(5) Change/heterogeneous sediment composition

(6) OM decay

(7) Erosion (Past or recent)

(8) Coarse sediment composition

(I) Exponential $^{210}Pb_{xs}$ decline

(II) Shift in the slope of $^{210}Pb_{xs}$ profile

(III) SML overlying exponential $^{210}Pb_{xs}$ profile

(IV) Reverse $^{210}Pb_{xs}$ pattern at surface

(V) Stair-stepped $^{210}Pb_{xs}$ profile

(VI) Low/constant $^{210}Pb_{xs}$ profile

(VII) Low $^{210}Pb_{xs}$ concentrations and inventories

(1) Steady-state accumulation

(2) Mixing (physical or bioturbation)

(3) Change in MAR (acceleration or reduction)

(4) Rapid MAR

(1)
- ✓ Use independent tracers to validate chronology

(2)
- ✓ Check if depth distribution of other elements is homogeneous with depth.
- ✓ Analyze short-lived radionuclides at the SML.
- ✓ Check for burrowing evidence → e.g. X-ray radiographs or visual description of sed. core.
- ✓ CRS or CF:CS model below SML → check residence time of ^{210}Pb in SML.
- ✓ The profile is likely undatable if entirely affected by mixing.

(3)
- ✓ Use independent tracers to validate MAR in regions with different slope.
- ✓ Check for variations in geochemical or physical parameters in the profile.
- ✓ Test sensitivity to acceleration according to DBD and apparent MAR.
- ✓ Check historical records of natural or anthropogenic events.
- ✓ Apply CRS or CF:CS model piecewise.

(4)
- ✓ Analyze short-lived radionuclides.
- ✓ Analyze ^{226}Ra if supported ^{210}Pb is not reached.
- ✓ Check historical records of event sedimentation.
- ✓ The profile is likely undatable by ^{210}Pb if other chronological tools are unavailable.

(5)
- ✓ Check if changes in grain size distribution, DBD and OM content also occur.
- ✓ Normalize radionuclide concentrations to the parameter driving $^{210}Pb_{xs}$ distribution.
- ✓ Analyze ^{226}Ra in all sections.
- ✓ CF:CS model in normalized profiles.
- ✓ The profile is likely undatable if normalization fails and other chronological tools are unavailable.

(6)
- ✓ Only if OM is high (> 30 %) and mostly labile (0.01–0.03 d^{-1})

(7)
- ✓ Compare $^{210}Pb_{xs}$ inventories with those at a reference site.
- ✓ Check for coarser grain size.
- ✓ Presence of short-lived radionuclides at reference site to check entire core recovery.
- ✓ CF:CS or CIC models to estimate mean MAR.

(8)
- ✓ Analyze radionuclides in the fine sediment fraction (sieve to <63 μm or <125 μm) → check new profile
- ✓ ^{226}Ra by gamma spectroscopy
- ✓ Check for records of event sedimentation
- ✓ If sieving increases $^{210}Pb_{xs}$ concentrations but its shape is similar, the profile is undatable and cannot be used for accumulation rate calculations.