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| **Process** | **Biochemical reaction** | **Formulation** | | **Description** |
| Gross primary production (GPP) | Nutrient limitation for phytoplankton growth | : photosynthesis rate  : Nutrient limitation for phytoplankton growth | | GPP refers to the total rate of organic carbon production by phytoplankton based on the rate of photosynthesis  : solar radiation  Light extinction coefﬁcient  H: water depth |
| Net primary production (NPP) | NPP is the rate of phytoplankton produces biomass which already subtract the respiration of primary producers, including:  phytoplankton excretion  phytoplanktonic maintenance | growth constants of phytoplankton | | NPP is GPP minus the autotrophs' respiration rate (i.e., only by the primary producers). |
| Nitrification |  | maximum rate constant | | Under aerobic conditions, ammonia is oxidized to nitrite and nitrate via nitrification  half-saturation constants |
| Denitrification |  |  | | Under anaerobic conditions, nitrate is reduced to gas forms as N2, N2O while organic P is degraded to inorganic PO43- |
| Aerobic degradation (respiration) |  |  | | Degradation of organic carbon in the aerobic condition that converts into inorganic matters |
| Phytoplankton = NPP - Phytoplankton mortality  DSi = NPP of Diatom = NPP x Redﬁeld ratio for silica (15/106)  NH4+ = Aerobic degradation – Nitrification – NPPNH4  NO3- = Nitrification - Denitrification – NPPNO3 | | | TOC = Phytoplankton mortality – Aerobic degradation – Denitrification  O2 = Oxygen air exchange + NPP – Aerobic degradation – Nitrification  PO43- = Aerobic degradation + Denitrification – NPPPO4 – PO4 adsorption | |