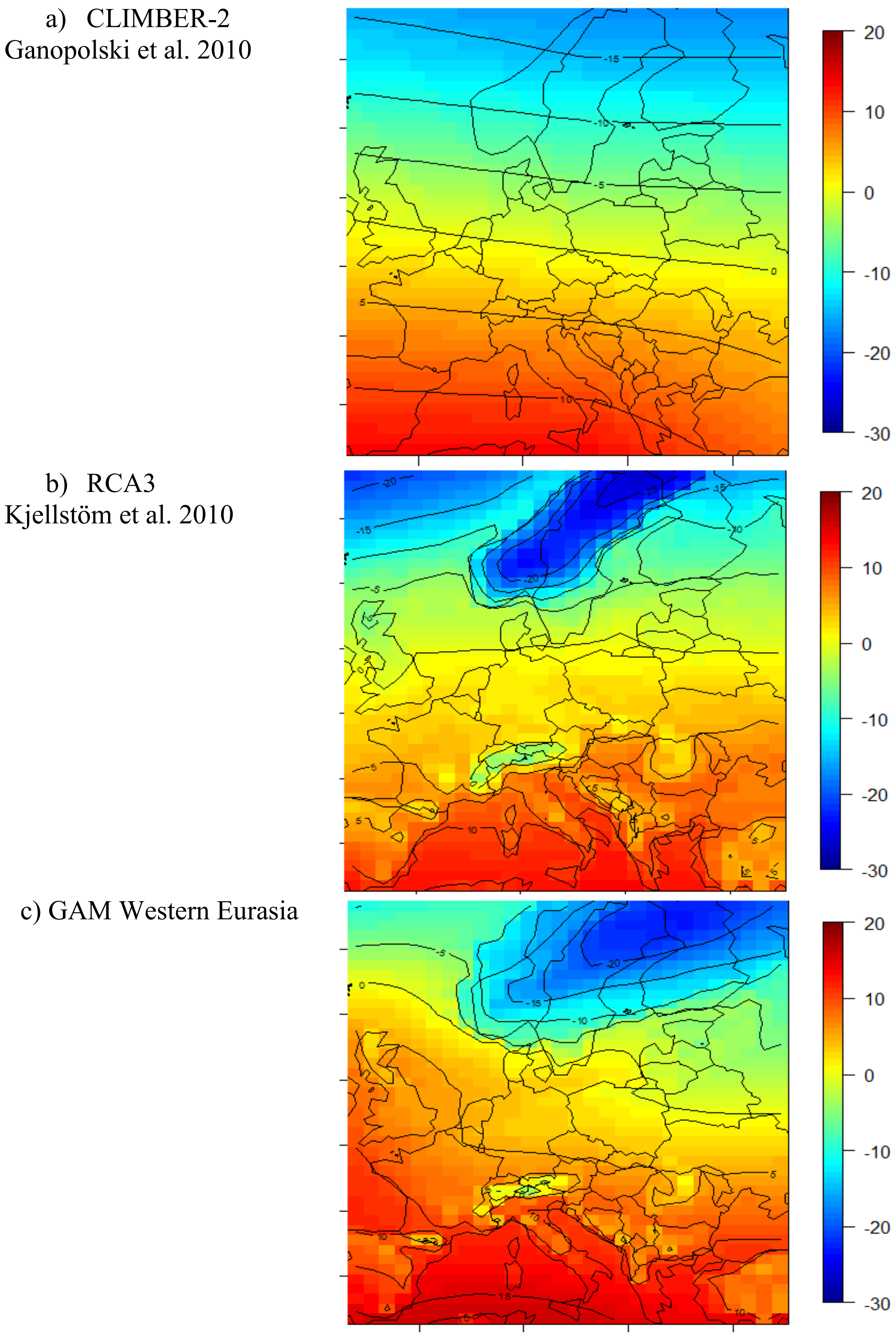

Fig. S2.1 Annual mean temperature at 44 kyr BP, a) as simulated by the global model CLIMBER-2 (Ganopolski et al. 2010), b) as simulated by the regional model RCA3 (Kjellström et al. 2010), and c) as predicted by the GAM model "Western Eurasia". Unit: Celsius. The data of CLIMBER-2 and RCA3 have been bi-linearly interpolated on to a 1.5° × 0.75° resolution.

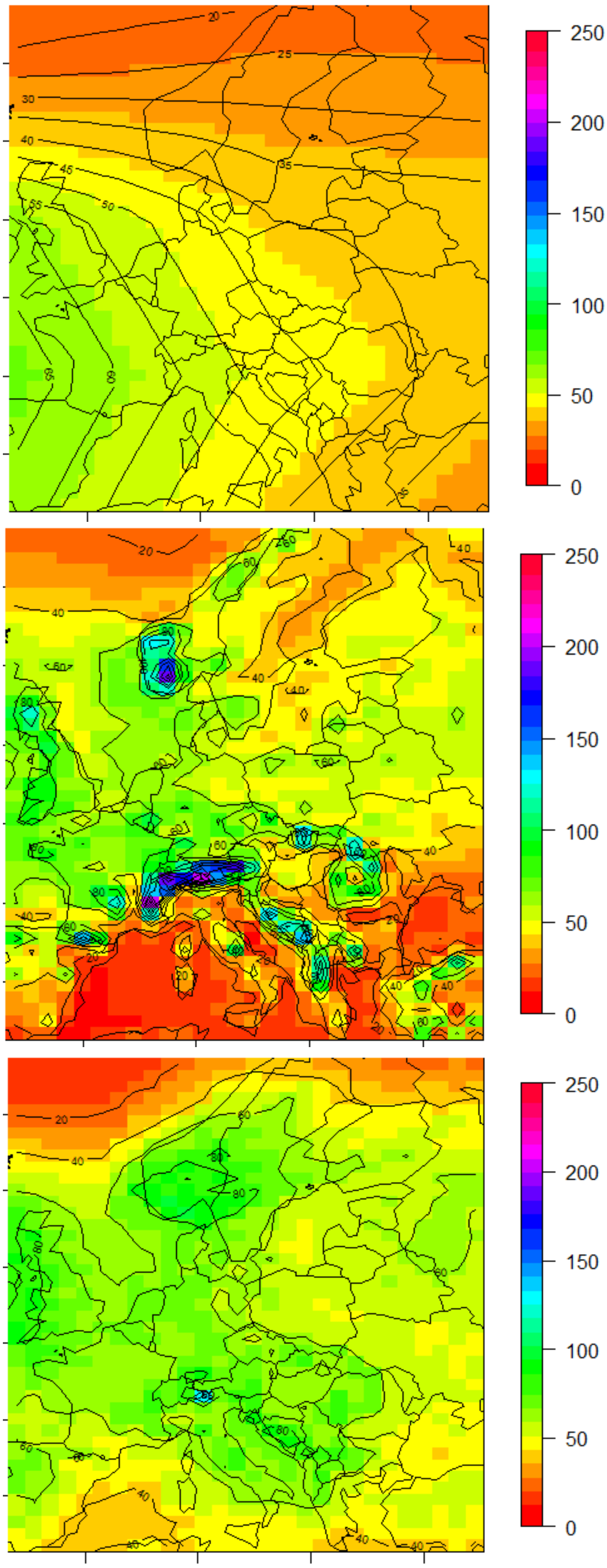

Fig. S2.2 a) Annual mean total precipitation at 44 kyr BP, a) as simulated by the global model CLIMBER-2 (Ganopolski et al. 2010), b) as simulated by the regional model RCA3 (Kjellström et al. 2010), and b) as predicted by the GAM model “Western Eurasia”. Unit: mm month^{-1}. The data of CLIMBER-2 and RCA3 have been bi-linearly interpolated on to a 1.5º × 0.75º resolution.