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Soil age and horizon modify the 35S labelled methionine dynamics in recultivated soils

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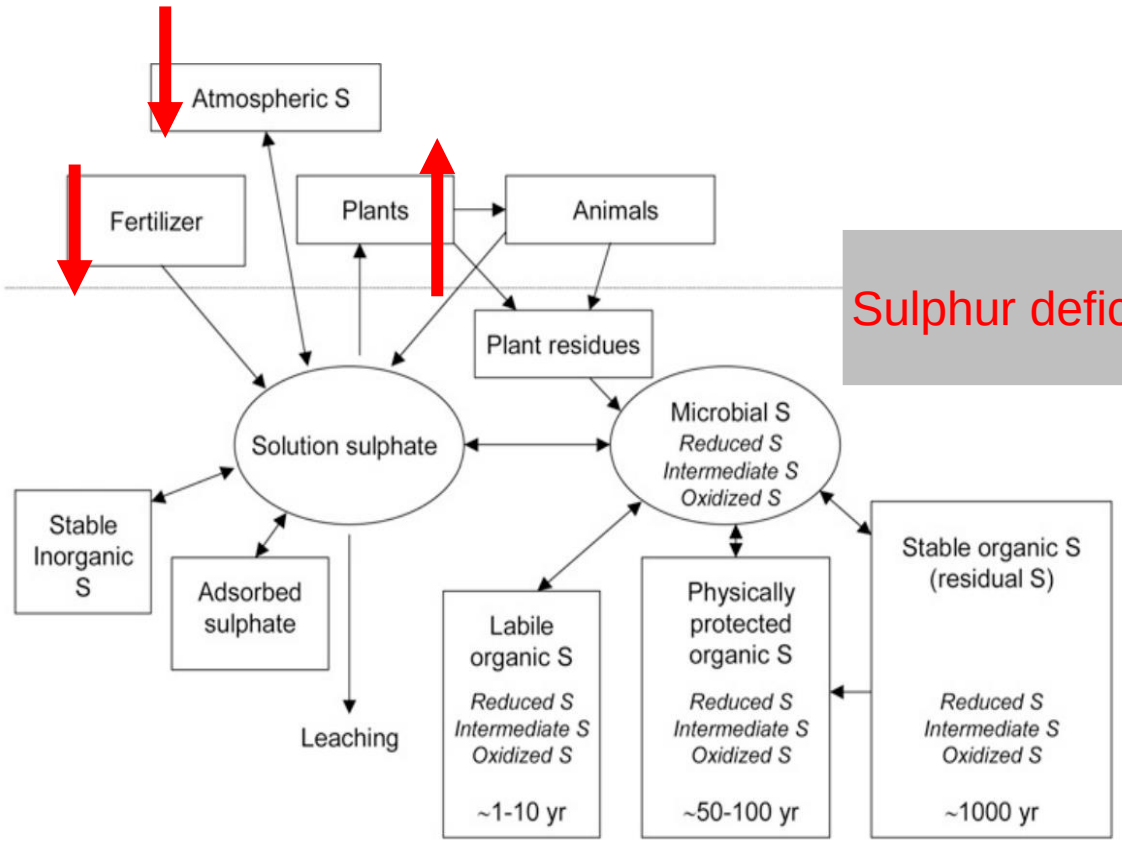
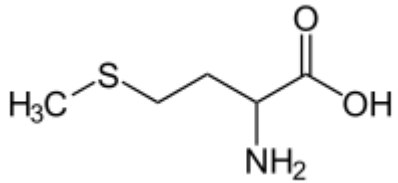
Sulphur deficiency

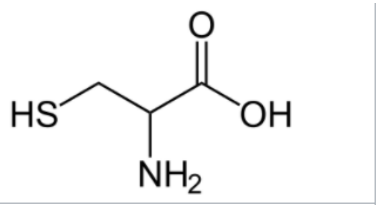
Sulphur cycle in soil-microbes-atmosphere



Sulphur deficiency

Sulphur deficiency in grass grown in the greenhouse





Cysteine and Methionine are main metabolite coordinating S assimilation and decomposition.

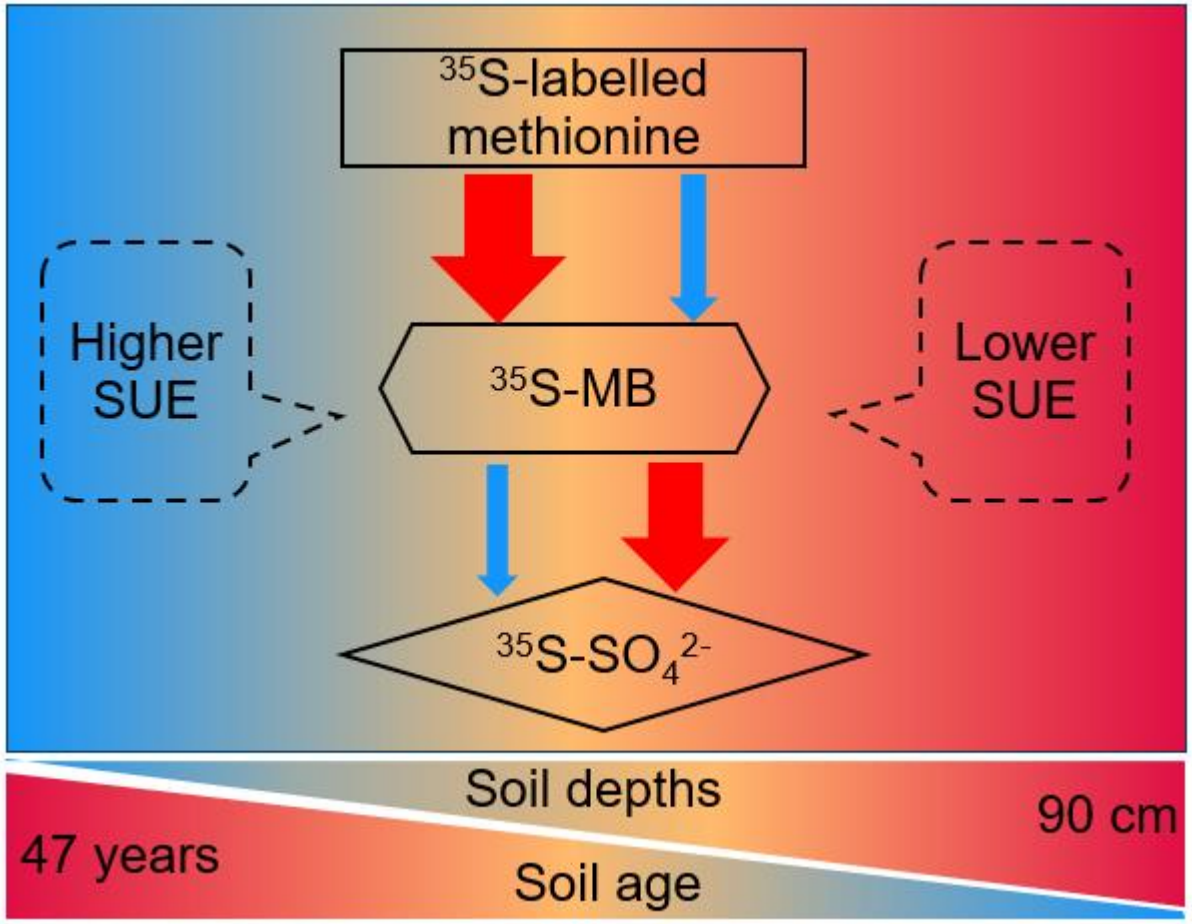
The greater of MBS, the greater will be the potential availability of S to plants.

Soil chronosequences after recultivation Inden Germany

- Four sites (1971, 1995, 2011, 2018)
- Three depths (0-30, 30-60, 60-90) in quadreplicate

Scientific questions and hypotheses

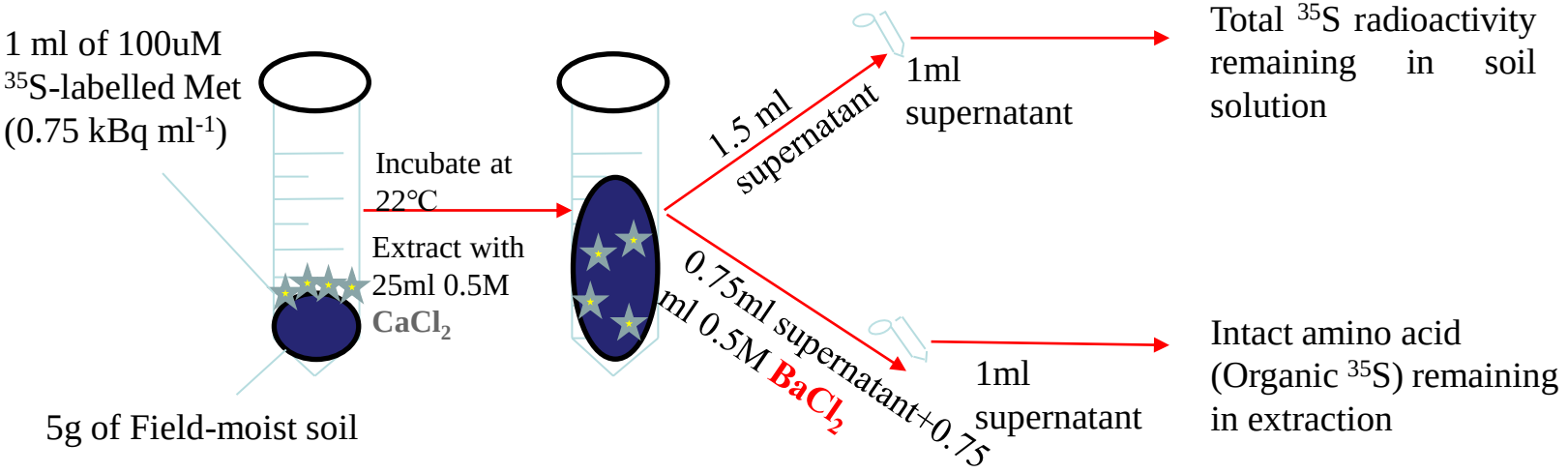
How does the methionine decomposition along with soil chronosequence and depths after different years' recultivation?



Methods

1 ml of 100uM ^{35}S-labelled Met was added to each 5 g field-moist soil.

Extracted by $CaCl_2$ **at 6, 24, 48, 96, 144h**



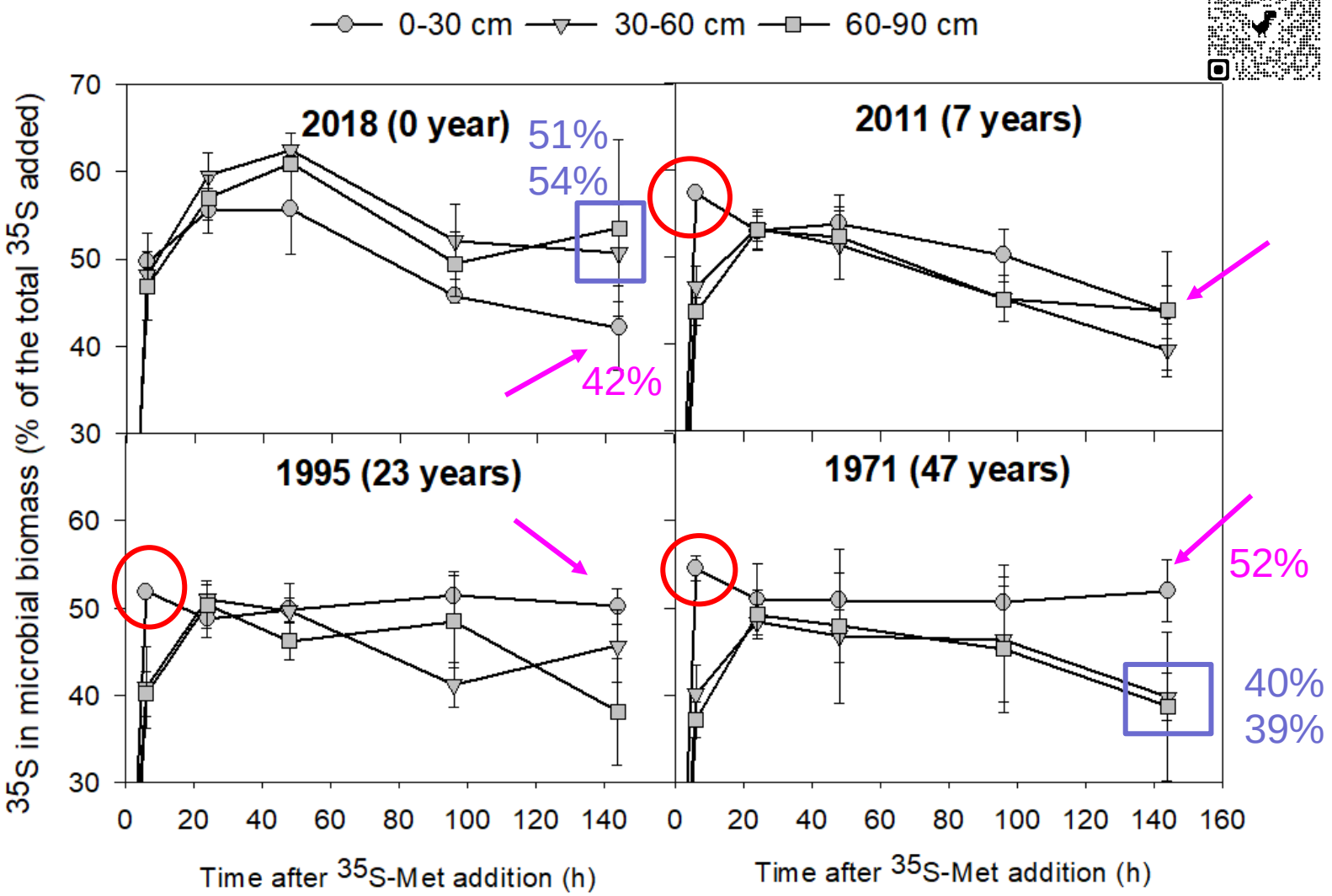
$^{35}SO_4^{2-}$ derived from labelled Met:

$^{35}S\text{-}SO_4^{2-}$ (IS) = $^{35}S_{CaCl2}$ (TS) – $^{35}S_{CaCl2+BaCl2}$ (OS)

^{35}S immobilised in the microbial biomass (MB):

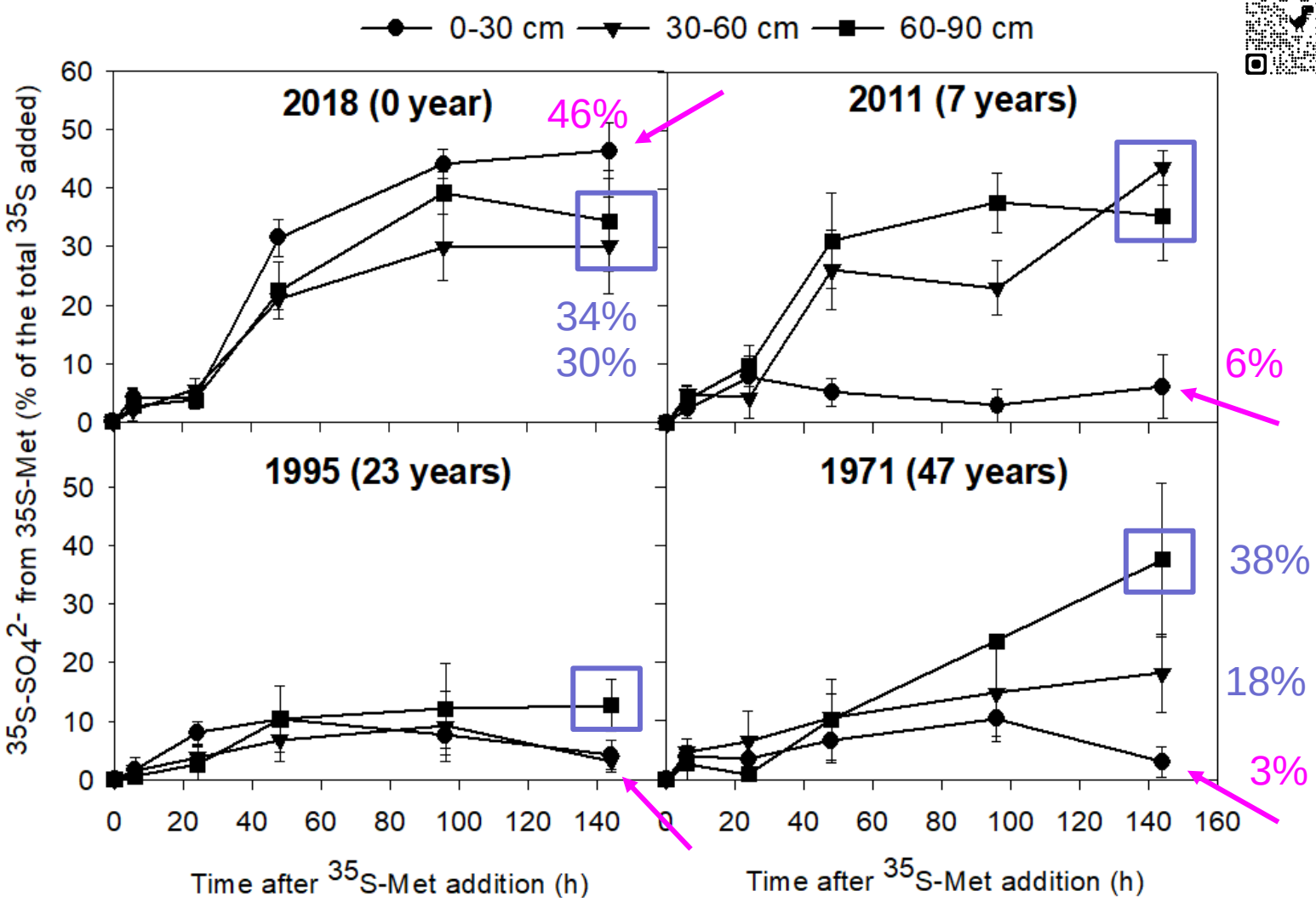
$^{35}S_{MB} = {}^{35}S_{add} - {}^{35}S_{CaCl2}$ (TS)

35S in microbial biomass (35S-MB)



After 47 years' recultivation, ^{35}S-MB in topsoil significantly increased from 42% to 52%, and higher than that in subsoils (after 144h).

$^{35}S\text{-}SO_4^{2-}$ release from 35S-Met



The released $^{35}S\text{-}SO_4^{2-}$ in top soil (0-30cm) dramatically decreased from 46% to 3% after 47 years' recultivation, while $^{35}S\text{-}SO_4^{2-}$ in 60-90cm showed slight change.

Summary

- The partition of methionine in topsoil was highly affected by soil age.
- More ^{35}S immobilized into MB and less $^{35}S\text{-}SO_4^{2-}$ released from ^{35}S-methionine in the topsoil (0-30cm) after 47-year recultivation.
- The effect of recultivation on subsoil was slower and smaller.
- A relative mature soil with a higher sulphur use efficiency might show with the increase of soil age.

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