**Supplementary material**

**TABLE S1** Calibration of parameters in water quality (including phytoplankton) model.

|  |  |  |  |
| --- | --- | --- | --- |
| Parameters | Description | Reference range | Value |
| ANDC  (The amount of NO3 consumed dissolved carbon) | Mass of NO3 consumed per unit of dissolved organic carbon oxidation |  | 0.933 |
| rNitM  (Rate of nitrification maximum) | Maximum nitrification rate (g N m3/day) | 0.001～1.3 | 0.1 |
| KHNitDO  (Key coefficient of half-saturation nitrification dissolved oxygen) | Dissolved oxygen half-saturation coefficient of nitrification |  | 0.5 |
| KHNitN  (Key coefficient of half-saturation nitrification nitrogen) | Semi-saturation coefficient of ammonia nitrogen for nitrification |  | 0.05 |
| TNit  (Temperature of nitrification) | Reference temperature of nitrification (°C) |  | 30 |
| KLP  (Key rate of lytic phosphorus) | Hydrolysis rates of soluble organic phosphorus particles (/d) | 0.01～0.63 | 0.08 |
| KDP  (Key rate of dissolved phosphorus) | Mineralization rate of dissolved organic phosphorus (/d) | 0.01～0.63 | 0.08 |
| KRC  (Key rate of refractory carbon) | Dissolution rate of insoluble particulate organic carbon (/d) | 0.001 | 0.001 |
| KLC  (Key rate of lytic carbon) | Dissolution rate of soluble particulate organic carbon (/d) | 0.01～0.63 | 0.06 |
| KDC  (Key rate of dissolved carbon) | Decomposition rate of dissolved organic carbon (/d) | 0.01～0.63 | 0.1 |
| KRP  (Key rate of refractory phosphorus) | Hydrolysis rate of insoluble particulate organophosphorus (/d) | 0.001 | 0.001 |
| KRN  (Key rate of refractory nitrogen) | Hydrolysis rate of insoluble particulate organic nitrogen (/d) | 0.001 | 0.001 |
| KLN  (Key rate of lytic nitrogen) | Hydrolysis rate of soluble particulate organic nitrogen (/d) | 0.01～0.63 | 0.05 |
| KDN  (Key rate of dissolved nitrogen) | Mineralization rate of dissolved organic nitrogen (/d) | 0.01～0.63 | 0.05 |
| WSrp  (Whereabout speed of refractory particulate) | Sedimentation rate of insoluble particulate organic matter (m/d) | 0.02～9.0 | 0.2 |
| WSlp  (Whereabout ppeed of lytic particulate) | Sedimentation rate of soluble particulate organic matter (m/d) | 0.02～9.0 | 0.2 |
| PMc  (Production maximum of cyanobacteria) | Maximum growth rate of cyanobacteria (/d) | 0.2～9.0 | 1.6 |
| TMRc1  (Temperature minimum regenerate of cyanobacteria) | Lower limit of optimum temperature for cyanobacteria growth (°C) |  | 28 |
| KHNx  (Key coefficient of half-saturation nitrogen) | Nitrogen half-saturation for algae (mg/L) | 0.006～4.32 | 0.012 |
| FCLP  (Flux of carbon labile particle) | Carbon partition coefficient of predatory algae: active particulate organic carbon |  | 0.4 |
| FPLP  (Flux of phosphorus labile particle) | Phosphorus partition coefficient of predatory algae: active particulate organic phosphorus |  | 0.3 |
| FNLP  (Flux of nitrogen labile particle) | Nitrogen partition coefficient of predatory algae: active particulate organic nitrogen |  | 0.3 |
| BMRc  (Basal metabolism rate for cyanobacteria) | Cyanobacteria basal respiratory rate (/d) | 0.01～0.92 | 0.05 |
| PRRc  (Predation rate on refractory cyanobacteria) | Predation Rate on algae (/d) | 0.03～0.3 | 0.07 |
| WSc  (Whereabout speed of cyanobacteria) | Setting velocity for algae (m/d) | 0.001～13.2 | 0.05 |
| KHPx  (Key coefficient of half-saturation phosphorus) | Phosphorus half-saturation for algae (mg/L) | 0.001～1.52 | 0.001 |
| KEb  (Key extinction coefficient of background) | Background extinction coefficient (/m) | 0.10～0.45 | 0.10 |
| KECHL  (Key extinction coefficient of chlorophyll) | Extinction coefficient of suspended chlorophyll (1/m per ug/L) | 0.002～0.02 | 0.012 |



**FIGURE S1** Comparison of simulated and measured water levels at four hydrological stations.



**FIGURE S2** Comparison of simulated and measured TN concentrations of Lake Poyang in 2015.



**FIGURE S3** Comparison of simulated and measured TP concentrations of Lake Poyang in 2015.



**FIGURE S4** Comparison of simulated and measured Chl *a* concentrations of Lake Poyang in 2015.