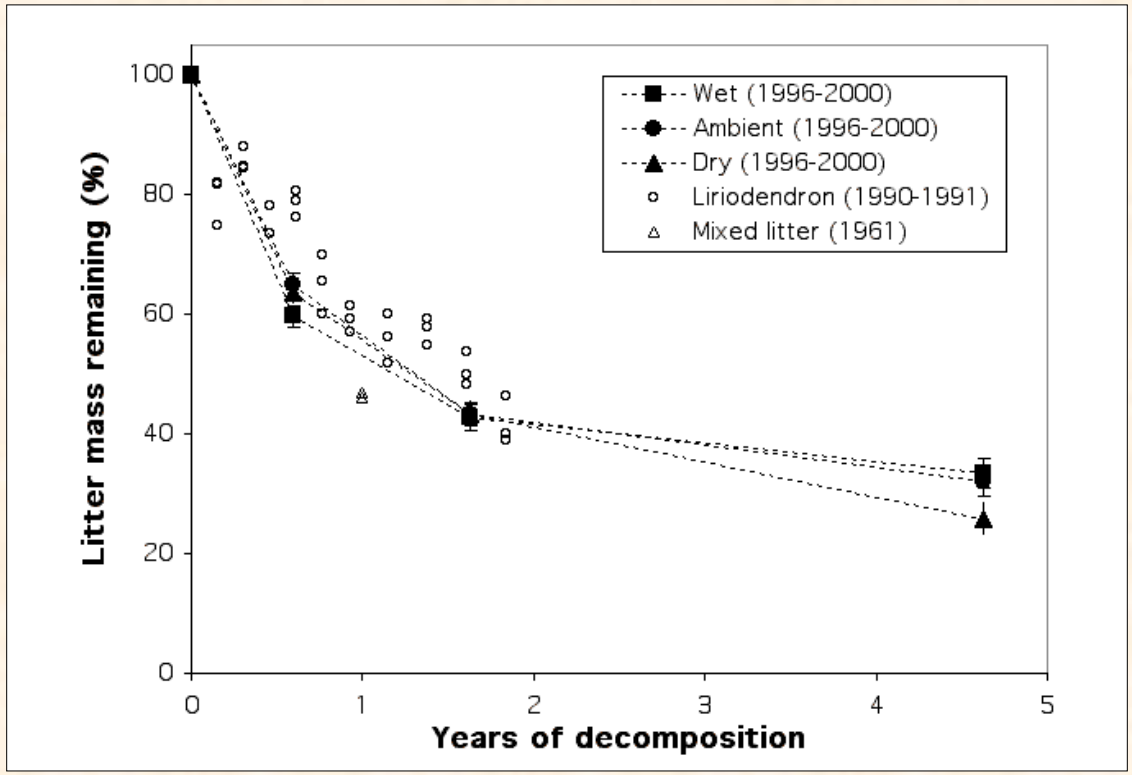
Reconciling Litter Decomposition with Isotopic Dilution of the Oi Horizon

Traditional Oi Decomposition from 'Litter Bags'



- **First year litter loss is ~50%**
- **Subsequent decomposition takes place in a buried horizons**
- **2-Year ~20% loss.**
- **3rd-Year ~12% loss and assumed to coincide with the transition from Oi to Oe/Oa litter quality.**

Calculated 1-Year Change in Oi Litter ^{14}C-signature

Calculated Contribution of new Oi litter to the Oi>1 layer

$$\% = (Y1-Y0)/(Oi-Y0)*100$$

Y0 = Oe ^{14}C signature at time zero

Y1 = Oe ^{14}C signature at 1-year

Oi = ^{14}C signature of added litter

Enrichment vs. Dilution

If Oi cohorts of litter had homogeneous ^{14}C-signatures, turnover calculated from either isotopic enrichment or dilution would yield identical results.

^{14}C Enrichment

(1005 ‰ Oi added to Oe layers)

TVA	=	46 ± 50%
WB	=	54 ± 8%
PR	=	40 ± 20%
HR	=	50 ± 25%

Values are mean % ± 95% c.i.

^{14}C Dilution

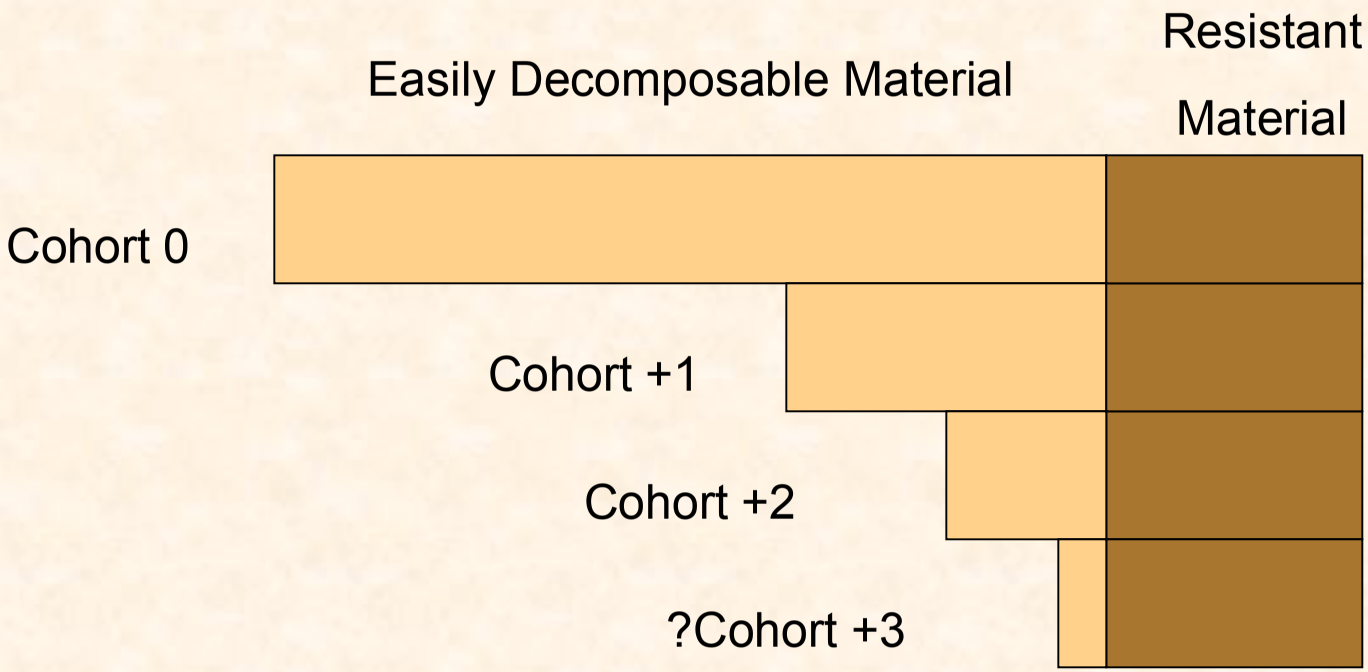
(221 ‰ Oi added to enriched Oe layers)

TVA	=	78 ± 16%
PR	=	71 ± 18%

Values are mean % ± 95% c.i.

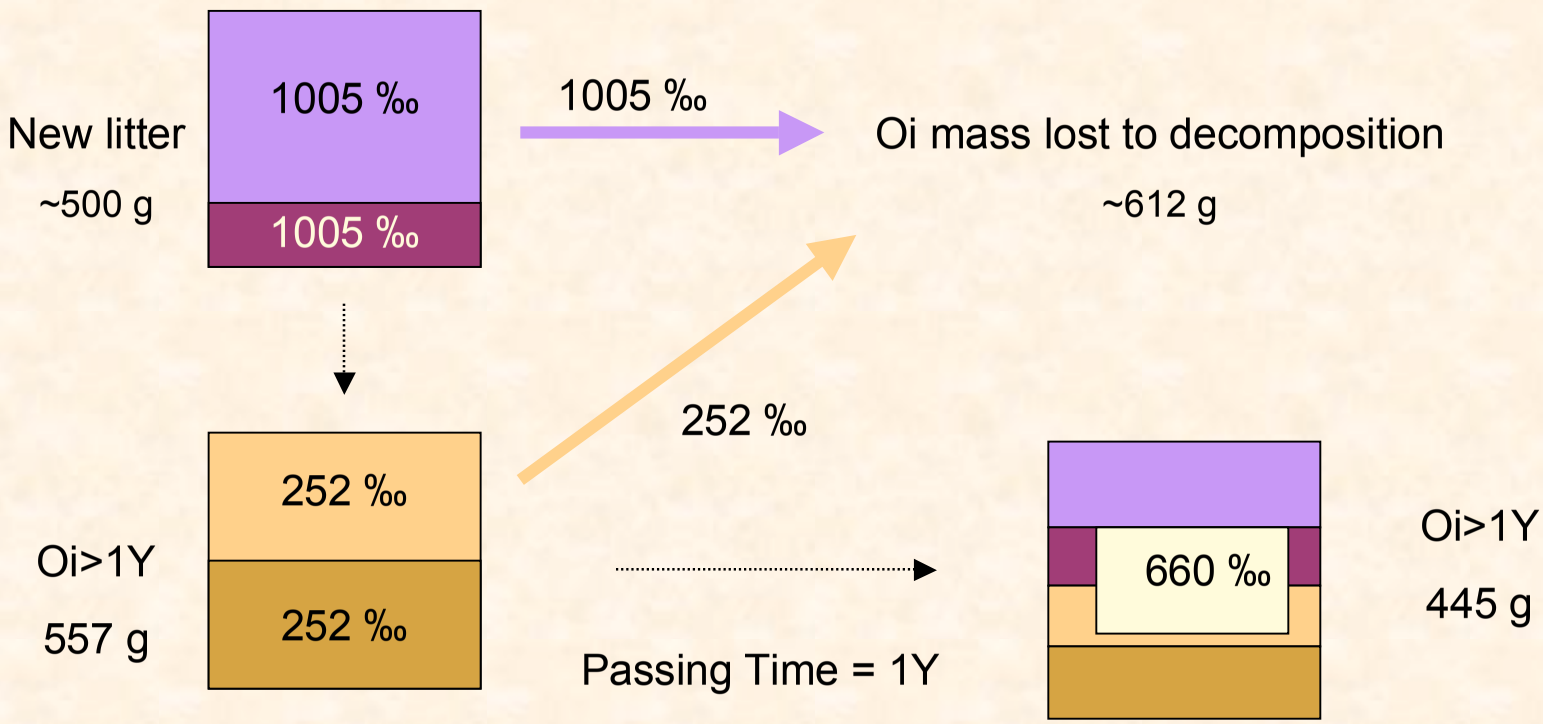
Because the results were not the same, it is likely that the Oi layer is not homogeneous with respect to ^{14}C-signatures.

Hypothetical Oi-layer by Cohort



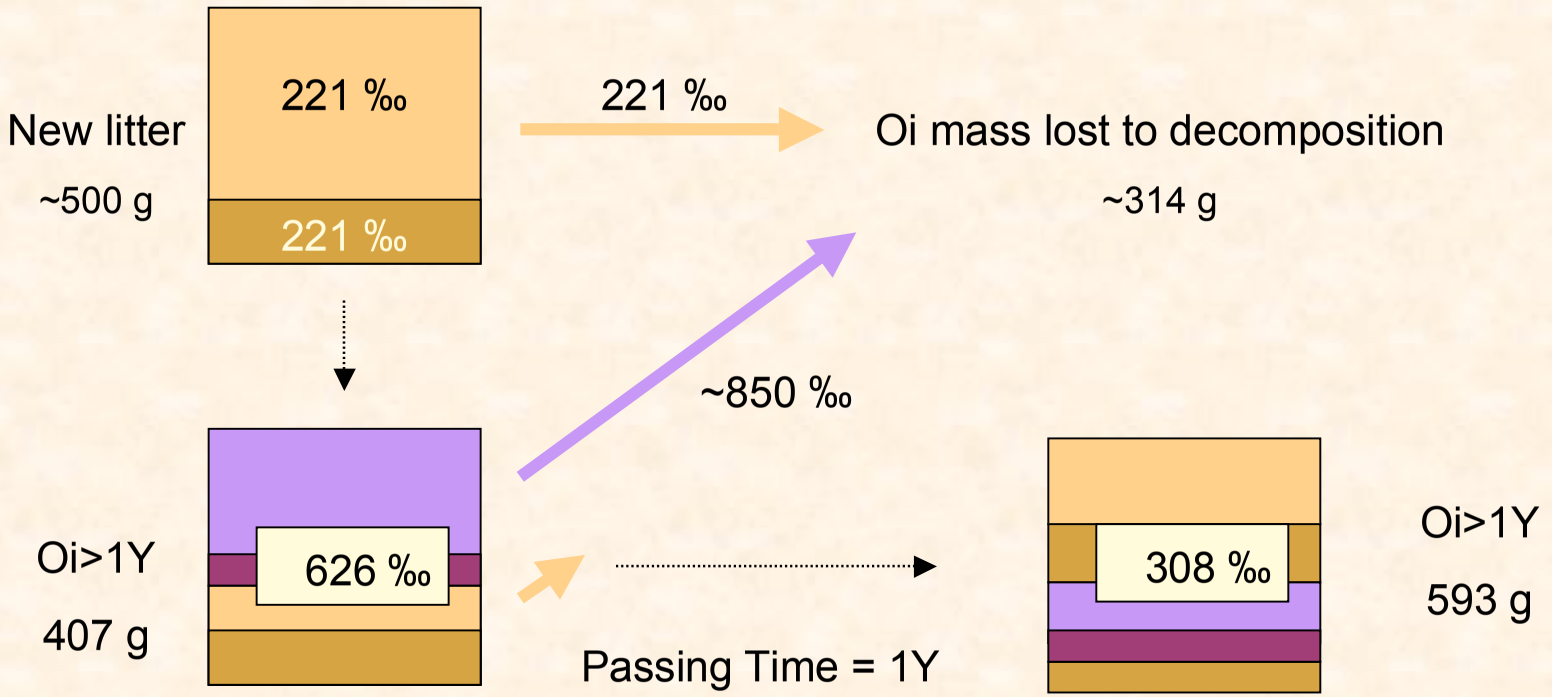
In a stable system all of this material has a similar ^{14}C-signature, however, in our experiment we are clearly analyzing a mixture of materials.

The 'Well-behaved' Case
(Enrichment of WB Oi-layer)



Homogeneous pools mix to yield 50% change in Oi horizon

The 'Problem' Case
(Dilution of TVA Oi-layer)



Non-homogeneous pools mix to yield an apparent ~75% change in the Oi horizon because of preferential loss of material having higher than bulk ^{14}C-signature.