

Suspended solids, light penetration and primary production in the Scheldt estuary

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In strong tidal estuaries such as the Scheldt, the hydrodynamic conditions display large variations, with current velocities ranging from zero during slacks up to 2 m.s^{-1} during ebbs and floods. This highly fluctuating water velocity induces a periodically varying shear stress at the sediment-water interface, resulting in a cyclic pattern of sedimentation and resuspension. As a result, the suspended solid concentration in the water column follows a marked tidal fluctuation which causes significant variations of the light-attenuation coefficient. Since the underwater light field depends on both the incident light and the light-attenuation coefficient, the instantaneous light availability (PAR) in the water column has to be computed from these two periodic signals.

In this paper, we present some characteristics of the underwater light field in the Scheldt estuary. We show that the estimation of gross primary production (GPP) by phytoplankton is strongly affected by the time-variation of the light-attenuation coefficient (k_d). In particular, the common practice of considering a constant (time-averaged) k_d value leads to an erroneous assessment of the time- and depth-integrated GPP. Finally, we show some estimates of the phytoplankton net primary production (NPP) in the Scheldt, computed from a coupled model that takes into account the hydrodynamic conditions, the light penetration and the phytoplankton dynamics.