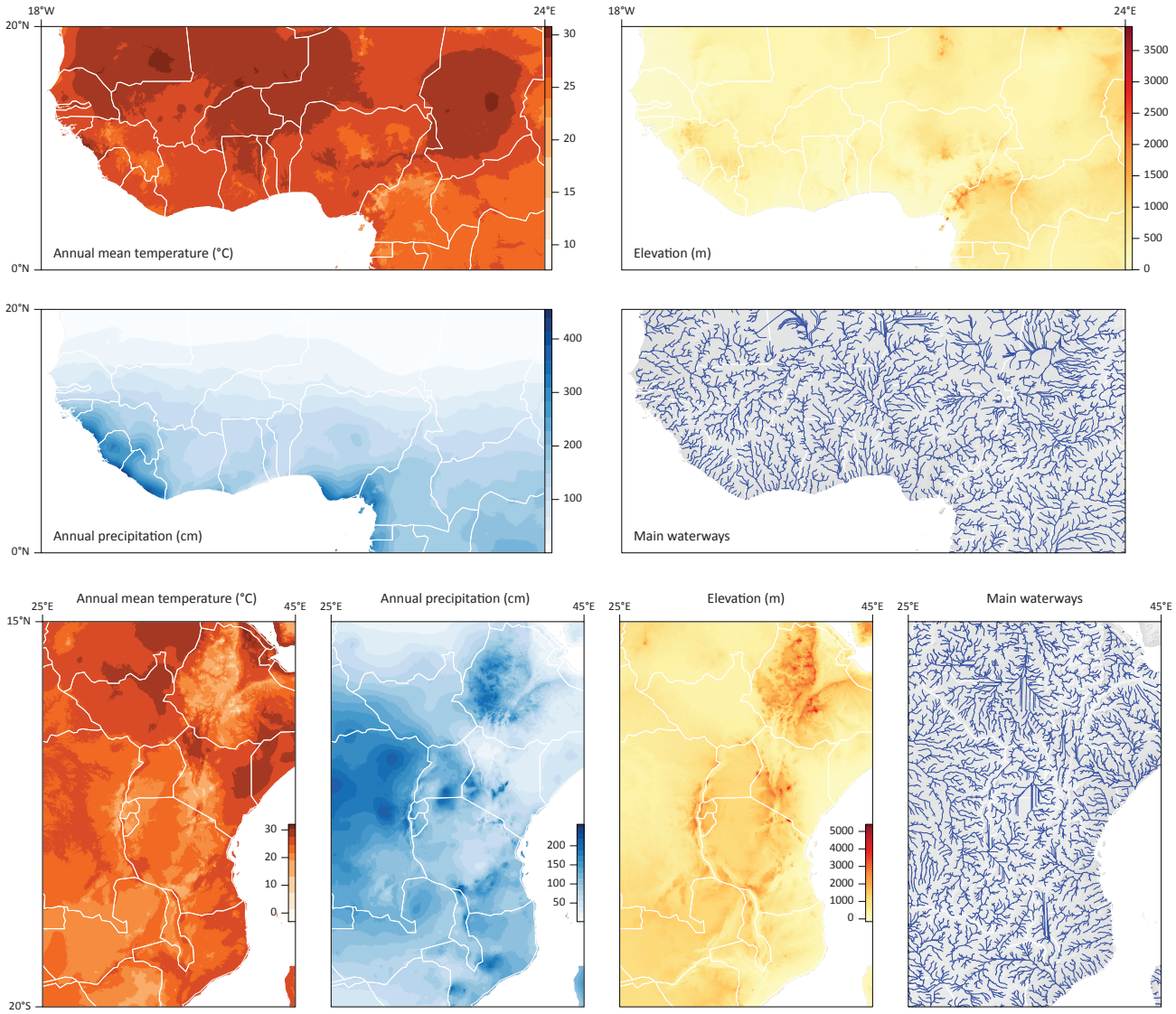

Figure S1. Additional environmental variables that were tested in the analysis of the two RYMV spreads.

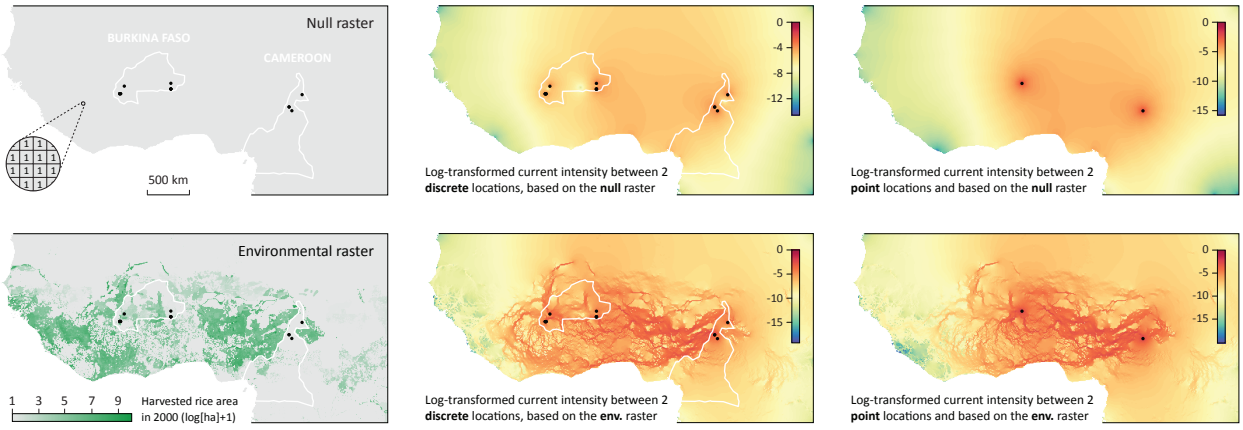

Figure S2. Log-transformed CIRCUITSCAPE current maps computed between two discrete locations (Burkina Faso and Cameroon, surrounded by white polygons) or two point locations (black dots), and based on a "null" or an environmental raster (rice harvested area). Each of the four current maps illustrates the connectivity between two given regions (represented by groups of point locations) or point locations in a raster framework (McRae *et al*. 2008): current density indicates the probability of a random walker to pass by each cell of the map (Shah & McRae 2008). Estimated electric connectivity can then be used to compute pairwise environmental distances in the form of electric resistances between locations. In the context of the present study, discrete locations are defined as countries (white polygons) within which we have a series of sampling locations (black dots). In that case, related current maps and pairwise electric resistances are esti-mated by considering pairwise connectivity between all sampling points from one country and all sampling points from the other. The "null" raster corresponds to the environmental raster but a value of "1" is uniformly assigned to all its accessible cells. This homogeneous raster was treated as a resistance factor but, because of its uniformity, the same result is obtained when treating it as a conductance factor. As for the environmental raster, it was here treated as a conductance factor, meaning that cells associated with relatively higher rice harvested area values are more permeable to movement.

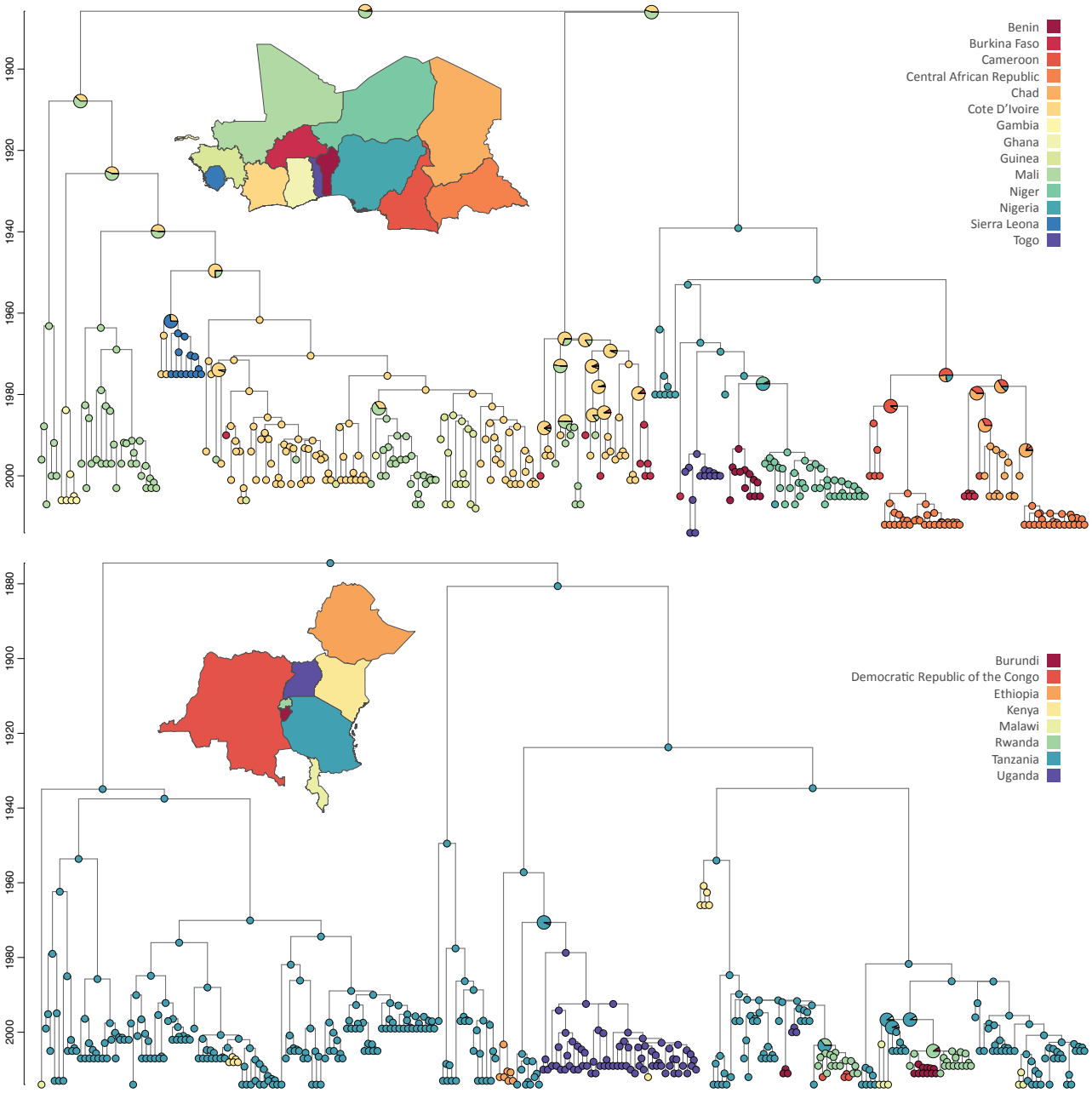

Figure S3. Consensus (maximum clade credibility) trees obtained from the discrete phylogeographic analyses of the extented data sets of RYMV sequences from West Africa (above) and East Africa (below). Tree nodes are coloured according to the inferred ancestral location(s). Inferred ancestral locations associated with a posterior probability below 5% are not reported, and pie charts are used for internal nodes with more than one ancestral location associated with a prosterior probability > 0.05 (see also SI Files S3 and S4 for the corresponding annotated tree files).

Figure S4. Scatterplot between great-circle geographic distances and environmental distances computed with CIRCUITSCAPE on the null raster between all sampling locations of RYMV sequences from West Africa and analysed in Trovão *et al*. (2015; correlation = 0.89).

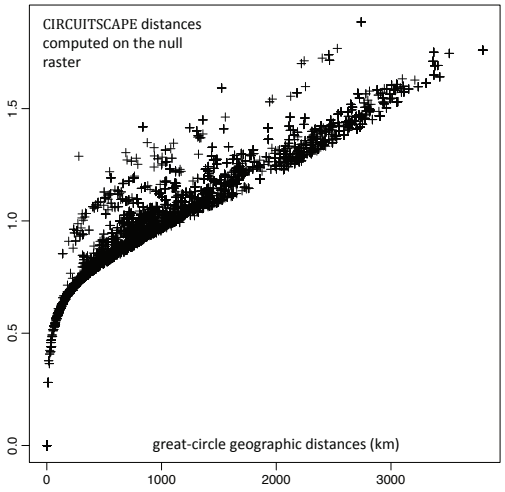

Table S1. Source of data for each environmental raster.

Environmental raster	Source	URL
Rice harvested area (2000)	HarvestChoice, International Food Policy Research Institute (IFPRI)	harvestchoice.org
Rice harvested area (2005)	HarvestChoice, International Food Policy Research Institute (IFPRI)	harvestchoice.org
Elevation	SRTM (Shuttle Radar Topography Mission) near-global DEMs (Digital Elevation Models)	webmap.ornl.gov
Annual mean temperature	WorldClim database, version 2.0	worldclim.org
Annual precipitation	WorldClim database, version 2.0	worldclim.org
Main rivers	USGS (United States Geological Survey; HYDRO1k database)	lta.cr.usgs.gov/HYDRO1K

Table S2. Analysis of the impact of several environmental factors on RYMV dispersion frequency (based on discrete diffusion inference) and velocity (based on continuous diffusion inference).

Discrete phylogeographic reconstruction	**Data set of Trovão *et al*. (180 + 117 sequences)**				**Updated data set (210 + 240 sequences)**			
	West Africa		**East Africa**		**West Africa**		**East Africa**	
+ GLM analyses	**GLM coefficient**	**BF**	**GLM coefficient**	**BF**	**GLM coefficient**	**BF**	**GLM coefficient**	**BF**
Geographic distance	0.02 [-3.86, 3.85]	0.1	-0.02 [-3.78, 3.89]	0.0	-0.02 [-3.97, 4.18]	0.0	-0.01 [-3.94, 4.03]	0.3
Null raster (R)	-1.08 [-1.4, -0.77]	**>99**	-0.01 [-3.78, 3.84]	0.1	-1.13 [-1.5, -0.83]	**>99**	-0.33 [-3.58, 3.41]	7.1
Rice harvested area 2000 (C)	-0.07 [-3.81, 3.89]	0.0	0.07 [-4.01, 4.13]	0.1	-0.01 [-3.95, 3.77]	0.0	-0.05 [-3.85, 3.74]	0.8
Rice harvested area 2000 (O)	-0.03 [-3.88, 3.83]	0.1	0.03 [-3.87, 3.78]	0.1	-0.01 [-4.14, 4.05]	0.1	0.06 [-3.73, 3.89]	0.1
Rice harvested area 2000 (D)	0.06 [-3.74, 3.87]	0.0	0.05 [-3.82, 4.05]	0.0	-0.06 [-3.81, 3.86]	0.0	-0.08 [-3.95, 3.72]	0.0
Rice harvested area 2000 (O, log)	-0.01 [-3.94, 3.91]	0.3	0.00 [-3.70, 4.03]	0.1	0.03 [-3.72, 3.89]	0.1	-0.01 [-3.85, 3.81]	0.2
Rice harvested area 2000 (D, log)	-0.04 [-3.81, 3.89]	0.0	-0.06 [-3.91, 3.60]	0.0	0.06 [-3.84, 4.00]	0.0	0.07 [-3.99, 4.11]	0.0
Elevation (O)	-0.06 [-3.92, 3.87]	0.1	0.05 [-3.87, 3.86]	0.0	0.00 [-3.96, 3.89]	0.1	0.06 [-3.69, 4.22]	0.0
Elevation (D)	0.08 [-3.83, 4.00]	0.0	-0.04 [-4.02, 3.97]	0.0	-0.03 [-4.06, 3.81]	0.0	0.04 [-3.92, 4.07]	0.0
Annual precipitation (O)	0.03 [-3.87, 3.96]	0.1	0.00 [-3.98, 4.06]	0.1	-0.04 [-3.91, 3.56]	0.0	0.07 [-3.86, 3.92]	0.4
Annual precipitation (D)	0.05 [-3.84, 4.01]	0.0	0.00 [-4.01, 3.84]	0.0	-0.08 [-3.99, 3.91]	0.0	0.01 [-3.65, 3.92]	0.0
Annual mean temperature (O)	-0.02 [-3.82, 3.97]	0.0	-0.01 [-3.93, 4.00]	0.0	-0.04 [-3.85, 4.02]	0.1	0.03 [-3.88, 3.96]	0.2
Annual mean temperature (D)	0.02 [-3.91, 3.86]	0.0	-0.04 [-4.03, 3.95]	0.0	0.03 [-4.10, 3.96]	0.0	0.03 [-3.80, 3.79]	0.0
Continuous phylogeographic reconstruction	**Data set of Trovão *et al*. (180 + 117 sequences)**				**Updated data set (210 + 240 sequences)**			
	West Africa		**East Africa**		**West Africa**		**East Africa**	
+ *post hoc* analyses	***Q* statistic**	**BF**	***Q* statistic**	**BF**	***Q* statistic**	**BF**	***Q* statistic**	**BF**
Rice harvested area 2000 (C)	-0.07 [-0.15, 0.05]	-	-0.03 [-0.07, 0.00]	-	-0.11 [-0.2, -0.03]	-	-0.07 [-0.11, 0.02]	-
Rice harvested area 2000 (log, C)	0.02 [-0.04, 0.10]	-	-0.02 [-0.04, 0.01]	-	-0.02 [-0.08, 0.03]	-	-0.01 [-0.06, 0.04]	-
Rice harvested area 2005 (C)	-0.09 [-0.15, 0.00]	-	-0.01 [-0.06, 0.05]	-	-0.13 [-0.2, -0.05]	-	-0.01 [-0.08, 0.05]	-
Elevation (C)	-0.1 [-0.15, -0.03]	-	-0.03 [-0.08, 0.00]	-	-0.07 [-0.16, 0.00]	-	-0.13 [-0.2, -0.08]	-
Elevation (R)	-0.06 [-0.1, -0.02]	-	-0.03 [-0.07, 0.00]	-	-0.08 [-0.1, -0.05]	-	-0.07 [-0.1, -0.02]	-
Annual precipitation (C)	-0.02 [-0.07, 0.03]	-	-0.01 [-0.03, 0.06]	-	-0.01 [-0.07, 0.04]	-	0.01 [-0.02, 0.06]	-
Annual precipitation (R)	-0.1 [-0.16, -0.06]	-	0.00 [-0.05, 0.02]	-	-0.1 [-0.15, -0.07]	-	-0.02 [-0.06, 0.01]	-
Annual mean temperature (C)	-0.01 [-0.01, 0.00]	-	-0.01 [-0.02, 0.00]	-	-0.01 [-0.01, 0.00]	-	0.00 [-0.02, 0.01]	-
Annual mean temperature (R)	0.00 [0.00, 0.01]	8.1	0.00 [-0.01, 0.02]	-	0.01 [0.00, 0.01]	10.1	0.00 [-0.02, 0.01]	-
Main rivers (*k*=10, C)	-0.04 [-0.10, 0.02]	-	-0.01 [-0.05, 0.01]	-	-0.02 [-0.08, 0.02]	-	-0.08 [-0.1, -0.05]	-
Main rivers (*k*=100, C)	-0.1 [-0.16, -0.03]	-	-0.03 [-0.07, 0.01]	-	-0.09 [-0.2, -0.03]	-	-0.11 [-0.2, -0.06]	-
Main rivers (*k*=1000, C)	-0.1 [-0.19, -0.05]	-	-0.03 [-0.08, 0.00]	-	-0.1 [-0.19, -0.04]	-	-0.12 [-0.2, -0.07]	-

For GLM coefficients and *Q* statistics, we report both the median value and 95% HPD interval. "BF" refers to "Bayes factor" and, according to the scale of interpretation defined by Kass & Raftery (1995), BF >3 and >20 can respectively be considered as "positive" and "strong" (in bold) evidences of the GLM coefficient or *Q* statistic significance. "O" and "D" indicate if the considered environmental factor was respectively measured at the locations of origin or destination, "C" and "R" indicate if the considered environmental raster was respectively treated as a conductance or resistance factor; and *k* corresponds to the parameter used to transform the initial main rivers raster (see the text for further details).