

Beneficial use of river sediments as topsoil for
passive carbon capture and storage
during land restoration and energy crop production
– A Net Zero management option?

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Torrance and Ben Nunn



SURICATES: Sediment Uses as Resources In Circular And Territorial Economies



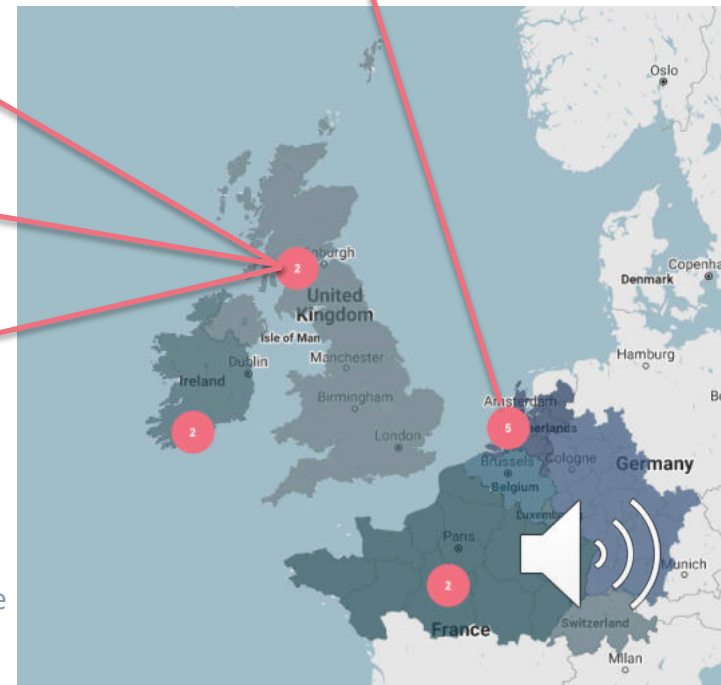
Bioengineering (e.g. phyto-conditioning & enhanced dewatering for soil)

Pozzolanic addition (e.g. opc & ggbs as strengthened soil)



In concrete (e.g. replacing sand)

Sediment reallocation



@SuricatesNWE

12th International SedNet Conference
(online) 28 Jun-2 Jul 2021

Nature-based dewatering – an essential precursor to reuse of canal sediment



Total Organic Carbon 10% (5-18%)

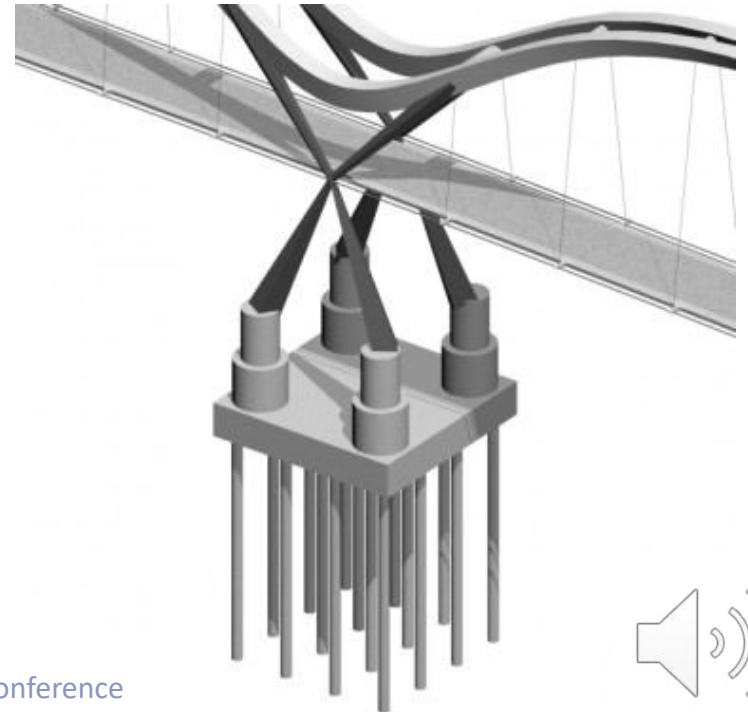


- OM issue for concrete strength –bioreduction?
- Fate of C in light of Net Zero?
- Opportunities for C storage in technosoils?



Infinity Bridge, Stockton-on-Tees (2007-8)





Coffer dam, Infinity Bridge (2008)



Placed sediments, Tees Barrage (2008)



Tees Barrage Brownfield biomass trials 2007-2012



Material change for
a better environment



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Feb 2008



Apr 2008



White House
Economic
Information Group

Baseline soil analyses

Granulometry: Sand to silty sand sediment (loamy sand to sandy loam soil)

	Placed sediment	CEFAS Action Level 1 current/proposed	<u>CEFAS Action Level 2 current/proposed</u>	<i>BS3882 Topsoil 2015</i>	CIEH/LQM S4ULs POS _{PARK}
Cr ^T mg.kg ⁻¹	135-195	40/50	<u>400/370</u>	<i>N/a</i>	33000
Cu mg.kg ⁻¹	45-49	40/30	<u>400/300</u>	<i><135</i>	44,000
Ni mg.kg ⁻¹	21-26	20/30	<u>200/150</u>	<i><75</i>	3,400
Zn mg.kg ⁻¹	196-221	130/130	<u>800/600</u>	<i><200</i>	170,000
Organic matter %	<i>1.8-2.8</i>	-	-	<i>LOI 2-20%</i>	-
N ^T %	<i>0.07-0.17</i>			<i>>0.15</i>	-



Jul 2008



Phalaris arundinacea



Feb 2010



Feb 2010



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Jul 2012



wrap

Material change for
a better environment

Nov 2012



wrap

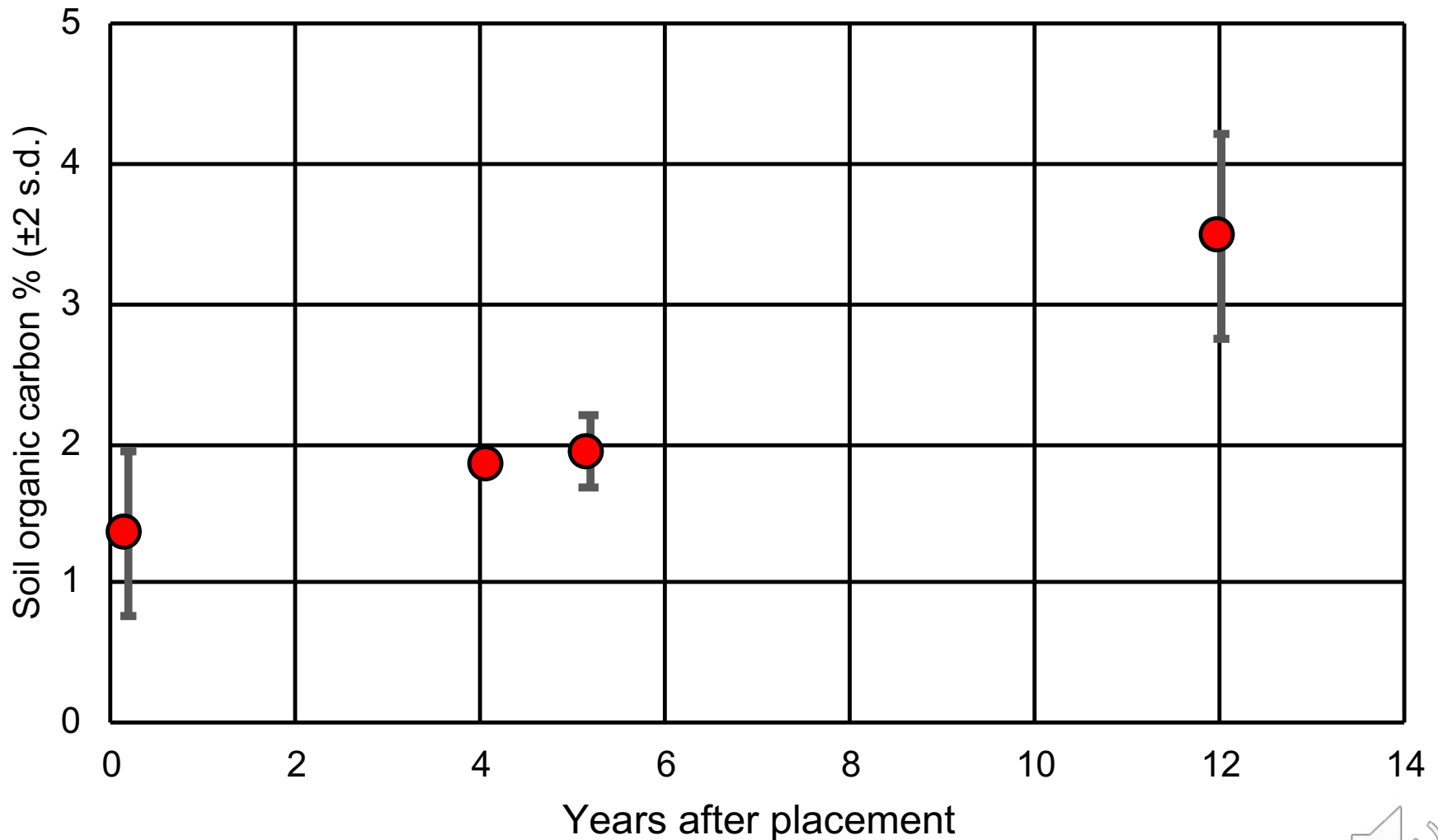
Material change for
a better environment

Feb 2020

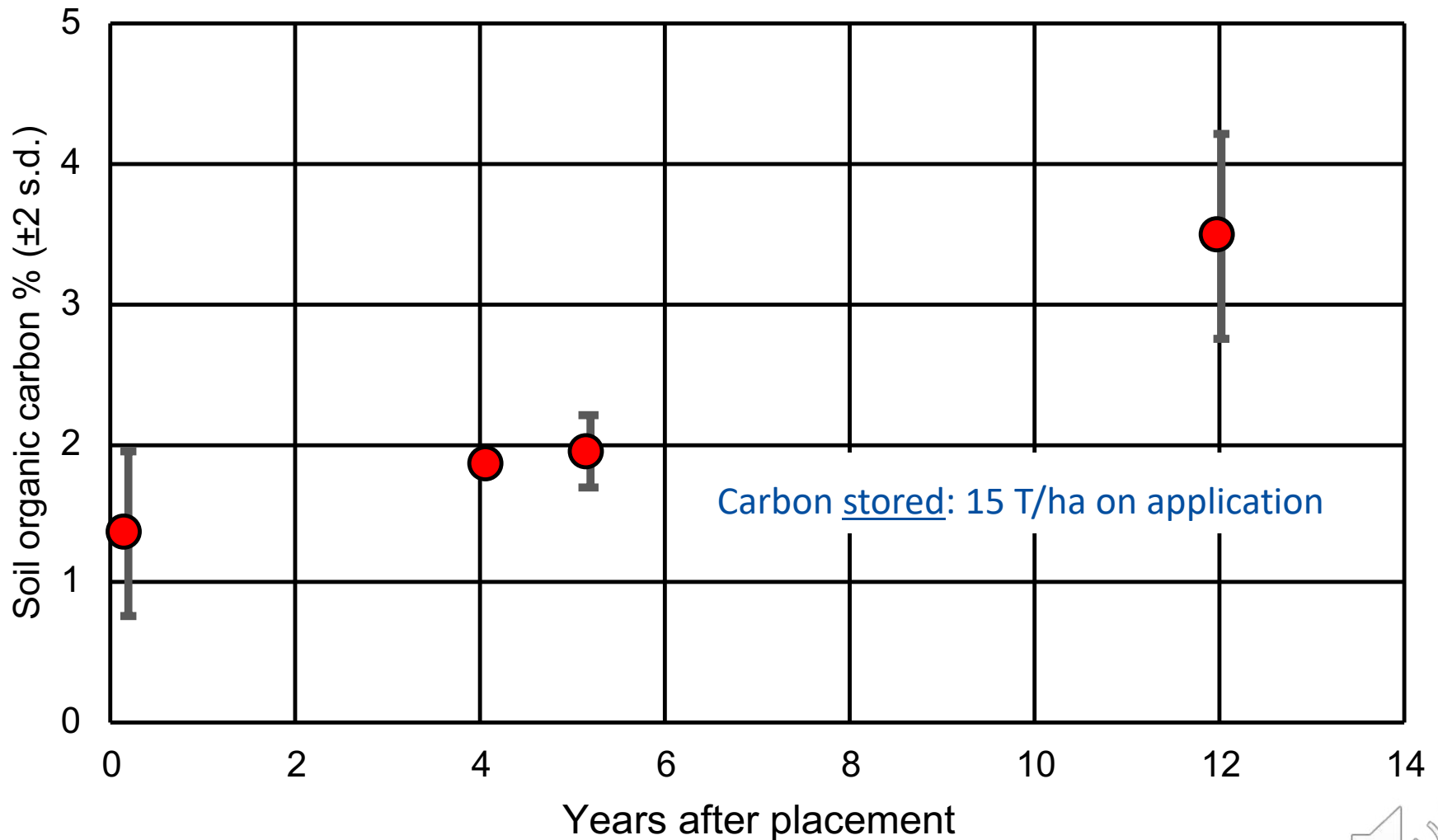




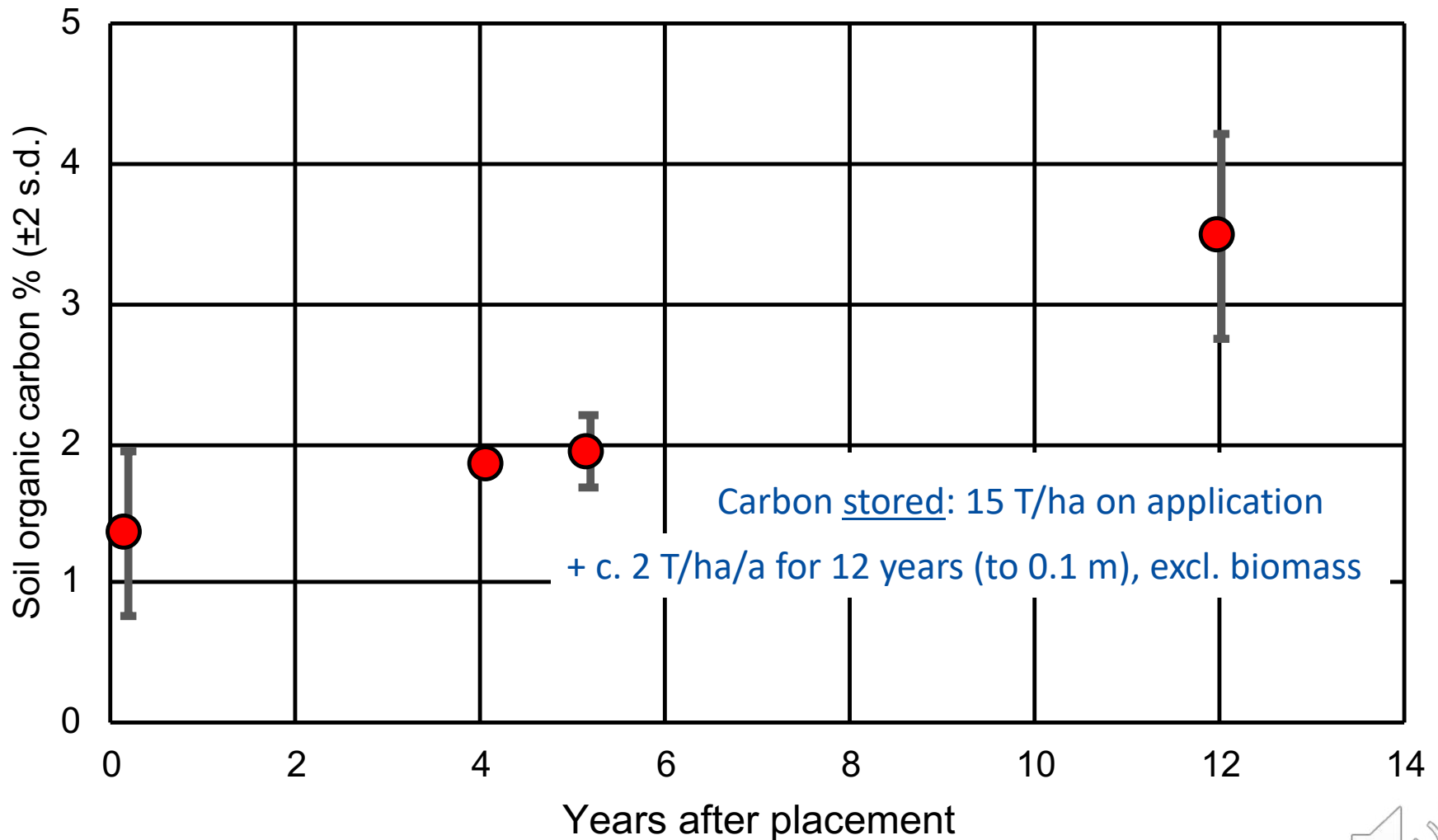
Soil Carbon 2008 to 2020



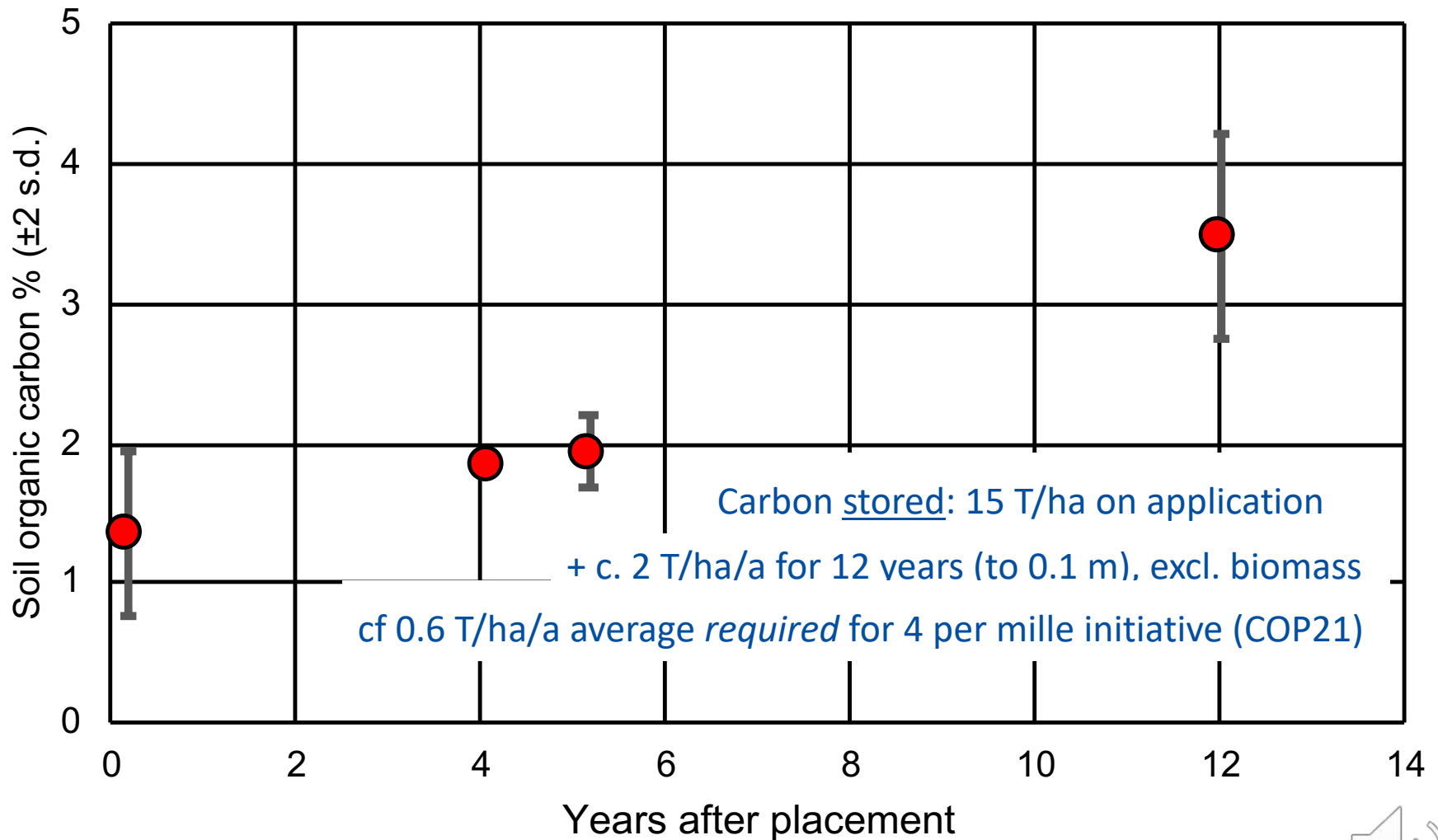
Soil Carbon 2008 to 2020



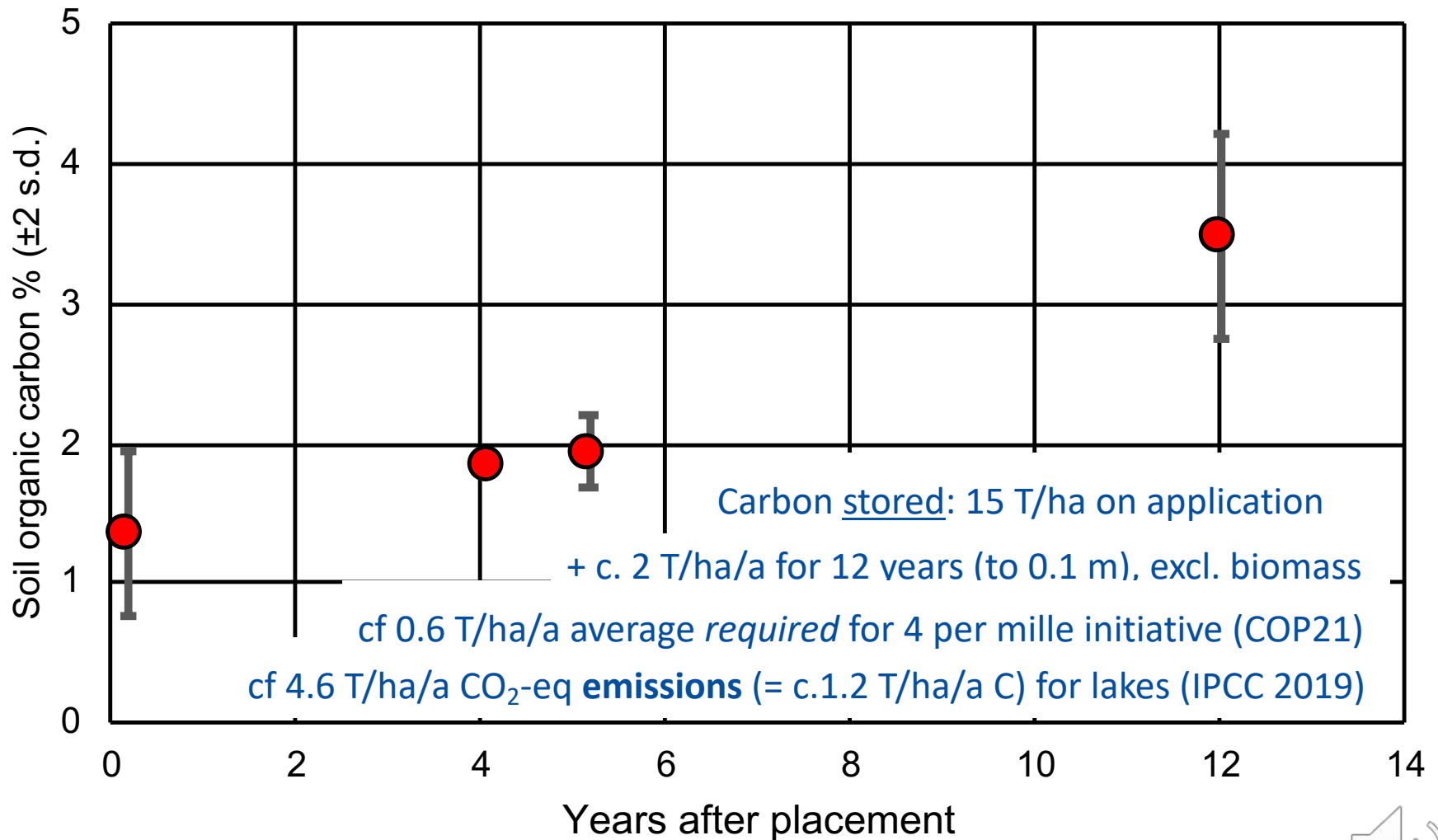
Soil Carbon 2008 to 2020



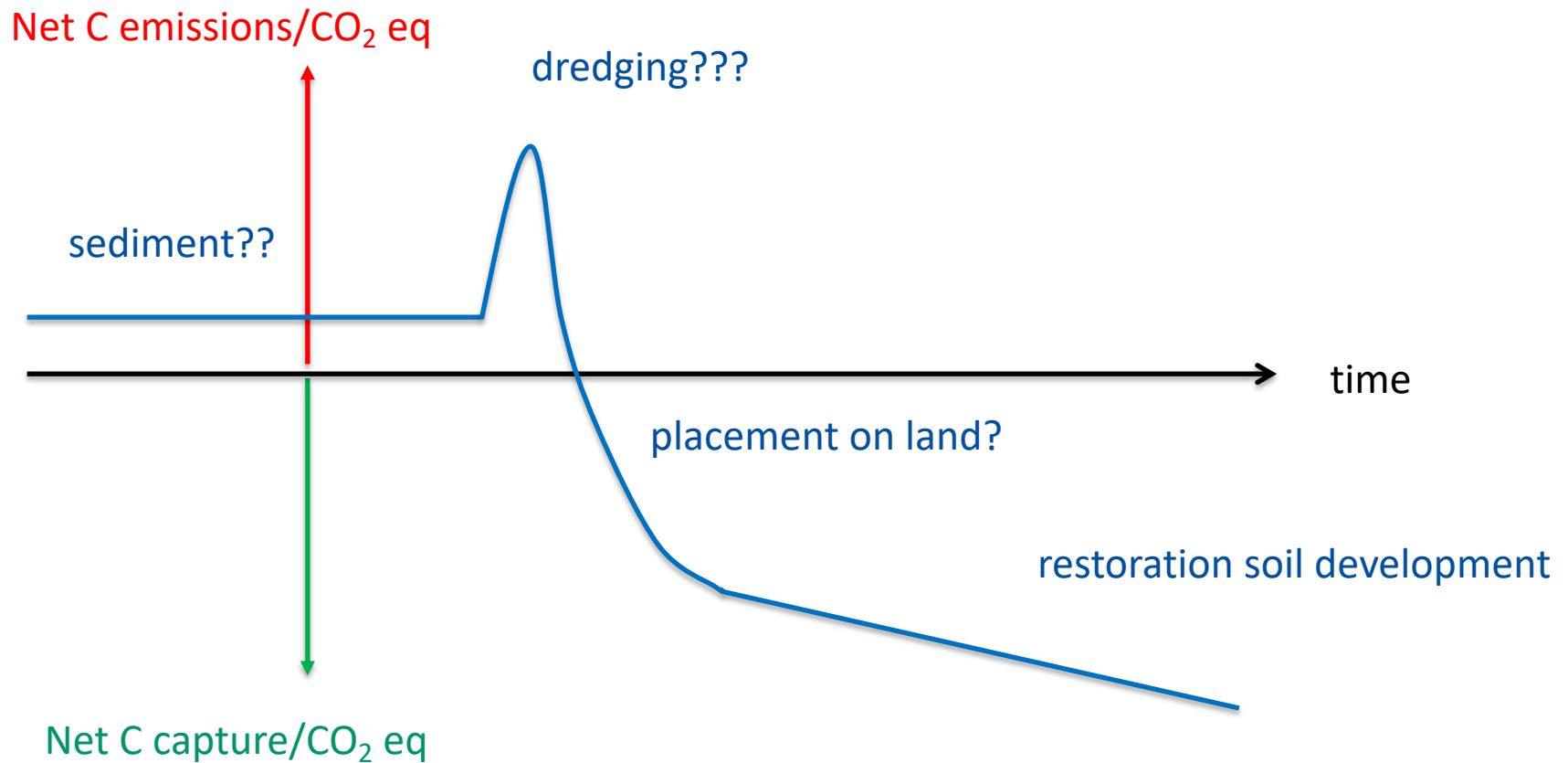
Soil Carbon 2008 to 2020



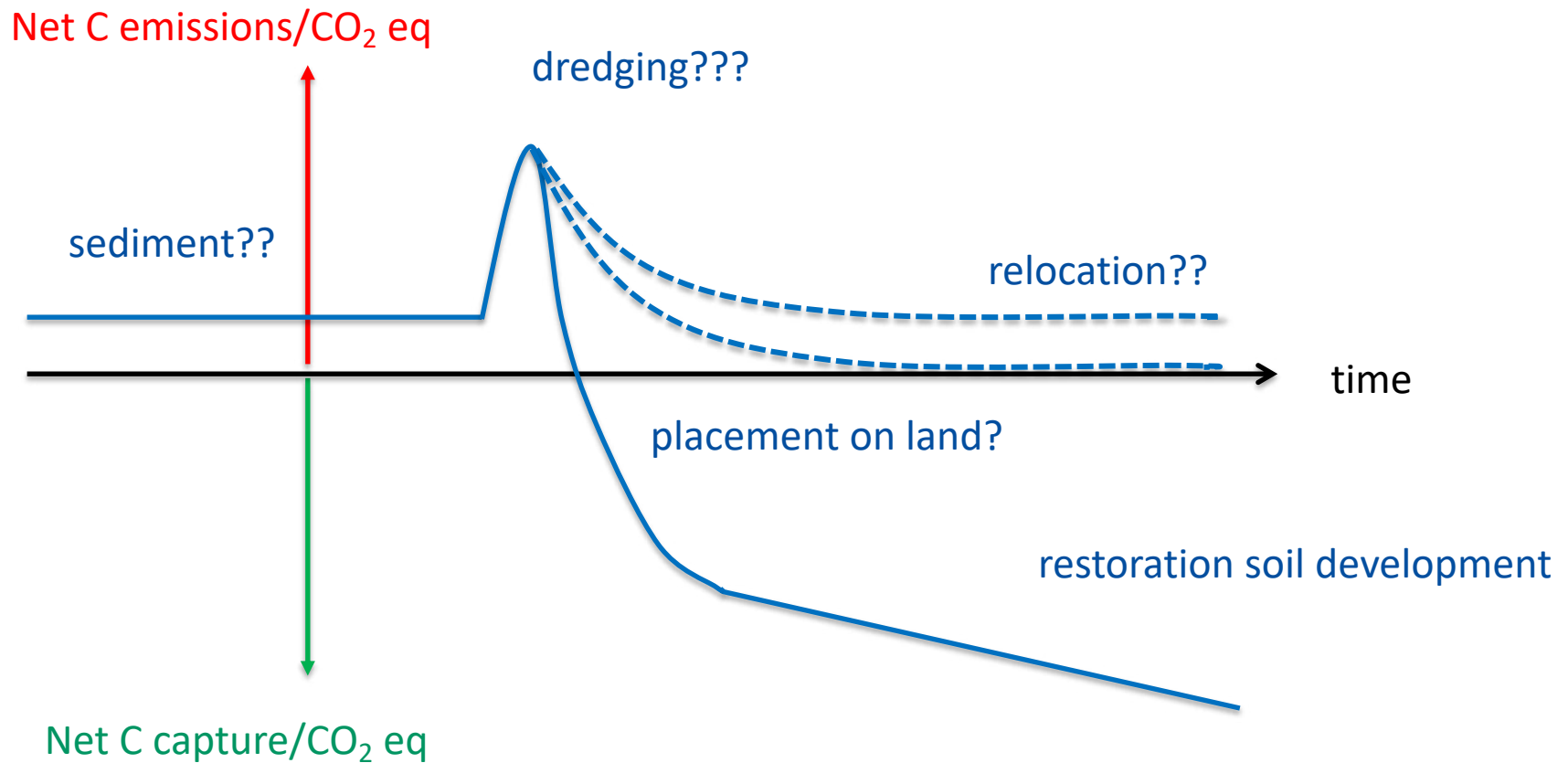
Soil Carbon 2008 to 2020



Comparative C emissions/capture?

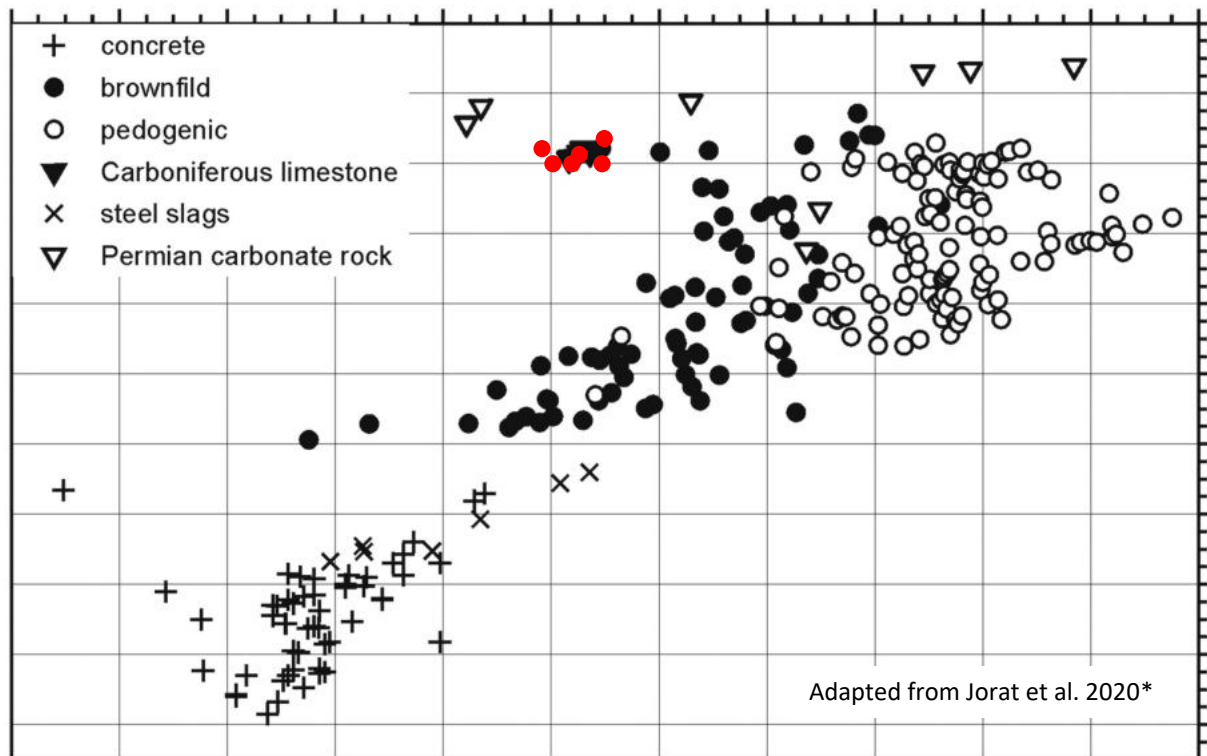


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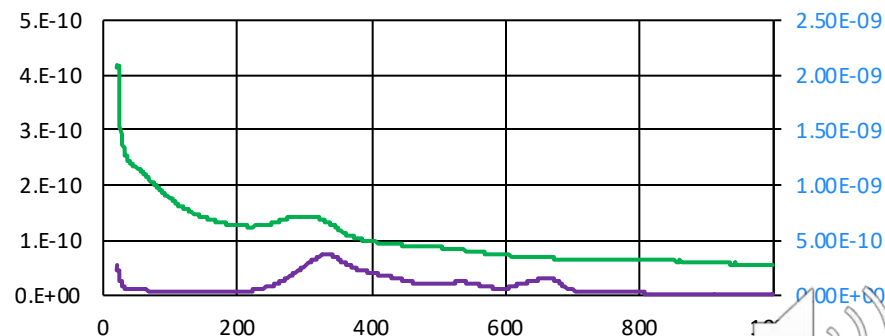
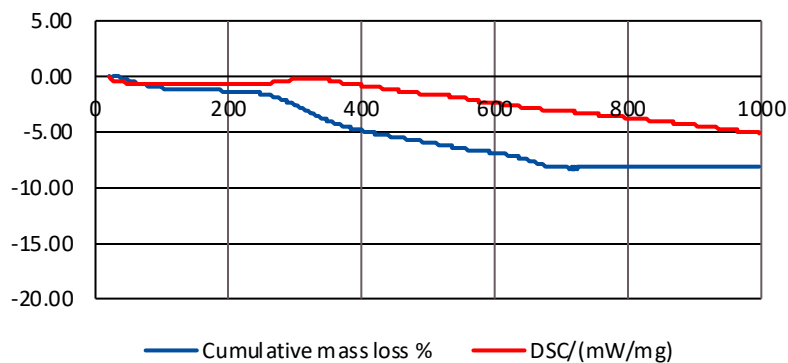


$\delta^{18}\text{O}$, ‰ VPDB

-22 -20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0

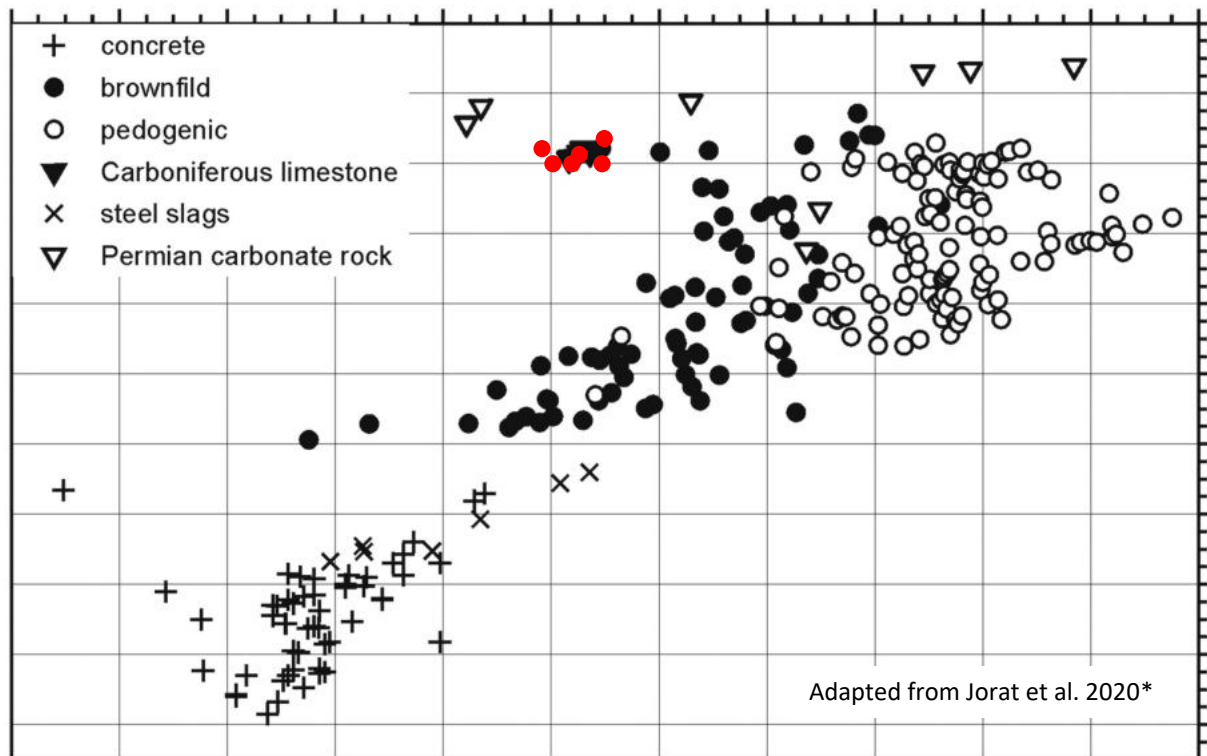


Cellulose + calcite
(no carbonation)

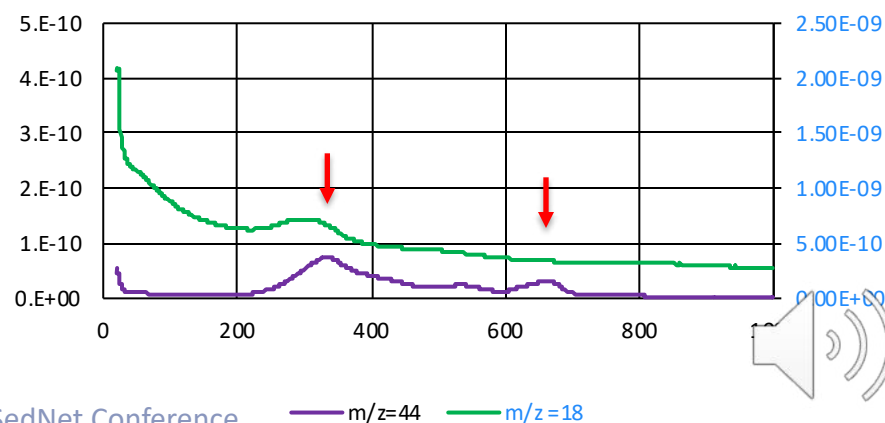
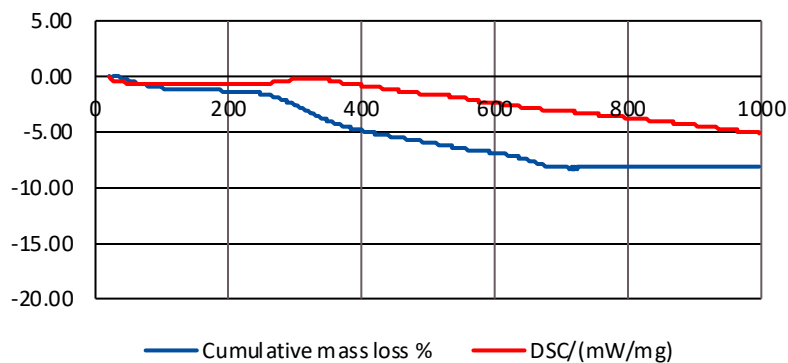


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