Supplement material

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 1). 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 2. Six relevant skill scores are calculated for the comparison shown in Figure 2 and are plotted in Figure 3 as a function of the upstream area of each river gauge. These include (from top-left in Figure 3) 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).

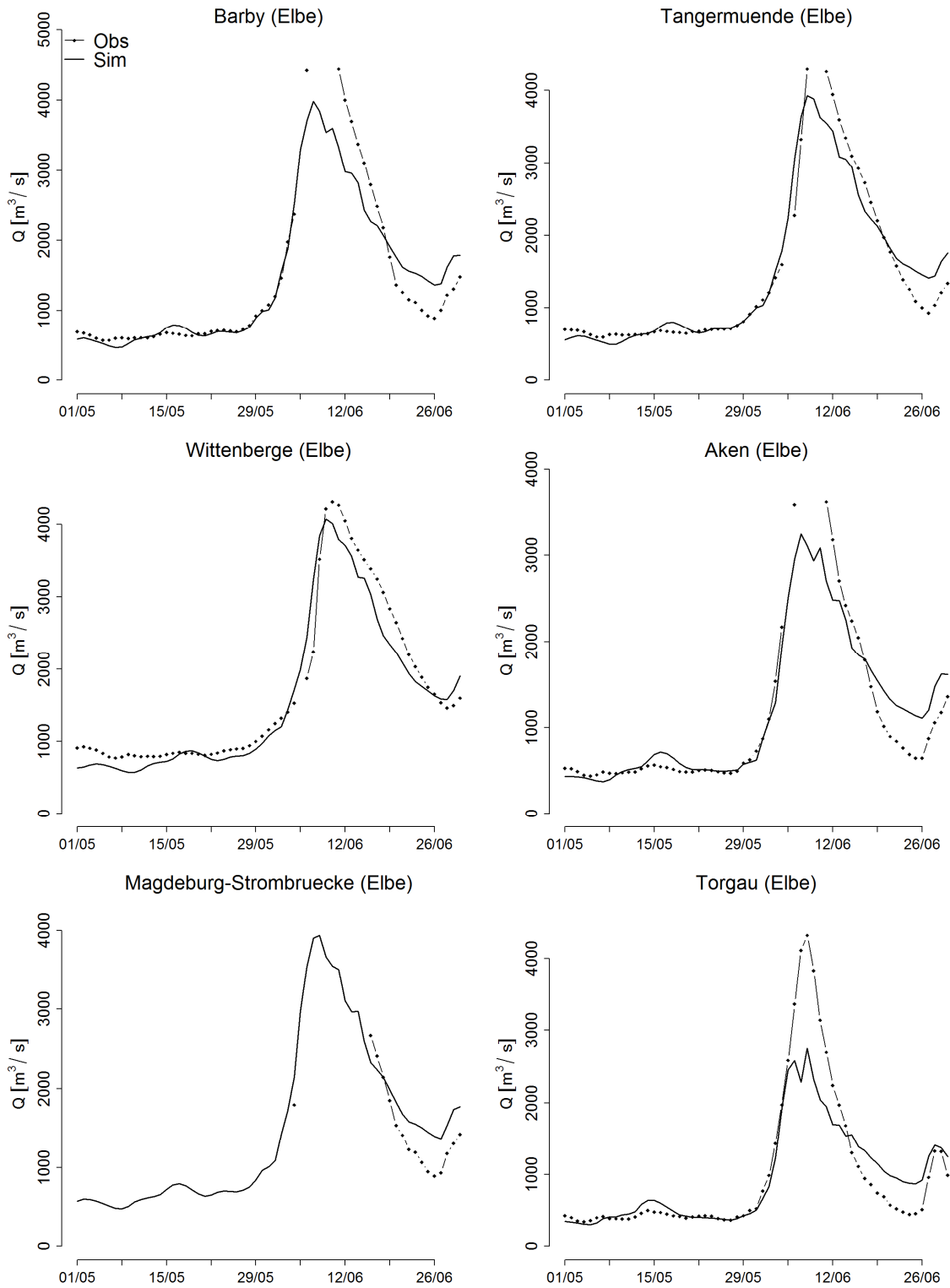Figure 1: Location of the river gauges where observed daily discharge was provided for May-June 2013.
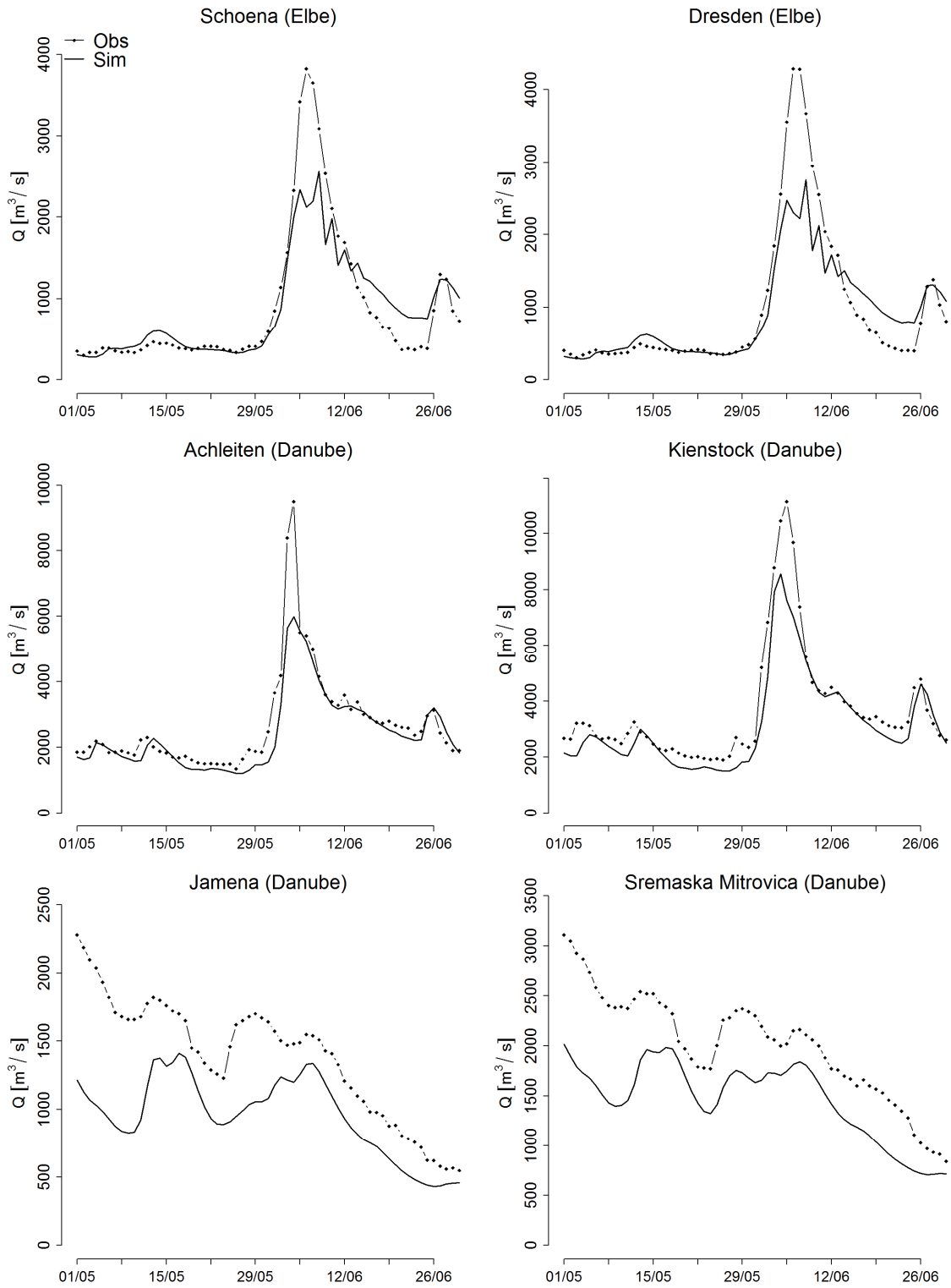
Figure 2: Observed vs. simulated discharges for river gauges shown in Figure 1.
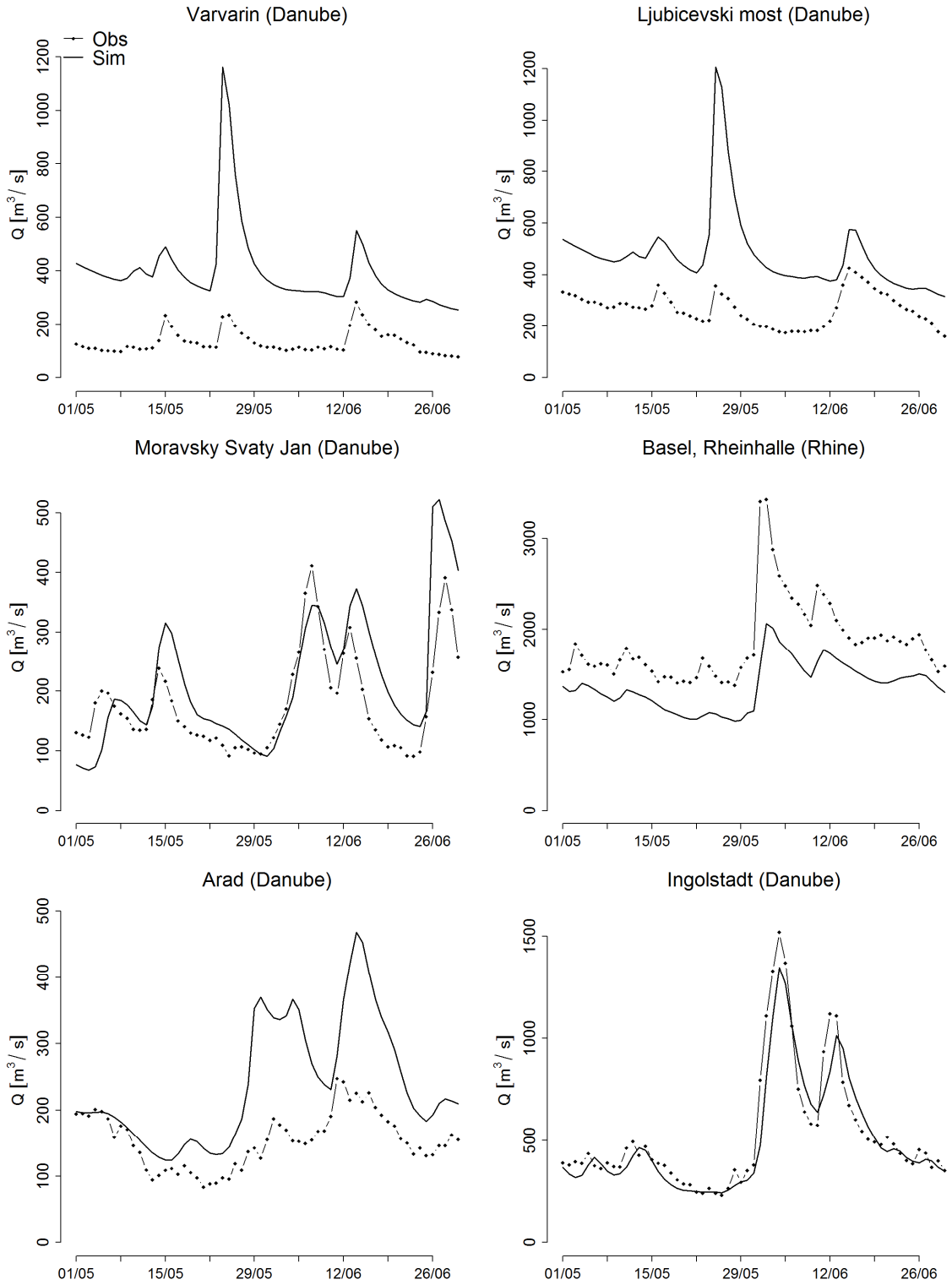
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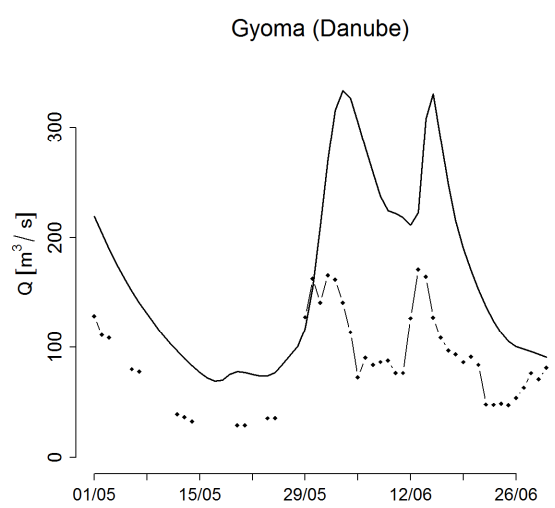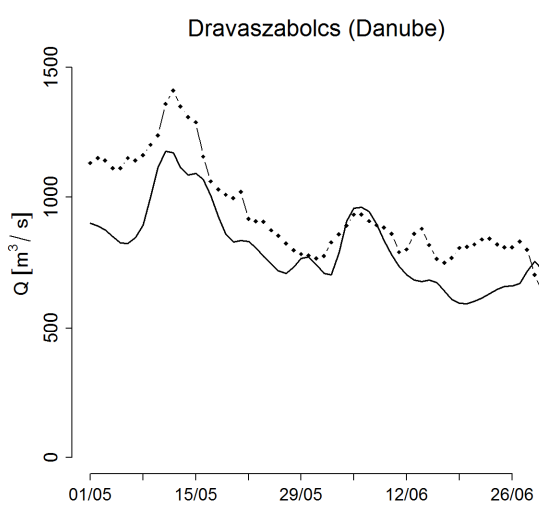
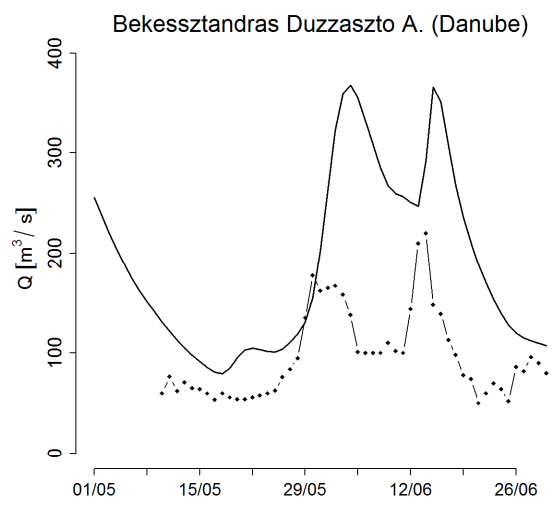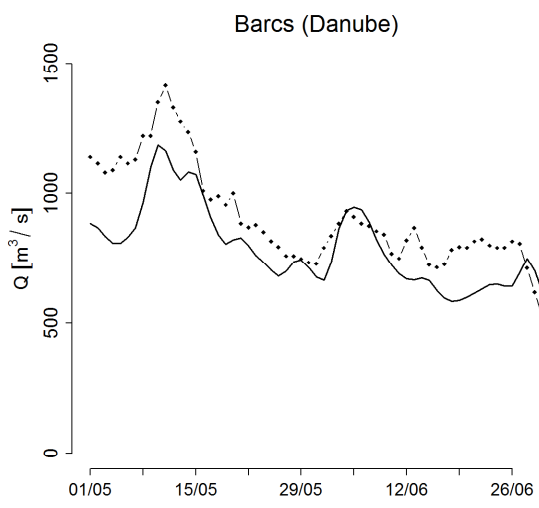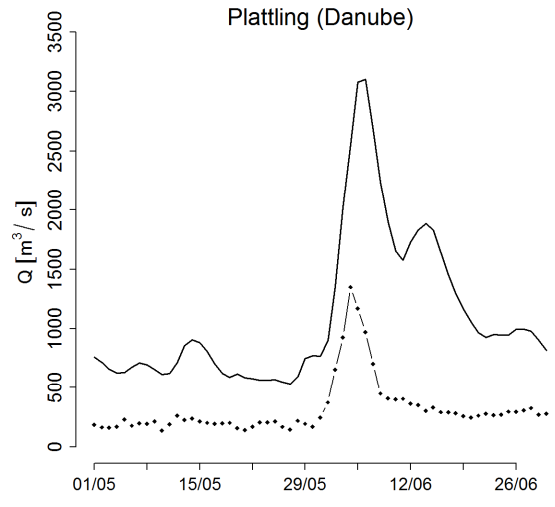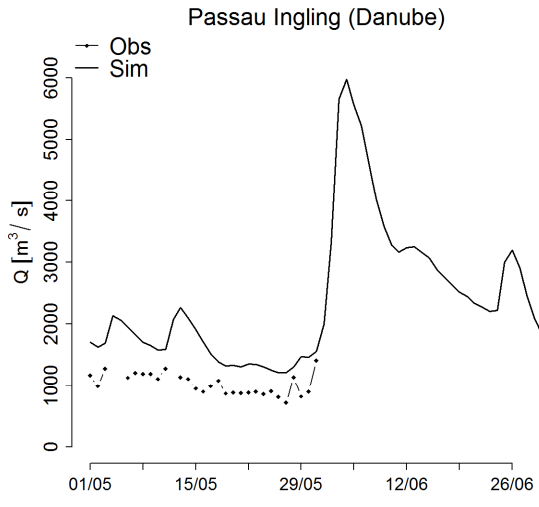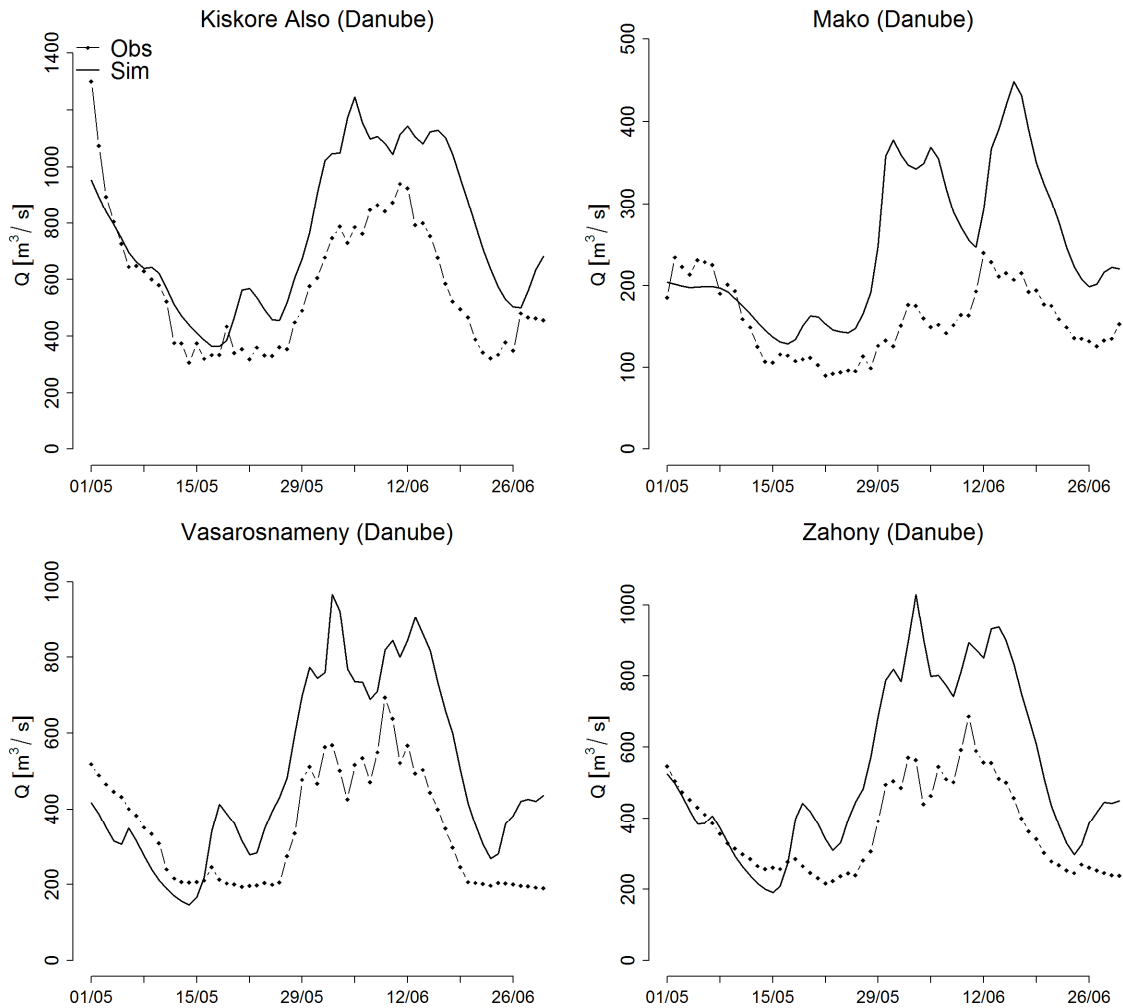*Figure 2 (continued)*

Figure 3 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.
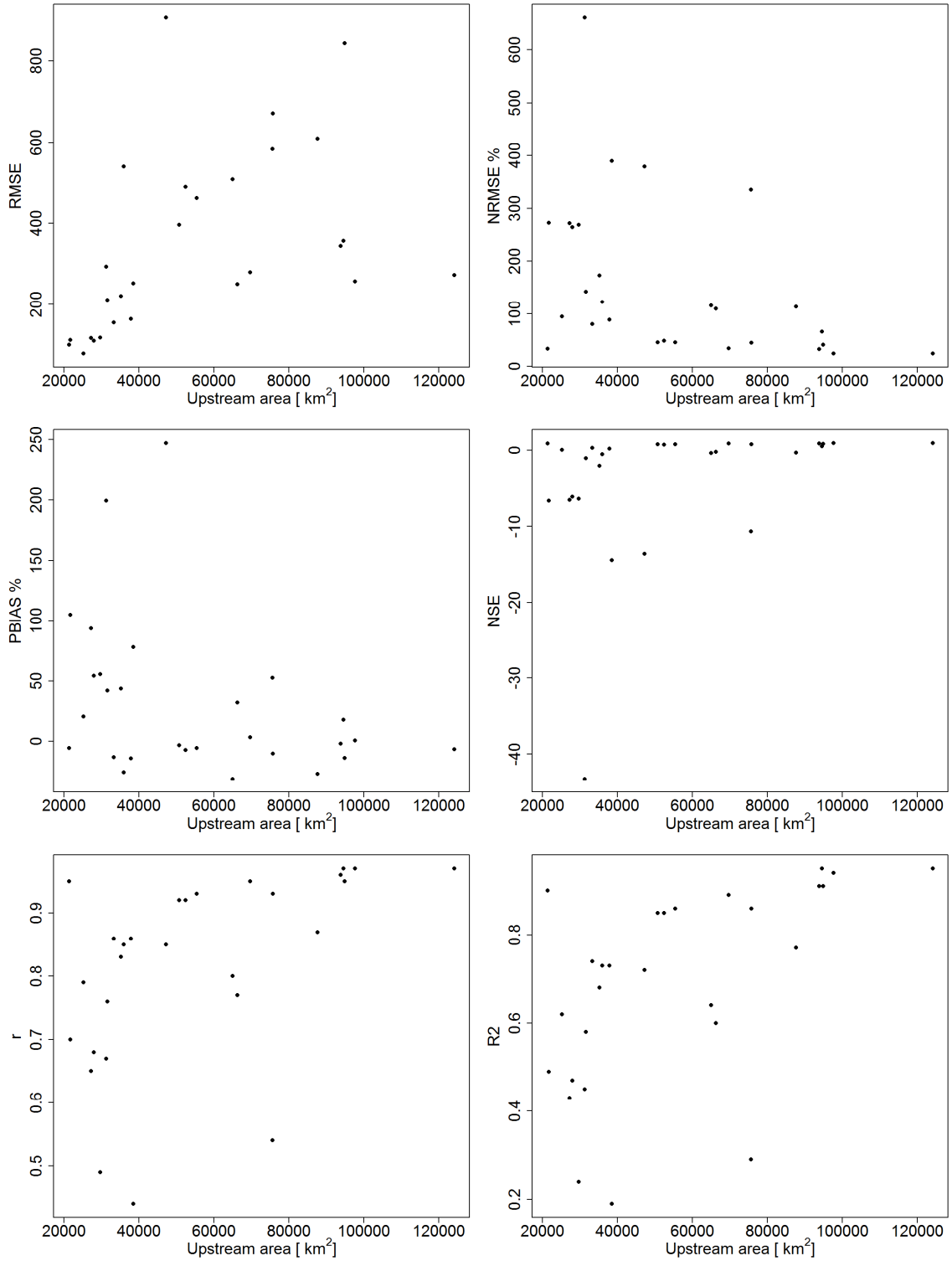
Figure 3: Skill scores of the discharge comparison shown in Figure 2.