

Supplementary Figures and Tables

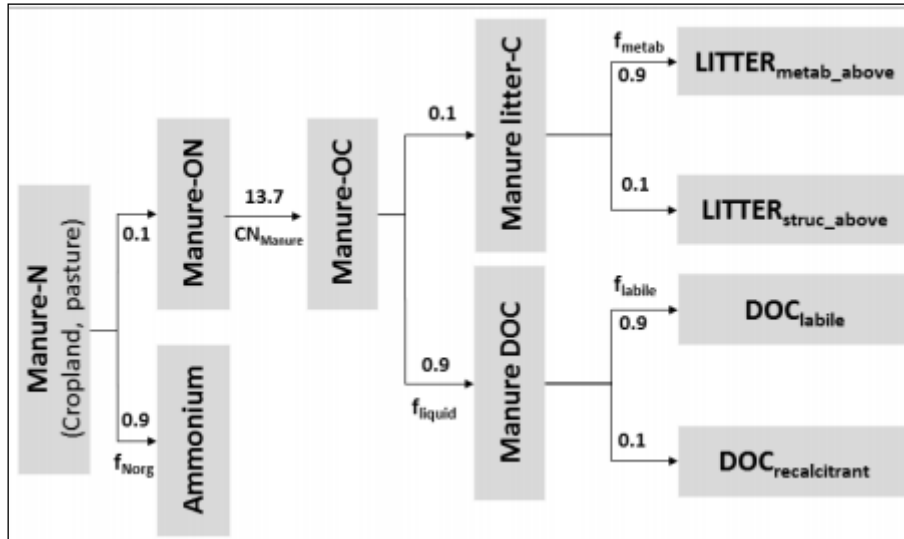


Figure S1. Implementation of the manure scheme in ORCHILEAK.

Table S2. Dominant pfts (%) for 5 large European river catchments.

BASINS	BOREAL FOREST	TEMPERATE FOREST %	GRASSLAND	CROPLAND
	%		%	%
Danube	27	8	22	39
Elbe	22	6	26	41
Rhine	10	20	35	24
Rhône	10	15	50	18
Seine	<0.1	12	35	49

**Table S3. Hydrology results in multiple catchments across Europe. Comparison catchment areas, discharge observed vs modeled and statistics (Nash-Sutcliffe efficiency, mean error and coefficient of determination).**

Station	REAL Catchment area km <sup>2</sup>	OBS average (m <sup>3</sup> /s)	MODELED Catchment area km <sup>2</sup>	MOD average (m <sup>3</sup> /s)	NSE	mean error %	R <sup>2</sup>
Frankfurt	24760	201	31900	335	-0.95	66	0.55
Basel	35900	1084	35770	1190	0.35	12	0.62
Dresden	53100	340	45830	342	0.54	2	0.55
Beaucaire	95590	1745	77270	1698	0.4	3	0.57
Bratislava	131330	2078	133830	2400	0.01	17	0.49
Neu Darchau	131950	704	137820	1216	-1.5	73	0.6
Senta	140130	809	106220	882	0.53	11	0.58
Lobith	160800	2345	152140	2767	0.04	20	0.48
Svistov	658340	5793	651980	6965	0.19	18	0.43
Ceatal	807000	6456	787530	7302	0.07	18	0.44

**Table S4. Comparison of modeled (MOD) versus observed (OBS) DOC concentrations measured at specific locations along the European river network. The table also reports the location ID (see figure 3), the original reference, and the sampling period.**

RIVER	#ID	SOURCE	COVERED PERIOD	OBS mg C l <sup>-1</sup>	MOD mg C l <sup>-1</sup>
Douro	A1	Abril (2002)	09/1997	2.5	3.6
Sado	A2	Abril (2002)	04/1996 and 09/1997	6.7	3.2
Gironde	A3	Abril (2002)	11/1996 to 02/19998	3.1	3.2
Loire	A4	Abril (2002)	08/1998	3.9	4.9
Scheld	A5	Abril (2002)	07/1996 to 05/1998	6.8	7.2
Ems	A6	Abril (2002)	07/1997	6.8	6.4
Elbe	E1	Abril (2002)	04/1997	4.6	6.3
Rhine	Ri1	Abril (2002)	10/1996 to 03/1998	2.9	5.3
Thame	A7	Abril (2002)	09/1996 and 02/1999	5.8	2.5
Tech	M1	Mattsson (2008)	10/2001 to 09/2002	1.8	2.8
Wales	M2	Mattsson (2008)	01/2002 to 12/2002	5.5	2.6
Denmark	M3	Mattsson (2008)	10/2001 to 09/2002	7.2	10.3
Finland	M4	Mattsson (2008)	01/2001 to 12/2001	13	11.1
Rhine	Ri1	Glorich	1992 to 1996	4.3	4.7
Elbe	E1	Glorich	1998 to 2001	6.1	6.2
Seine	S1	Eau de France	2002 to 2006	6.9	4.5
Rhone	Ro1	Eau de france	1990 to 1995	4.1	4.4
England	-	Worrall 2012	2001 to 2007	4.8	7.4
Baltic	-	Fransner 2016		13	10

**Table S5. Statistics for the simulated discharge, DOC concentration and DOC flux in four large rivers against measured values reported in the GLORICH dataset.**

RIVER	DISCHARGE	DISCHARGE	CONCENTRATION	CONCENTRATION	FLUX	FLUX
	RMSE %	R <sup>2</sup>	RMSE %	R <sup>2</sup>	RMSE %	R <sup>2</sup>
Rhine	45	0.43	70	0.43	84	0.35
Elbe	114	0.43	334	0.04	121	0.5
Rhone	37	0.6	117	0.1	122	0.6
Seine	202	0.08	64	0.4	147	0.5