Supplementary Material to paper 'Compositional balance should be considered in the mapping of soil particle-size fractions using hybrid interpolators'

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This supplementary material consists of details of statistical chart and prediction results in the paper and in the following 5 sections. **Section S1** is the selected environmental covariates in our study. **Section S2** refers to the combination of environmental covariables for different ILR data. **Section S3** is spatial prediction maps of the silt and clay components. **Section S4** is the calculation process of ranking score. **Section S5** shows the distribution and their relative values of soil sampling points.

Supplementary Material Section S1. Selected environmental covariates

Table S1.1. Selected environmental covariates in our study.

Representation	Environment covariables	Abbreviation
Morphometry characteristics	Analytical Hill Shading	AHS
	Aspect	ASPECT
	Closed Depressions	CD
	Convergence Index	CI
	Channel Network Base Level	CNB
	Slope Length and Steepness Factor	LSF
	Multi-resolution Ridge Top Flatness Index	MRRTF
	Multi-resolution Valley Bottom Flatness Index	MRVBF
	Mid-slope Position	MSP
	Plan Curvature	PLC
	Profile Curvature	PRC
	Slope Height	SH
	Slope Length	SL
	Tangential Curvature	TC
Hydrologic characteristics	Catchment Area	CA
	Surface Area	SA
	Stream Power Index	SPI
	Topographic Wetness Index	TWI
	Vertical Distance to Channel Network	VDCN
Climatic and vegetative indices	Average Annual Precipitation	RAIN
	Average Annual Temperature	TEM
	Normalized Differential Vegetation Index	NDVI
Soil physical and chemical properties	Field Water Holding Capacity	FWHC
	Soil Depth	PDEPTH
	Saturated Hydraulic Conductivity	SHC
	Soil Organic Carbon	SOC
Categorical maps	Geomorphology	GEOT
	Land Use	LU
	Vegetation Classes	VEGET

Supplementary Material Section S2. Combination of ECs for different ILR data

Table S2.1. Combination of ECs for different ILR data (except for categorical variables) using AIC for GLM.

Data	Combination of environmental covariables
ILR1SBP1	WWC + NDVI + lon + soc + rain + CNB + NH
ILR2SBP1	FWHC + WWC + NDVI + tem + soc + dem + rain + AHS + aspect + MSP
ILR1SBP2	FWHC + WWC + NDVI + tem + soc + SHC + dem + rain + AHS + aspect + MSP
ILR2SBP2	FWHC + WWC + lon + soc + aspect + CNB + MSP + MRVBF
ILR1SBP3	FWHC + WWC + tem + lat + soc + dem + aspect + CNB + MSP + MRVBF
ILR2SBP3	NDVI + tem + soc + SHC + dem + rain + aspect + MSP + SH

Supplementary Material Section S3. Spatial prediction maps of the silt and clay components

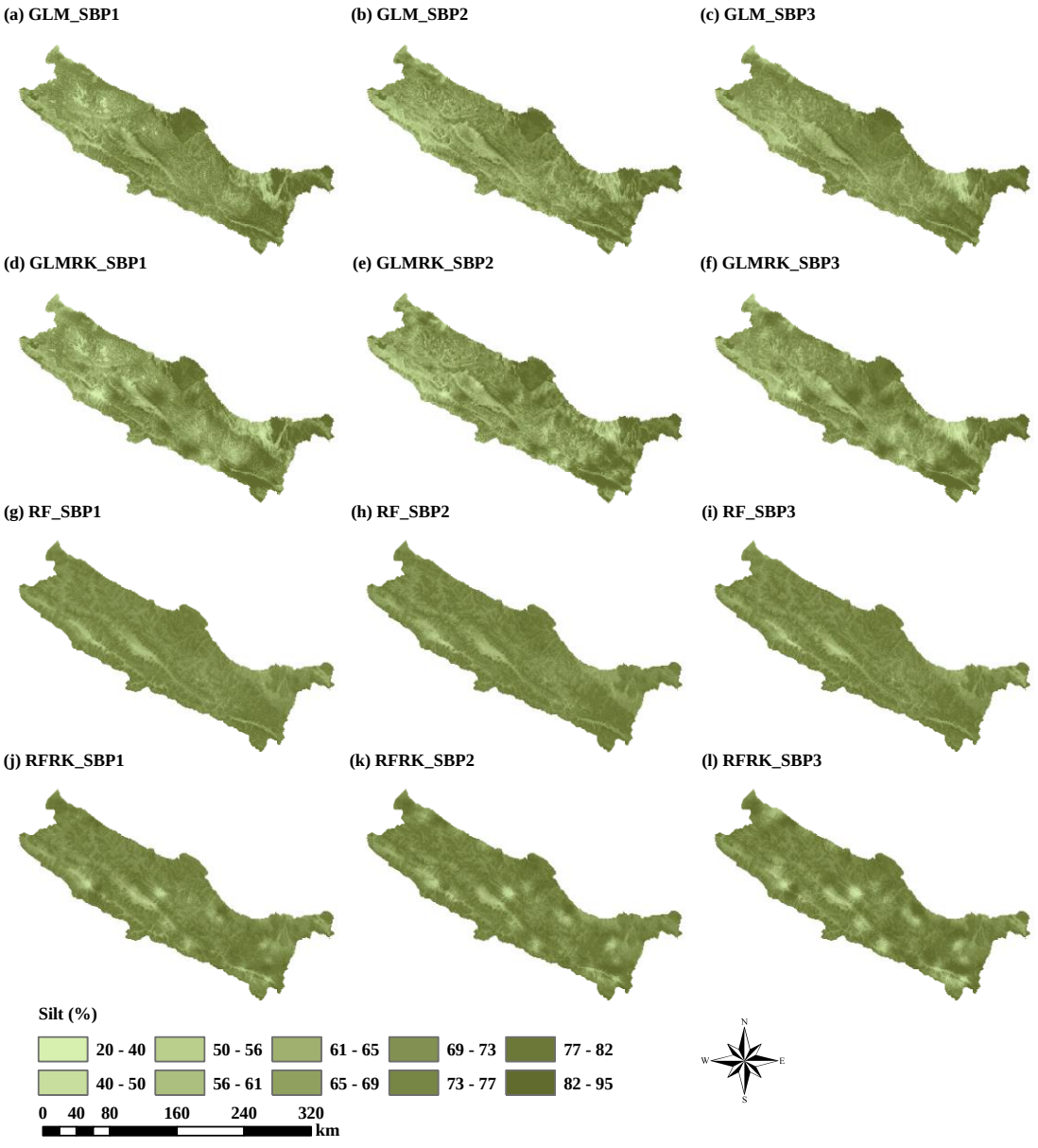

Figure S3.1. Spatial prediction maps of the silt component of the upper reaches of the Heihe River Basin.

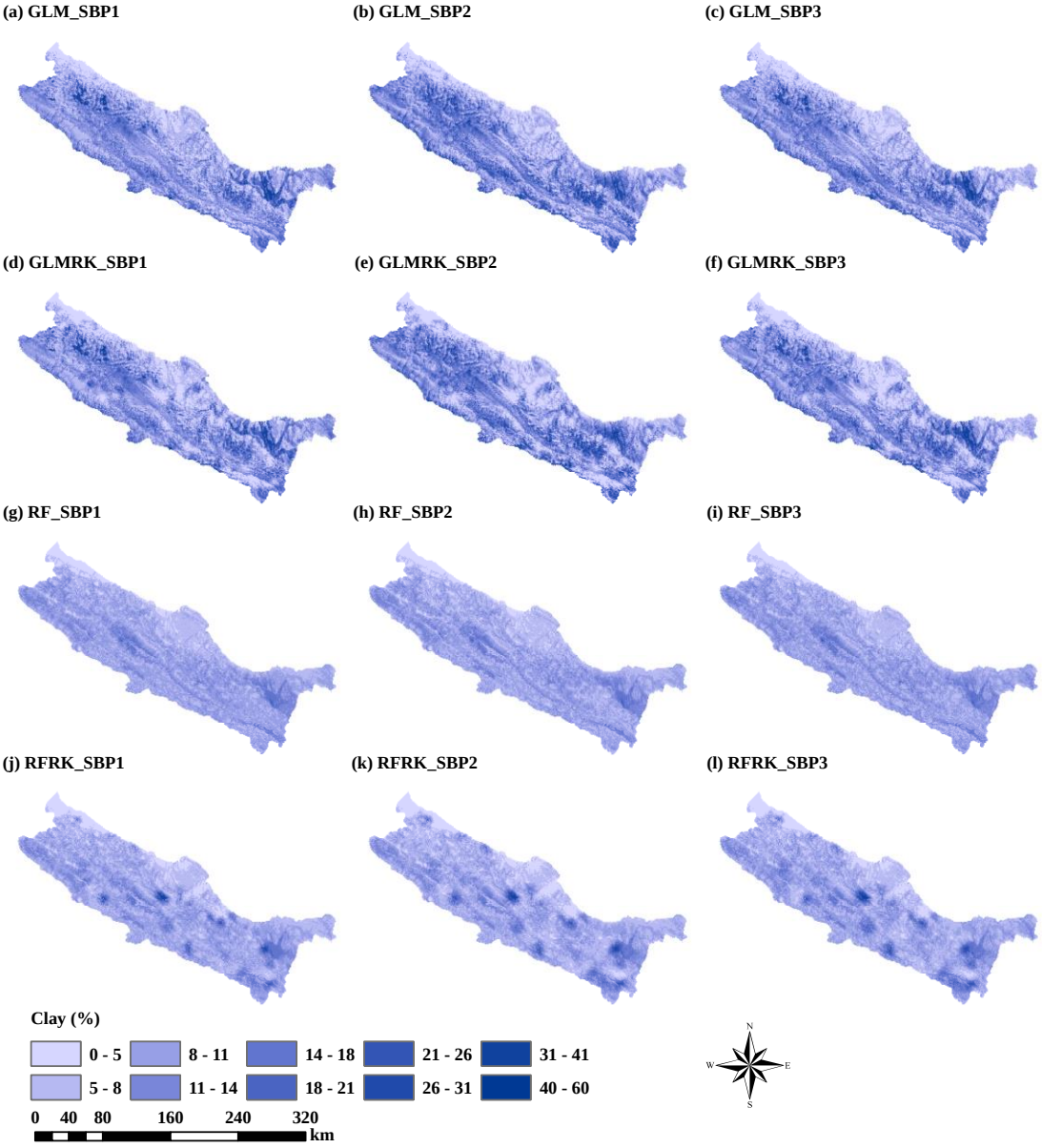

Figure S3.2. Spatial prediction maps of the clay component of the upper reaches of the Heihe River Basin.

Supplementary Material Section S4. The calculation process of ranking score

Table S4.1. Precedence table of model performance. SUM_1 and SUM_2 are the sum scores of ME and RMSE for each model, respectively; SUM_3 is the sum scores of ME, RMSE and AD for each model, SUM_4 is the sum scores of ME for GLM (GLMRK included) and RF (RFRK included), SUM_5 is the sum scores of RMSE for GLM (GLMRK included) and RF (RFRK included), SUM_6 is the sum scores of all indicators. The lower the value, the better the model performance.

Models	GLM			GLMRK			RF			RFRK		
	SBP1	SBP2	SBP3	SBP1	SBP2	SBP3	SBP1	SBP2	SBP3	SBP1	SBP2	SBP3
ME	3	1	2	3	2	1	1	2	2	1	2	3
	1	2	3	1	2	3	1	3	2	1	2	3
	1	2	3	1	2	3	1	3	2	1	2	3
SUM_1	**5**	**5**	**8**	**5**	**6**	**7**	**3**	**8**	**6**	**3**	**6**	**9**
RMSE	1	3	2	1	3	2	1	1	2	3	2	1
	2	3	1	1	3	2	1	2	3	3	2	1
	3	2	1	3	1	2	1	2	1	2	1	1
SUM_2	**6**	**8**	**4**	**5**	**7**	**6**	**3**	**5**	**6**	**8**	**5**	**3**
AD	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**
SUM_3	**13**	**15**	**13**	**11**	**14**	**14**	**7**	**14**	**13**	**13**	**12**	**13**
	ME			RMSE			ME			RMSE		
SUM_4	**10**	**11**	**15**				**6**	**14**	**15**			
SUM_5				**11**	**15**	**10**				**11**	**10**	**9**
SUM_6	**44**	**55**	**53**									

Supplementary Material Section S5. The distribution and their relative values of soil samples

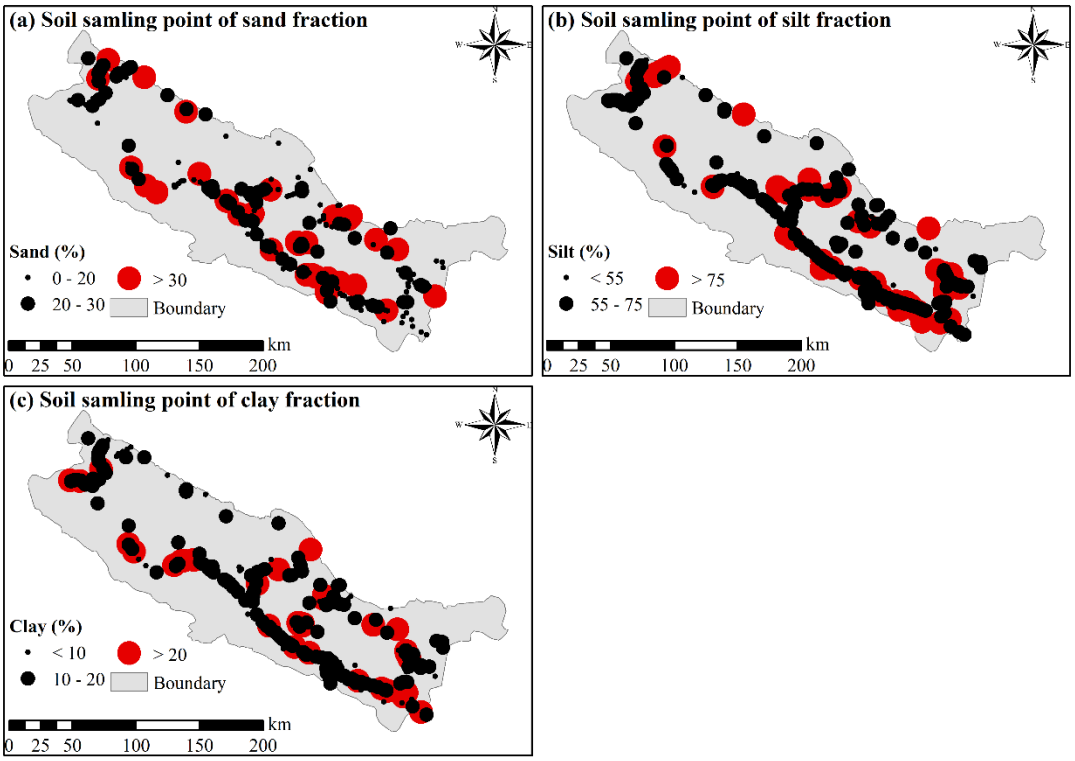

Figure S5.1. Distribution and relative values of soil sampling points for (a) sand, (b) silt and (c) clay fractions.