Model	Assumptions	Analytical solutions	References
CIC: constant initial concentration	(1), $\Phi(t)/\mathrm{MAR}(t) = \mathrm{Cte}$	$C_m = C_0 \cdot e^{-\lambda t}$	Robbins (1978), Robbins and Edgington (1975)
CF–CS: constant flux : constant sedimentation	(1), (2), (3)	$C_m = C_0 \cdot e^{-\lambda m/\mathrm{MAR}}$; $t = \frac{m}{\mathrm{MAR}}$	Krishnaswamy et al. (1971)
CRS: constant rate of supply	(1), (2)	$I_m = I \cdot e^{-\lambda t}$; $\mathrm{MAR} = \frac{\lambda I_m}{C_m}$	Appleby (2001), Appleby and Oldfield (1978)
CMZ–CS: complete mixing zone with constant SAR	(2), (3), $k_\mathrm{m} = \infty$, $m \geq m_a$ $k_\mathrm{m} = 0$, $m < m_a$	$C_m = C = \frac{\Phi}{\mathrm{MAR}+\lambda m_a}$, $m \geq m_a$ $C_m = C \cdot e^{-\lambda(m-m_a)/\mathrm{MAR}}$, $m < m_a$	Robbins and Edgington (1975)
CF–CS: constant diffusion	(2), (3), $k_\mathrm{m} = \mathrm{Cte}$	$C_m = \frac{\Phi}{\mathrm{MAR}-k_\mathrm{m}\beta} e^{-\beta m}$; $\beta = \frac{\mathrm{MAR}-\sqrt{\mathrm{MAR}^2+4\lambda k_\mathrm{m}}}{2k_\mathrm{m}}$	Laissaoui et al. (2008), Robbins (1978)
CF–CS: depth-dependent diffusion and/or translocational mixing	(2), (3), $k_\mathrm{m} = f_m$; may include local sources and sinks	General numerical solution	Abril (2003), Abril and Gharbi (2012), Robbins (1986), Smith et al. (1986)
IMZ: incomplete mixing zone	(2), (3)	A linear combination of solutions for CF–CS and CMZ–CS with coefficients g and $(1-g)$, being $g \epsilon [0, 1]$	Abril et al. (1992)
SIT: sediment isotope tomography	(1)	$C_m = C_0 \cdot e^{-B \cdot m} \cdot$ $\cdot e^{\sum_{n=1}^{N} a_n \sin\left(\frac{n\pi m}{m_{\max}}\right)+\sum_{n=1}^{N} b_n (1-\cos)}$	Carroll and Lerche (2003)
NID–CSR: nonideal deposition, constant sedimentation rate	(1), (2), (3), fractioning of fluxes, depth distribution	$C_m = C_1 \cdot e^{-\lambda m/\mathrm{MAR}} + C_2 \cdot e^{-\alpha m}$; $C_2 = \frac{-\alpha g \Phi}{\alpha \mathrm{MAR}-\lambda}$; $C_1 = \frac{(1-g)\Phi}{\mathrm{MAR}} - C_2$	Abril and Gharbi (2012)
CICCS: constant initial concentration and constant sedimentation rate	(1), (2)	$\mathrm{MAR} = \lambda \frac{I - I_\mathrm{ref}}{C_r}$; I_ref = local fallout ^{210}Pb inventory; C_r = initial $^{210}\mathrm{Pb}_\mathrm{xs}$ in catchment-derived sediment	He and Walling (1996b)
IP–CRS: initial penetration, constant rate of supply	(2), initial mobility of $^{210}\mathrm{Pb}_\mathrm{xs}$ downward; two compartments 0 to z_k and z_k to ∞	$C_{i\,(z)} = A_i e^{\theta+(i)z} + B_i e^{\theta-(i)z}$; from 0 to z_k $C_{i\,(z)} = A_i e^{\sigma+(i)z} + B_i e^{\sigma-(i)z} + \frac{F_i}{\lambda}$; from z_k to ∞ $F_i = \frac{f_i}{(z_i - z_{i-1})} \sum_{m=1}^{k} \int_{z_{m-1}}^{z_m} r_m C_m \mathrm{d}z$; $\sum f_i = 1$ See reference for constants	Olid et al. (2016)
TERESA: time estimates from random entries of sediments and activities	(1), $^{210}\mathrm{Pb}_\mathrm{xs}$ fluxes are governed by horizontal inputs, correlation with MAR	$C_1 = C_0 \cdot e^{-\lambda T_0} \cdot \frac{1-e^{-\lambda \Delta T_1}}{\lambda \Delta T_1}$ $C_m = C_0 \cdot e^{-\lambda\left(T_0 + \frac{\Delta_{m-1}}{\mathrm{MAR}_{m-1}}\right)} \cdot \frac{1-e^{-\lambda \Delta T_m}}{\lambda \Delta T_m}$	Abril (2016), Botwe et al. (2017)