Table S1. Model comparison.

	ChemFate	EQC	SimpleBox	MAMI	TRANSPECII
Model Type	Level IV (fully dynamic, can change emission rates and daily climatic parameters)	Level III (steady-state, chemical releases at a constant rate)	Level III and Level IV (quasi-dynamic, can only change emission rates)	Level III (steady-state, chemical releases at a constant rate)	Level III (steady-state, chemical releases at a constant rate)
Time-Dependent Emissions	Yes, daily	No	Yes, weekly	No	No
Time-Dependent Concentration	Yes, daily	No	Yes, weekly	No	No
Model Format	Software coded in Python and source code is available in Github	Excel	Excel, with dynamic R for Level IV part	Excel	Software coded in Visual Basic
Chemical Type	1) Non-ionizable organic; 2) ionizable organic (acid, base); 3) metal (ionic, colloidal, and particulate forms)	Non-ionizable organic	1) Non-ionizable organic; 2) ionizable organic (acid, base); 3) metal (only ionic form)	1) Non-ionizable organic; 2) Ionizable organic (acid, base)	Metal (ionic, colloidal, and particulate forms)
Model Framework	1) Fugacity-based concept for non-ionizable organic chemicals, and 2) aquivalence-based concept for ionizable organic chemicals and metals.	Fugacity-based	Concentration-based	Activity-based	Aquivalence-based
Compartments	**Atmosphere** - air, aerosols **Freshwater** - water, suspended particles, sediment solids, sediment water **Seawater** - water, suspended particles, sediment solids, sediment water **Natural soil** - soil solids, soil air, soil water, deep soil **Urban soil** - soil solids, soil air, soil water, deep soil **Agricultural soil without biosolids** - soil solids, soil air, soil water, deep soil **Agricultural soil with biosolids** - soil solids, soil air, soil water, deep soil	**Atmosphere** - air, aerosols **Water** - water, suspended particles, fish, sediment solids, sediment water **Soil** - soil solids, soil air, soil water	**Atmosphere** - air, aerosols **Freshwater lake** - dissolved, suspended particles **Freshwater** - dissolved, suspended particles, sediment solids, sediment water **Surface sea** - dissolved, suspended particles **Deep sea** - dissolved, suspended particles, sediment solids, sediment water **Natural Soil** - soil solids,soil water **Agricultural soil** - soil solids, soil water **Other soil** - soil solids, soil water	Air, Freshwater, Freshwater sediment, Seawater, Seawater sediment, Natural soil, Agricultural soil, and Other soil	Water, Sediment, Soil
Model Run with Background Concentrations	Yes	No	No	No	No