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Supplement of

Modelling the socio-economic impact of river floods in Europe

L. Alfieri et al.

Correspondence to: Lorenzo Alfieri (lorenzo.alfieri@jrc.ec.europa.eu)

Liflood calibration performance

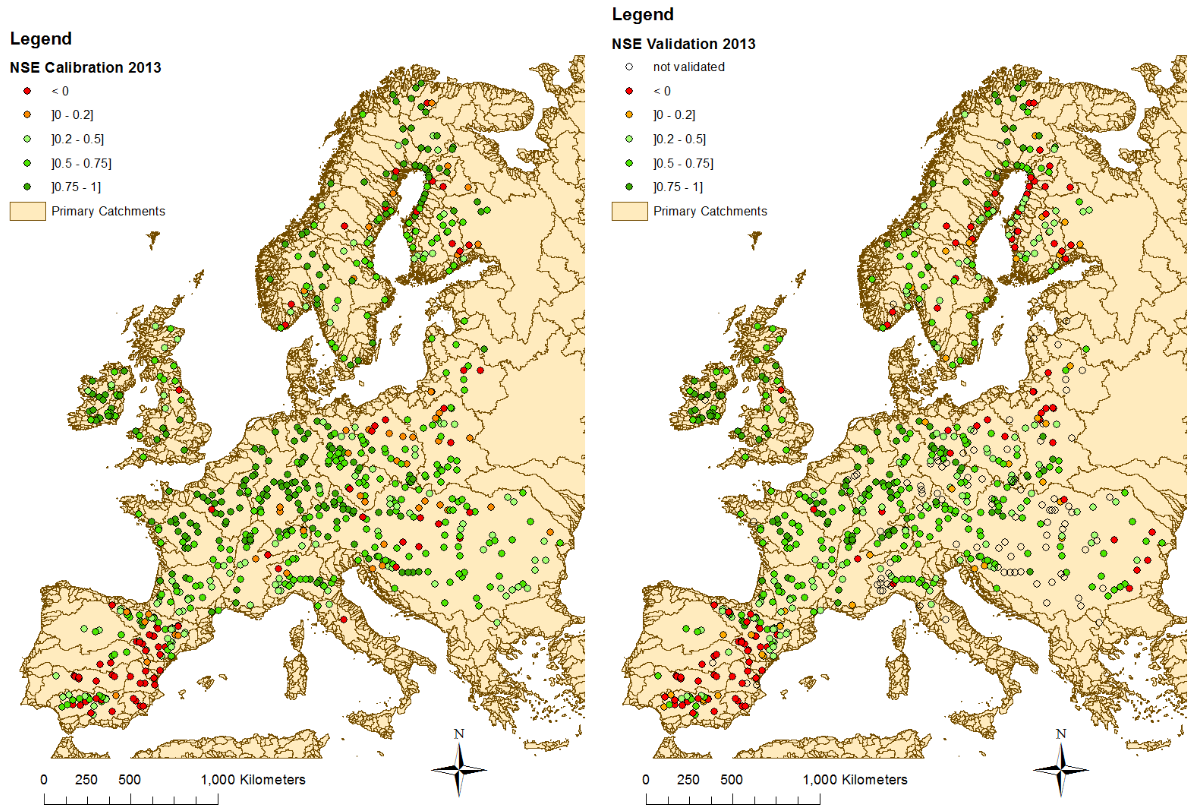

Figure S1: Nash-Sutcliffe Efficiency of the calibrated stations for the calibration (1994-2002, left) and the validation period (2003-2012, right).

Table S1: Number of calibrated stations divided by classes of Nash-Sutcliffe Efficiency.

Number of stations	Calibration	Validation
Total	693	594
NSE < 0	72 (10%)	97 (16%)
NSE >= 0	621 (90%)	497 (84%)
NSE > 0.2	578 (83%)	461 (78%)
NSE > 0.5	463 (67%)	345 (58%)
NSE > 0.75	224 (32%)	123 (21%)

Simulated flood inundation maps

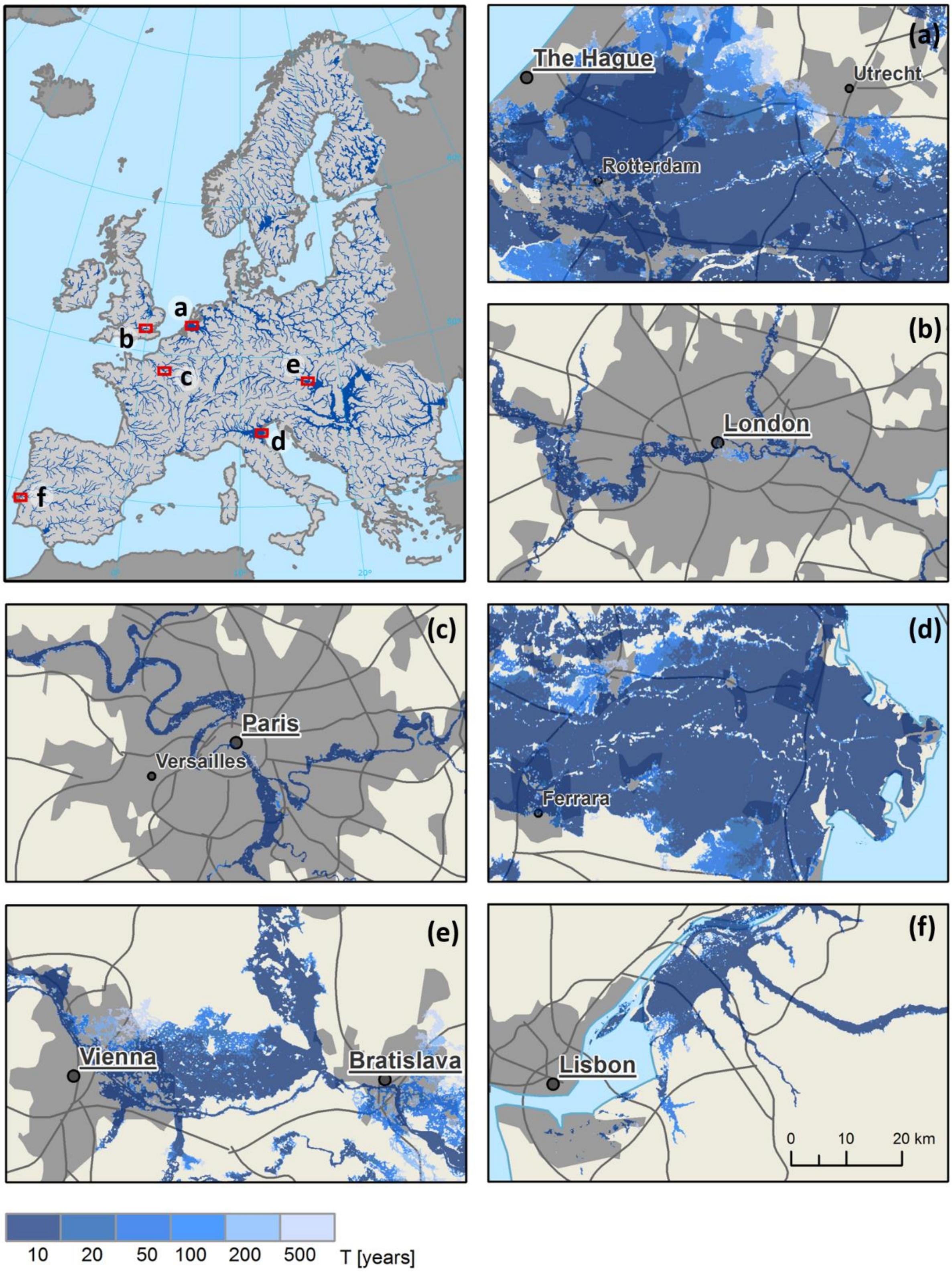

Figure S2: European flood hazard map for the 500-year return period (main panel) and zoom into six sample regions. The six panels (a-f) include an overlay of the six flood hazard maps with return period (T) of 10, 20, 50, 100, 200, and 500 years. Relatively small differences in the simulated flood extent for different return periods is due to the absence of flood protections in the simulation approach.

Floods in Central Europe in June 2013

Lisflood simulations driven by the EFAS-Meteo dataset as input were performed on the European domain and simulated daily discharge was compared with observations in 28 river stations where streamflow data was made available (see Figure S3). Note that some recorded discharge time series include missing values, particularly in the range of extreme values, often due to power cuts following the severe weather and the damaging of the measuring devices caused by the rage of the flood flow. The comparison between simulated and observed discharges is performed for the May-June 2013 time span and is shown in Figure S4. Six relevant skill scores are calculated for the comparison shown in Figure S4 and are plotted in Figure S5 as a function of the upstream area of each river gauge. These include (from top-left in Figure S5) the Root Mean Square Error (RMSE) [m^3/s], the Normalized Root Mean Square Error (NRMSE), the Percent Bias (PBIAS), the Nash-Sutcliffe Efficiency (NSE), the Pearson Correlation coefficient (r), and the Coefficient of Determination (R2).

Figure S3: Location of the river gauges where observed daily discharge was provided for May-June 2013.

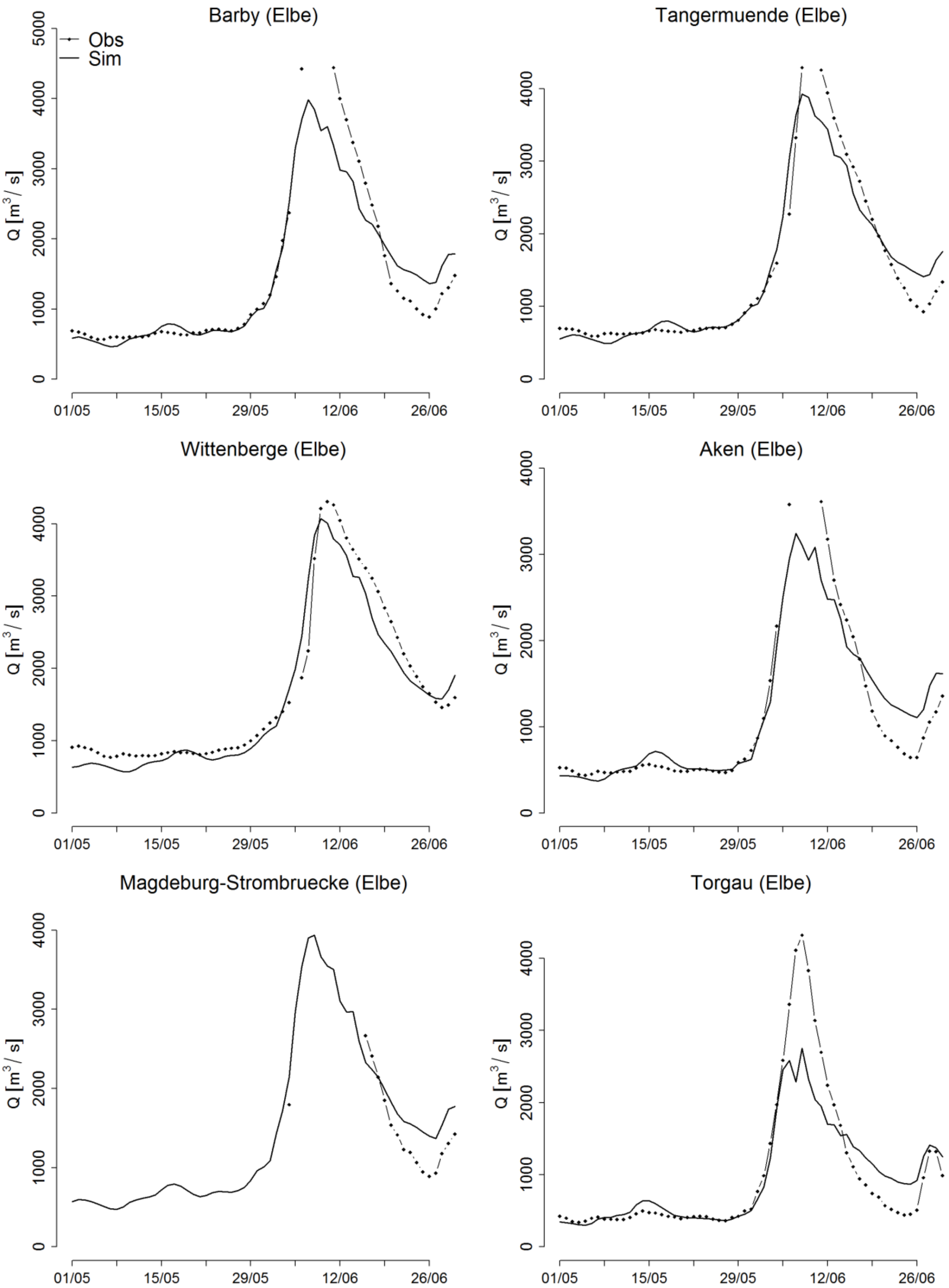

Figure S4: Observed vs. simulated discharges for river gauges shown in Figure S3.

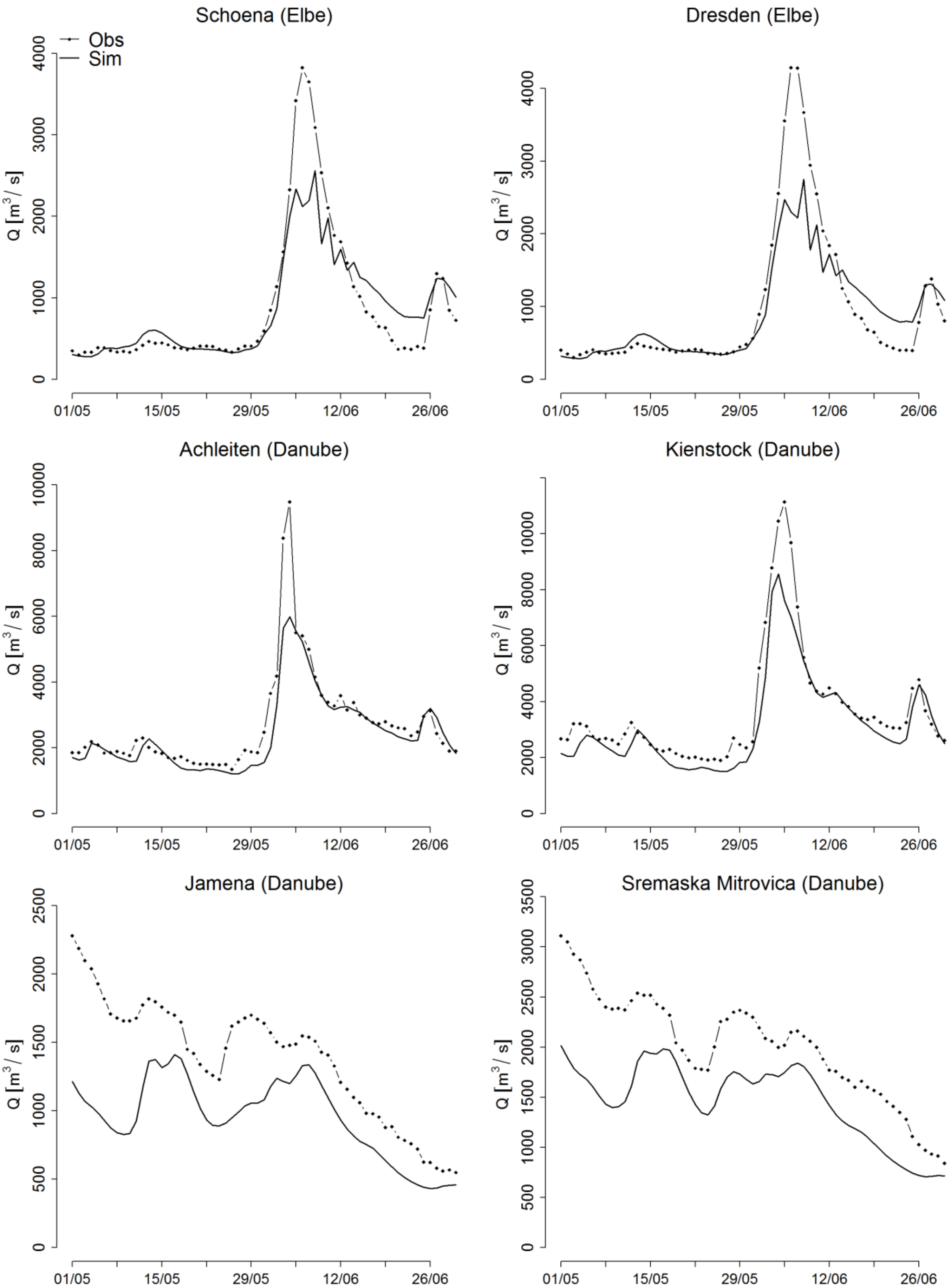

Figure S3 (continued)

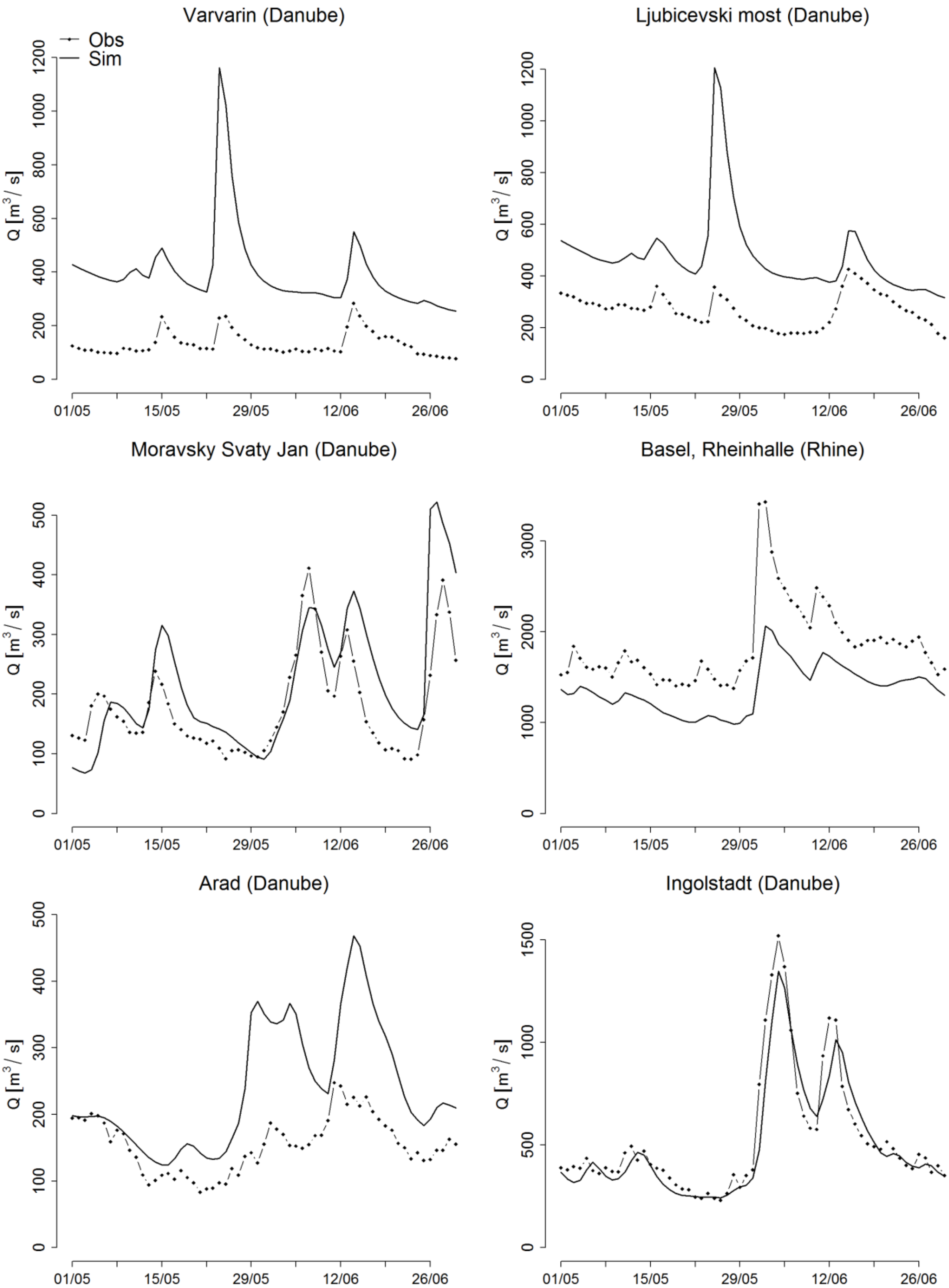

Figure S3 (continued)

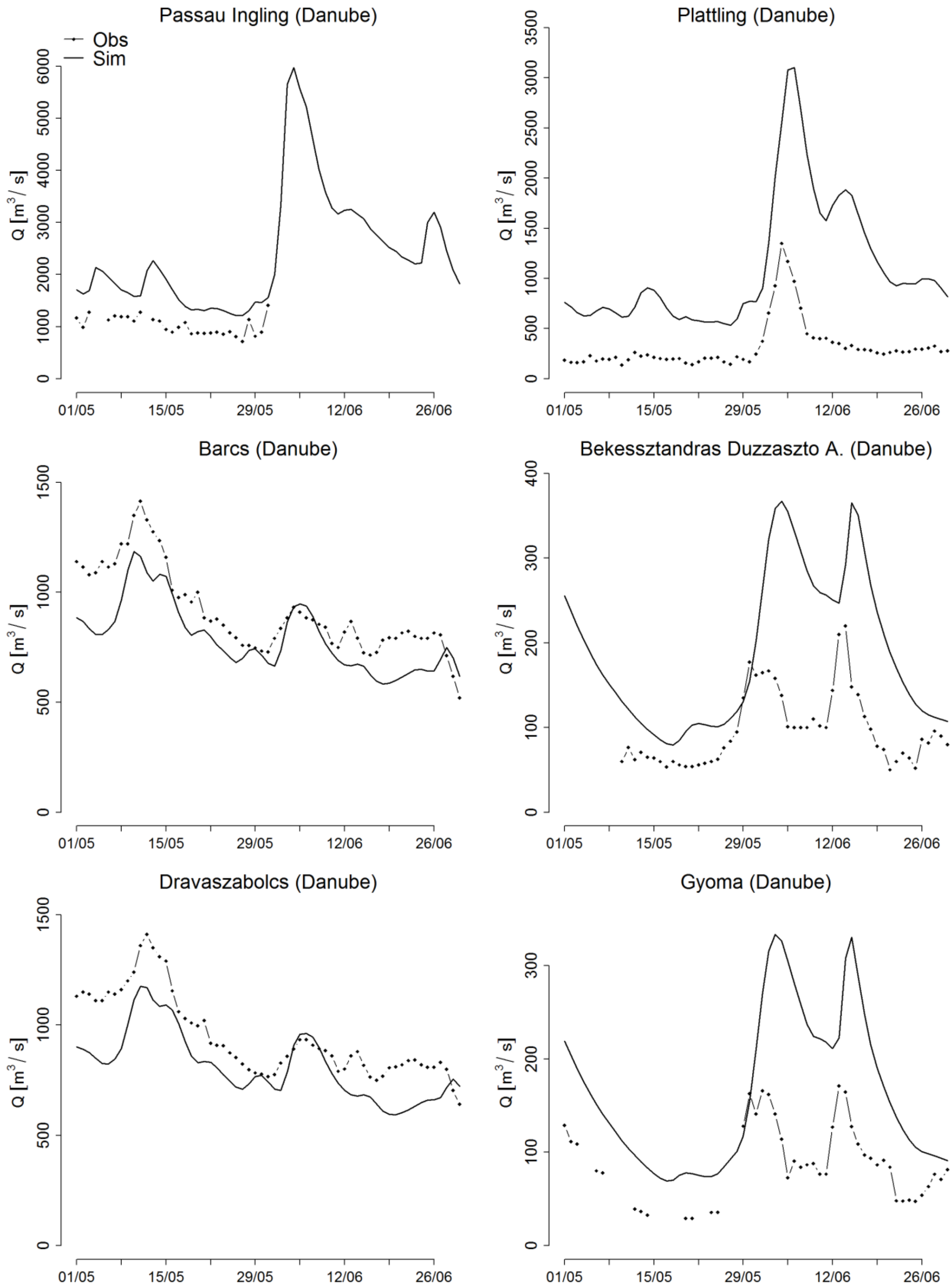

Figure S3 (continued)

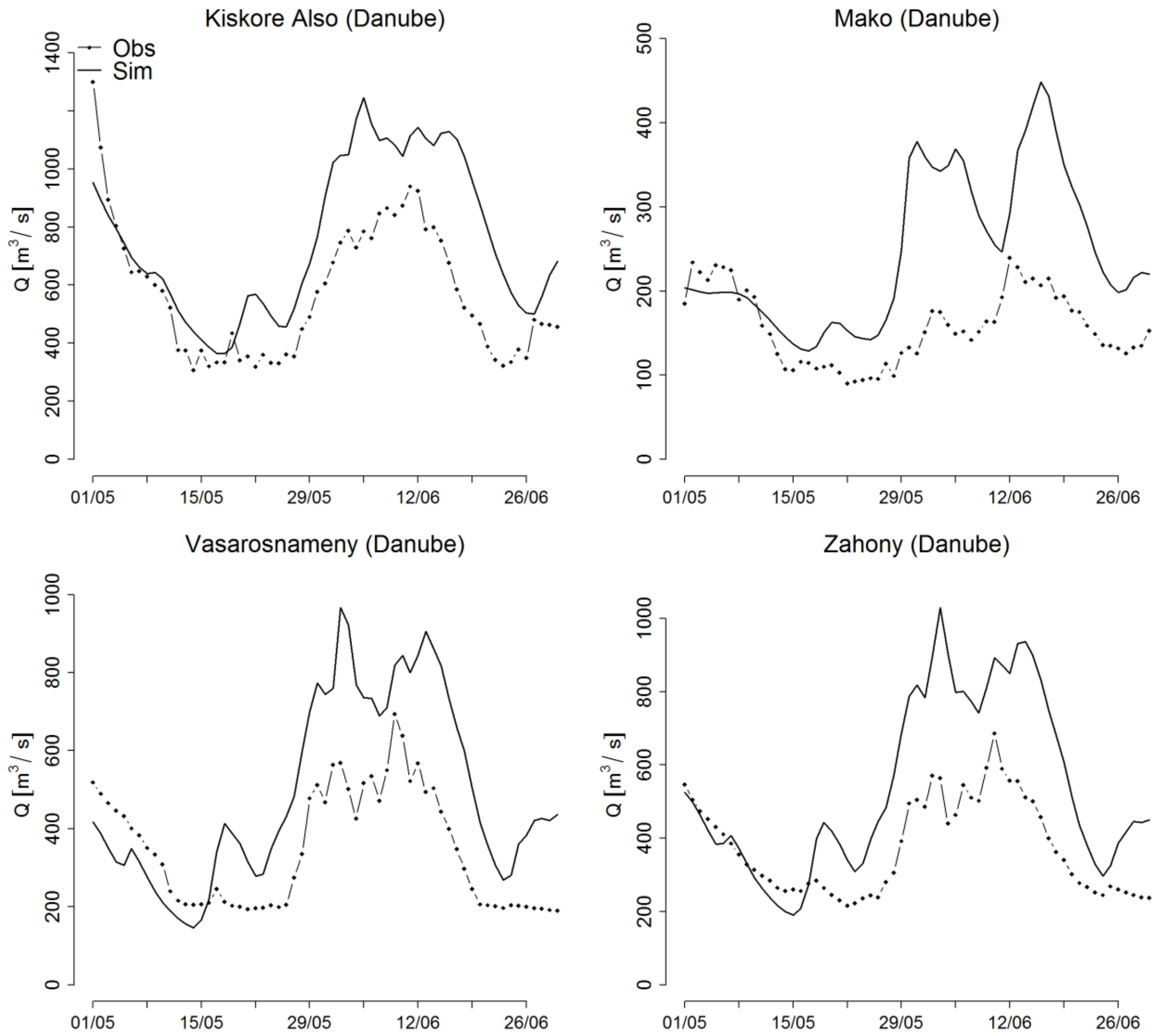

Figure S3 (continued)

Figure S5 shows a general improvement of the simulation performance for increasing upstream area, both in terms of bias and of correlation. Note that no data assimilation of discharge measurements is included in the hydrological model, as initial conditions are always estimated by updating the water balance in the river network, using the model states of the previous day and the maps of observed meteorological variables. In a number of cases the simulated discharge is in good agreement with observations for low flow conditions, while large negative bias occurs for peak discharge values. This points out the limitations given by the space and time resolution of the hydrological model and of the meteorological input data, which limits the representation of extreme discharge peaks, particularly when the event dynamics have peculiar features at finer scales than those considered in the modeling. Indeed, such an issue is less evident on river points further downstream the river network, where the simulation of discharges on average improves.

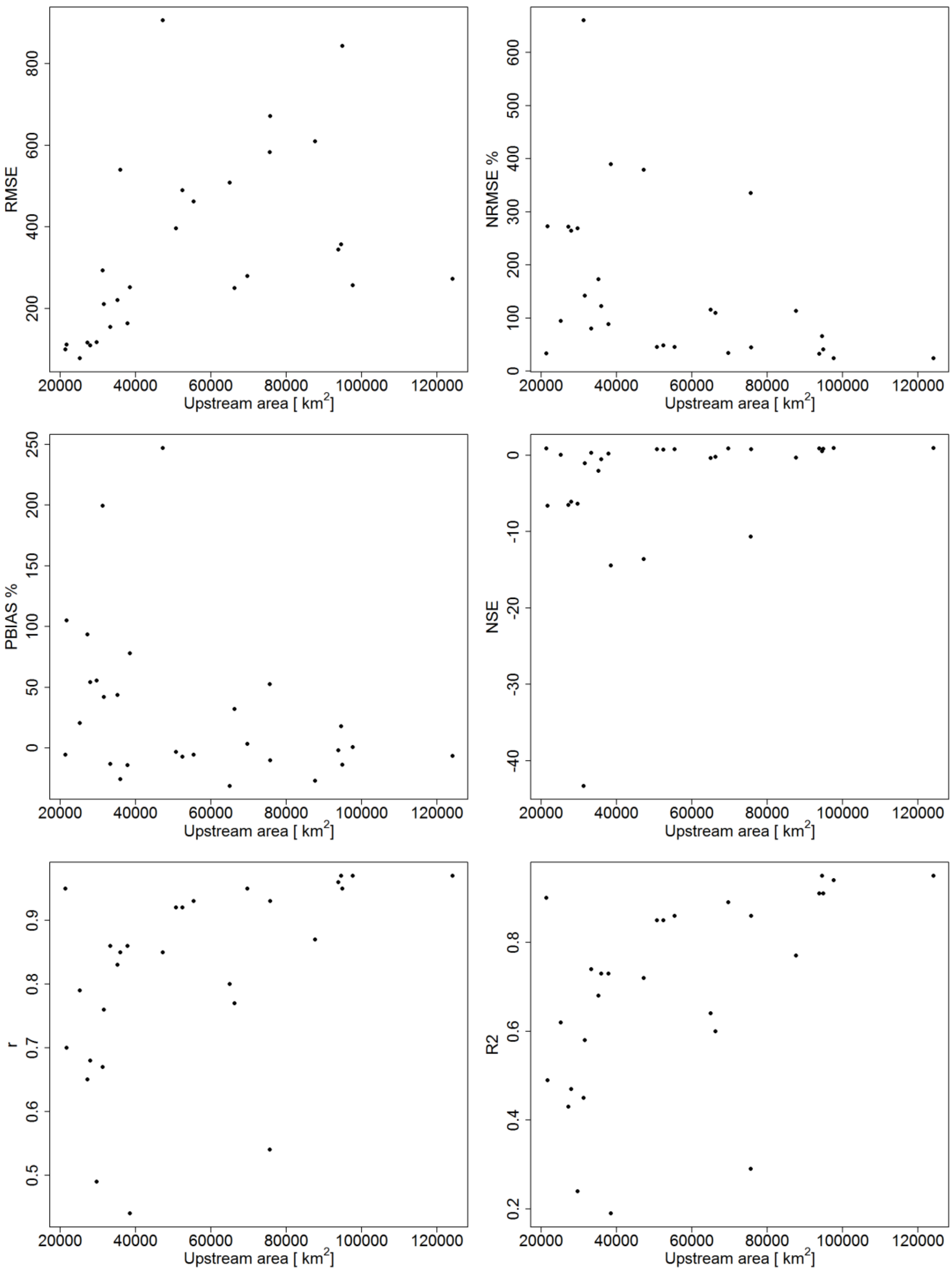

Figure S5: Skill scores of the discharge comparison shown in Figure S4.

Table S2: 2-digit ISO country code of the considered countries.

Country	ISO Code
Austria	AT
Belgium	BE
Bulgaria	BG
Croatia	HR
Czech Republic	CZ
Denmark	DK
Estonia	EE
Finland	FI
France	FR
Republic of Macedonia	MK
Germany	DE
Greece	EL
Hungary	HU
Ireland	IE
Italy	IT
Latvia	LV
Lithuania	LT
Luxembourg	LU
Netherlands	NL
Norway	NO
Poland	PL
Portugal	PT
Romania	RO
Slovakia	SK
Slovenia	SI
Spain	ES
Sweden	SE
United Kingdom	UK