**Formulas used for the microplastics fate and transport processes included in the Full-Multi model framework****.**

Colour related to level of confidence in the formulation (Green= high; Orange=medium; Red=low)

|  |  |  |  |
| --- | --- | --- | --- |
| Fate process | Formula | Parameters | Reference |
| Degradation |  | : degradation half-life in days | Assumed first order kinetics |
| Fragmentation |  | : number of MP fragments formed per day  : diameter of particle i in µm  : timescale for fragmentation of the 1000 µm size fraction  : number of fragments formed  : volume of the MP (µm3)  : volume of the fragment (µm3) | acts as a factor relative to size, bigger MPs have faster fractionation rates. |
| Advection |  | average flow velocity (ms-1)  : cross sectional area of the compartment (m2)  : volume of the compartment of moving water (m3) | (Praetorius et al. 2012) |
| Biofouling |  | time for the biofilm coverage to grow in minutes | Assumed first order kinetics |
| Defouling |  | time for the biofilm coverage to degrade in minutes | Assumed first order kinetics |
| Heteroaggregation |  | heteroaggregation attachment efficiency  SPM concentration (mg/L)  : collisions rate constant (s-1) | (Praetorius et al. 2012; Praetorius et al. 2020) |
| Aggregate breakup |  | : heteroaggregation rate constant (s-1) |  |
| Settling |  | : settling velocity of the MP particle (m/s)  : density of the MP (kg/m3)  : dynamic viscosity of water at 21C (kg/ms)  : density of water at 21C (kg/m3)  : gravitational acceleration on earth in (m/s2)  : radius of the MP particle (m)  : compartment depth (m) | (Dietrich 1982; Praetorius et al. 2012) |
| Rising |  | : settling velocity of the MP particle (m/s)  : compartment depth (m) |  |
| Mixing | For the surface water compartment:  For the stagnant water compartment:  No mixing assumed for the sediment compartment. | : volume of flowing water compartment (m3)  : volume of surface water compartment (m3)  : volume of stagnant water (m3) | Assumed first order kinetics and normalised by volume of the compartment (Praetorius, Scheringer, and Hungerbühler 2012) |
| Resuspension |  | : compartment depth (m) | (Praetorius, Scheringer, and Hungerbühler 2012) |
| Burial |  | : compartment depth (m) | (Praetorius, Scheringer, and Hungerbühler 2012) |
| Sediment transport |  | : velocity of sediment transfer (kg/s)  : mass of sediment (kg)  : sediment porosity  : sediment density (g/cm3)  : volume of sediment (m3) | (Praetorius, Scheringer, and Hungerbühler 2012) |