

# Mineralisation and Structural Modifications of Different Pyrogenic Materials by Microbial Activities

André Hilscher<sup>1</sup>, Christian Siewert<sup>2</sup> and Heike Knicker<sup>1</sup>

1 Lehrstuhl für Bodenkunde, Freising, TU München, Germany

2 Institut für Landschaftsarchitektur, Forschungsanstalt für Gartenbau  
Weihenstephan, Germany

# Fate of PyOM

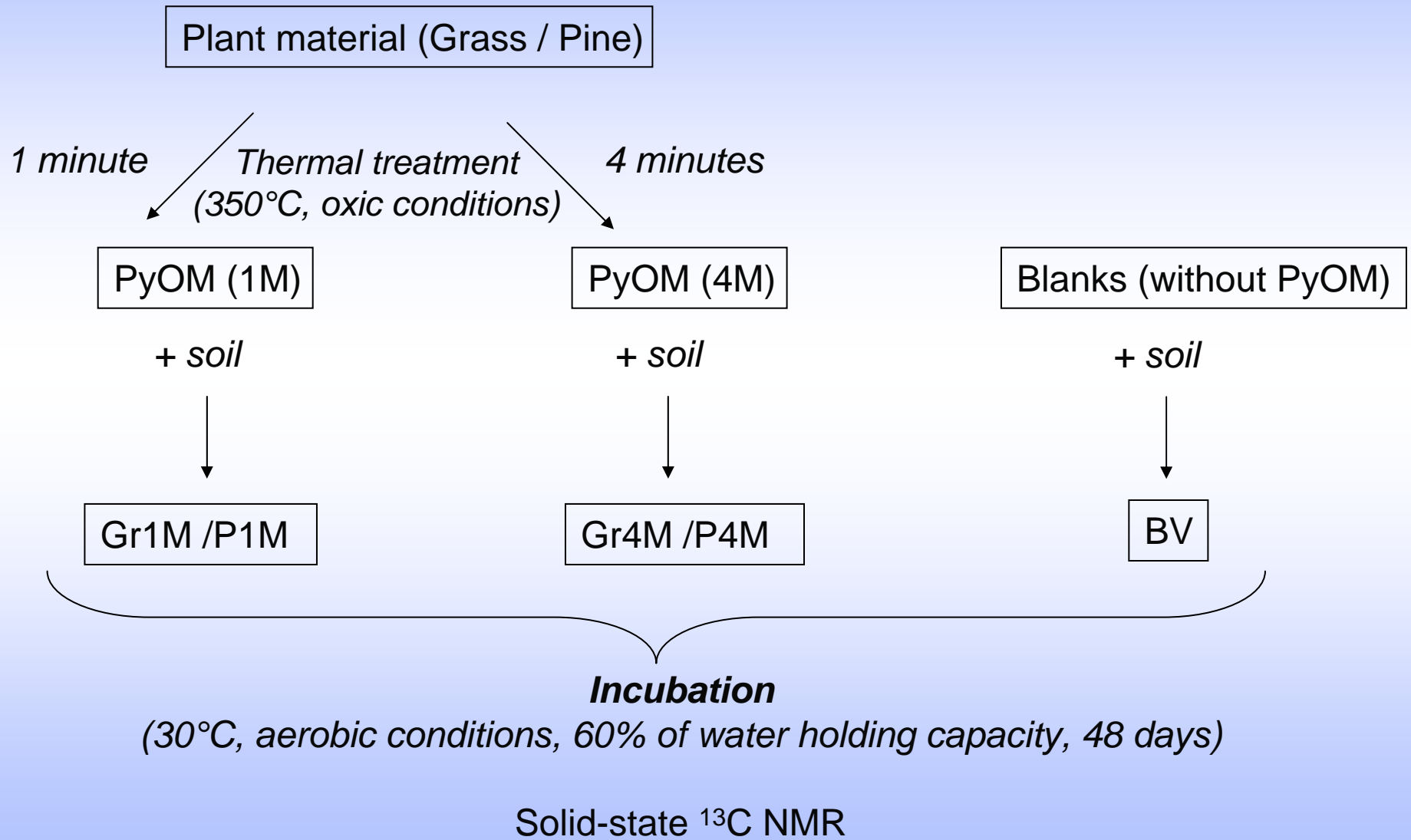
Contribution of residues remaining after incomplete combustion of vegetation (char) in soils and sediments

→ Knowledge is required concerning their degradation rates and the respective humification mechanisms.

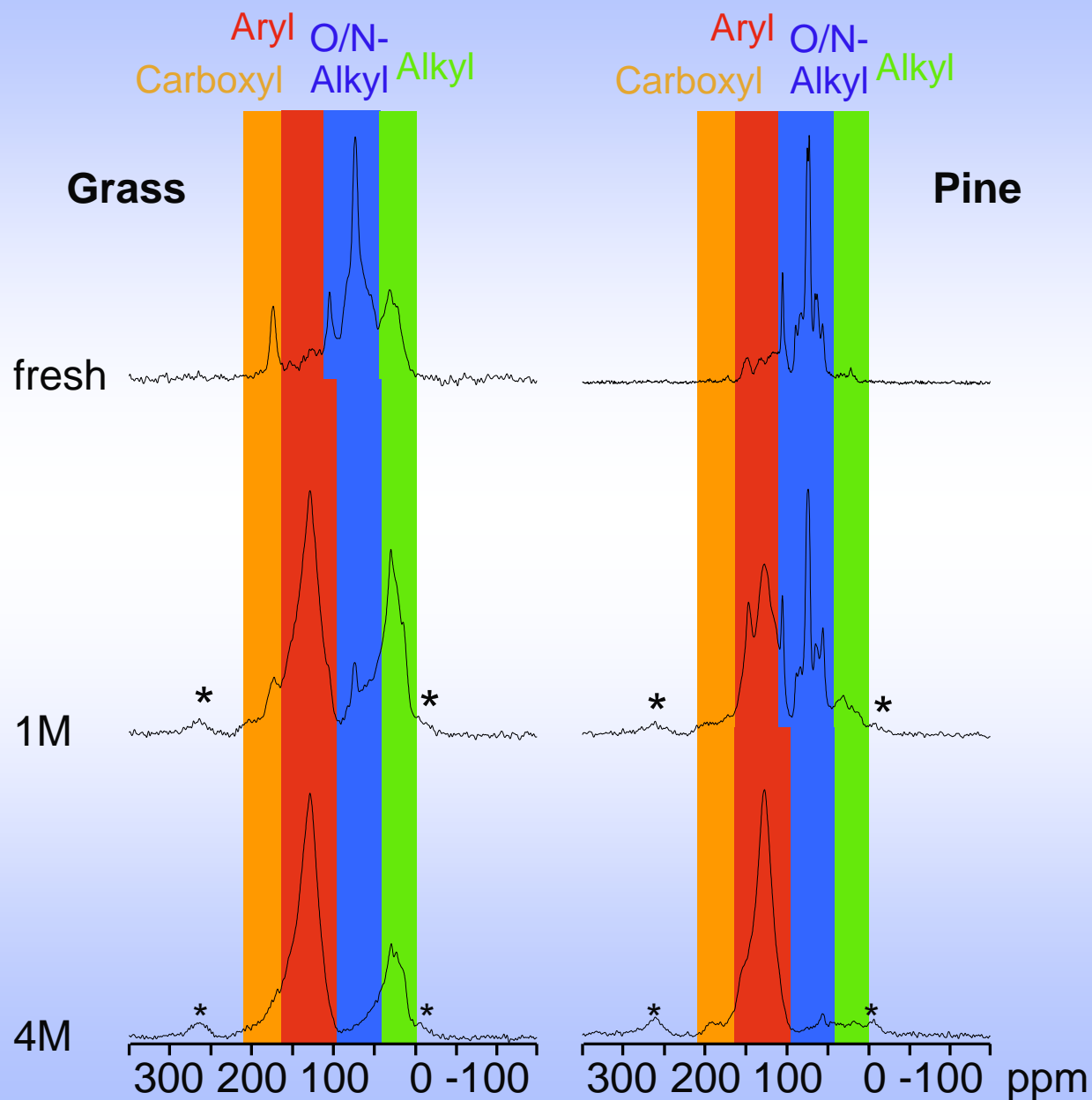
→ Required for estimation the resilience of PyOM in soils

**The objective of this study was to examine the degradation potential of different PyOM.**

# Material and methods

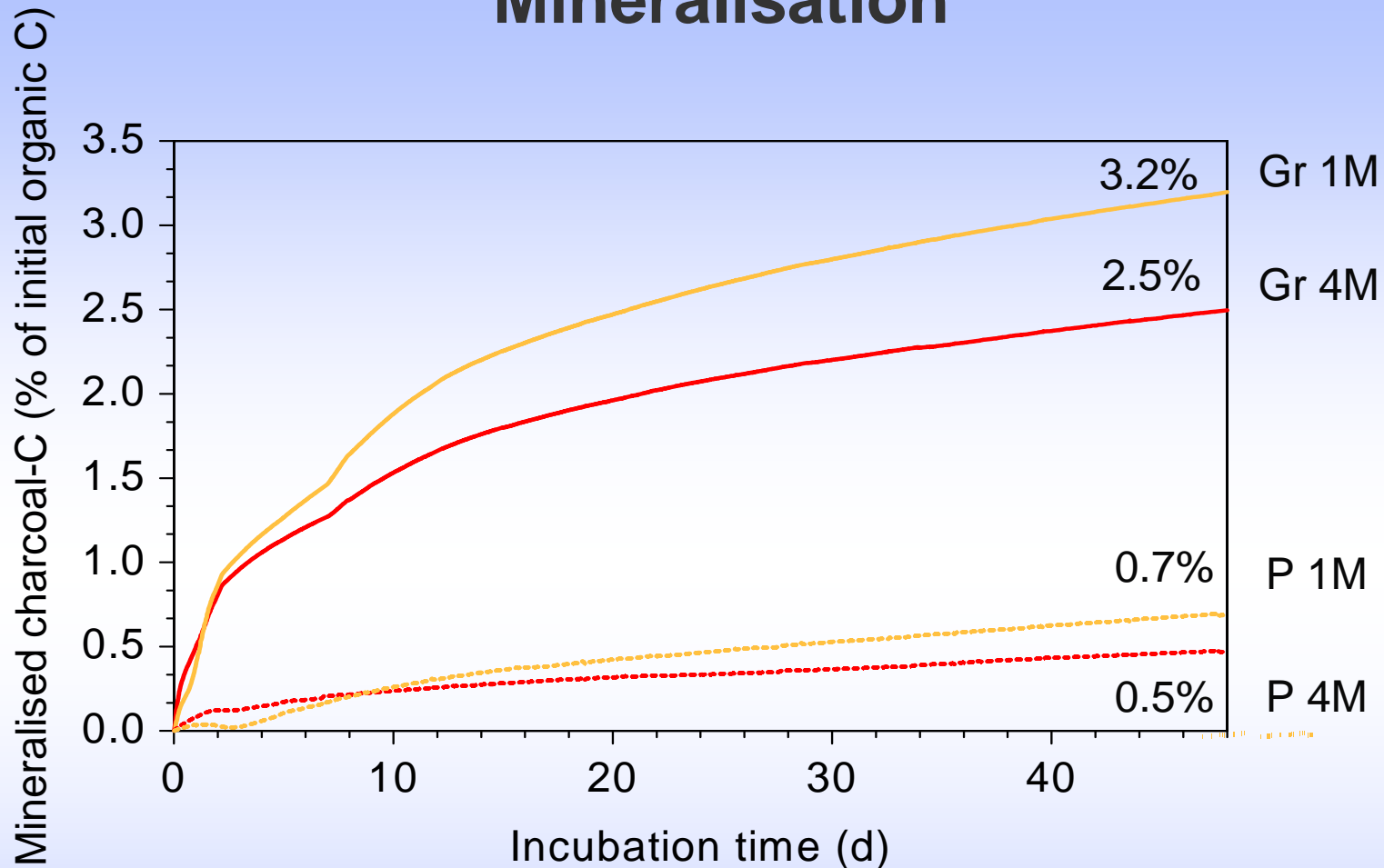


# Characterisation ( $^{13}\text{C}$ NMR)



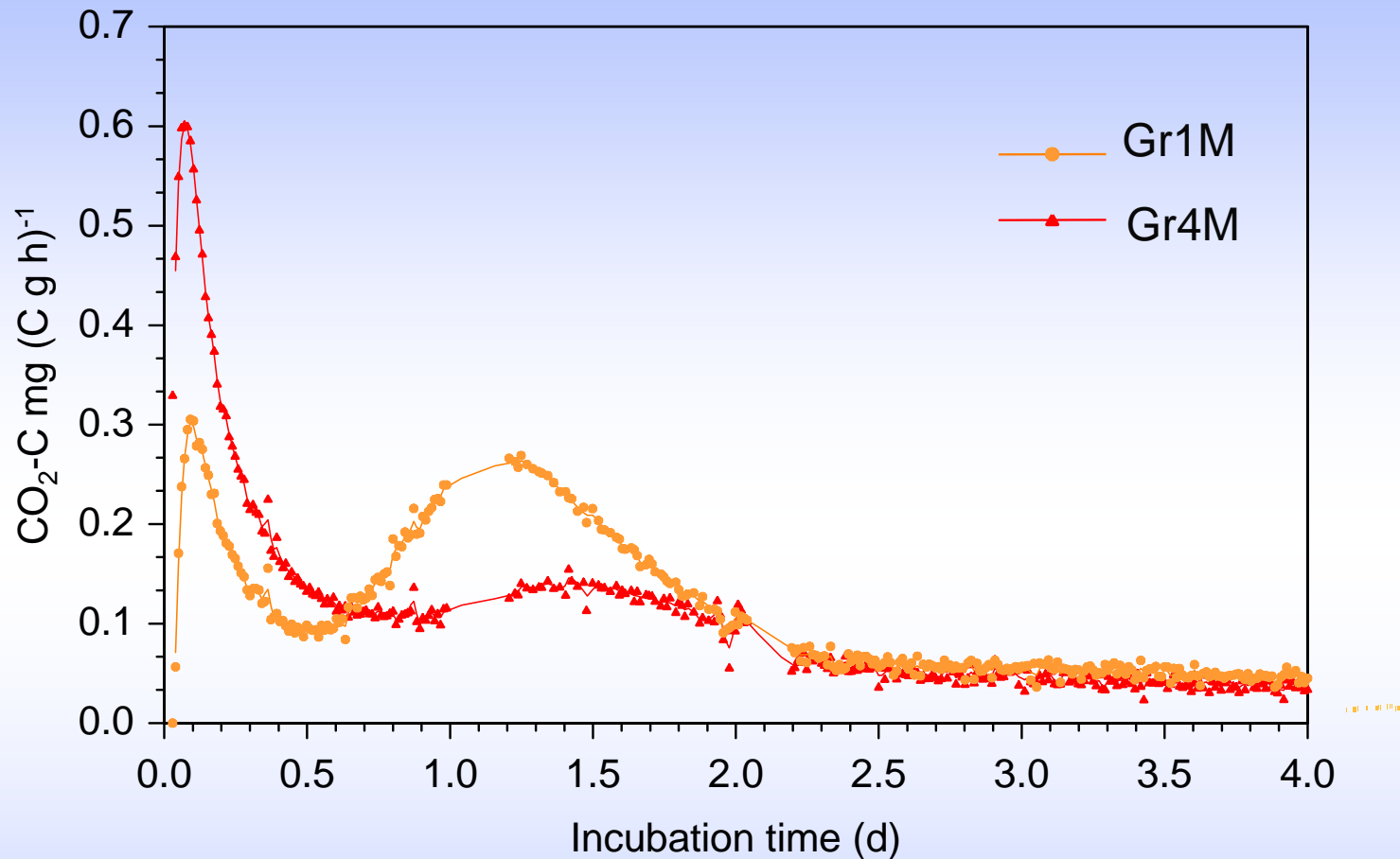
- Strong differences in chemical composition
- Grass-PyOM contains more heat recalcitrant alkyl C
- Increase of the aromaticity with burning time

# Mineralisation



- Highest mineralisation rates for grass-derived PyOM  
-> Same range of the incubated blank soil (2.9% )
- Decreasing mineralisation with stronger thermal alteration of PyOM
- Smaller mineralisation for pine-derived PyOM

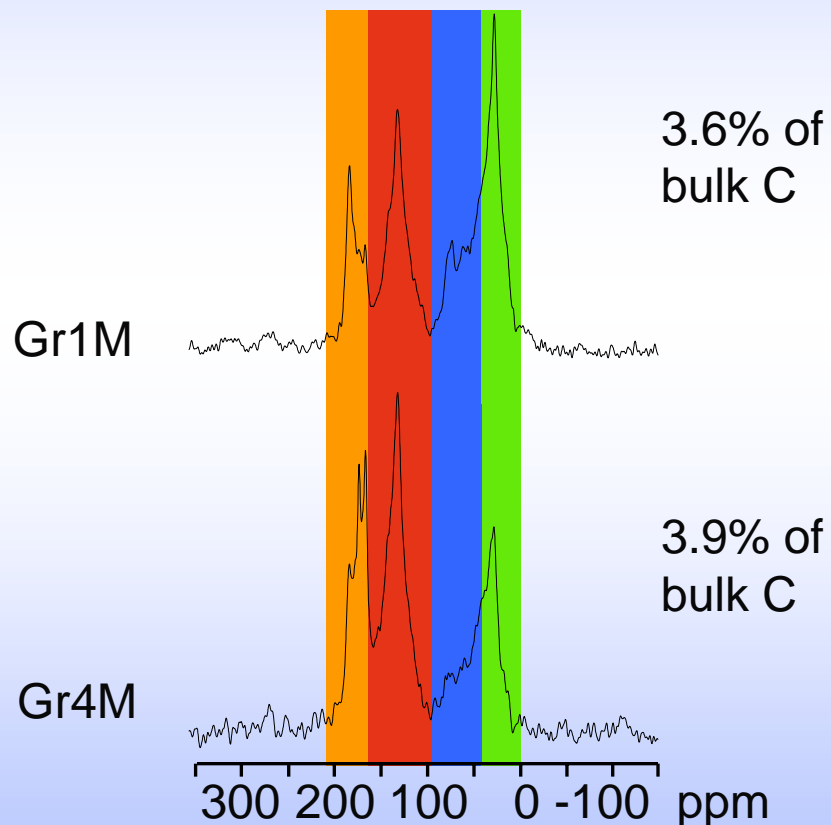
## Mineralisation rate during the begin (Grass)



- Higher mineralisation rate for stronger thermal altered PyOM at begin  
-> *Microbially available fraction in spite the higher aromaticity of Gr4M*
- Second mineralisation maximum  
-> *Use of more stable C source or alteration of the microbial community*

# Water soluble fraction (Grass PyOM)

Aryl O/N-  
Carboxyl Alkyl Alkyl

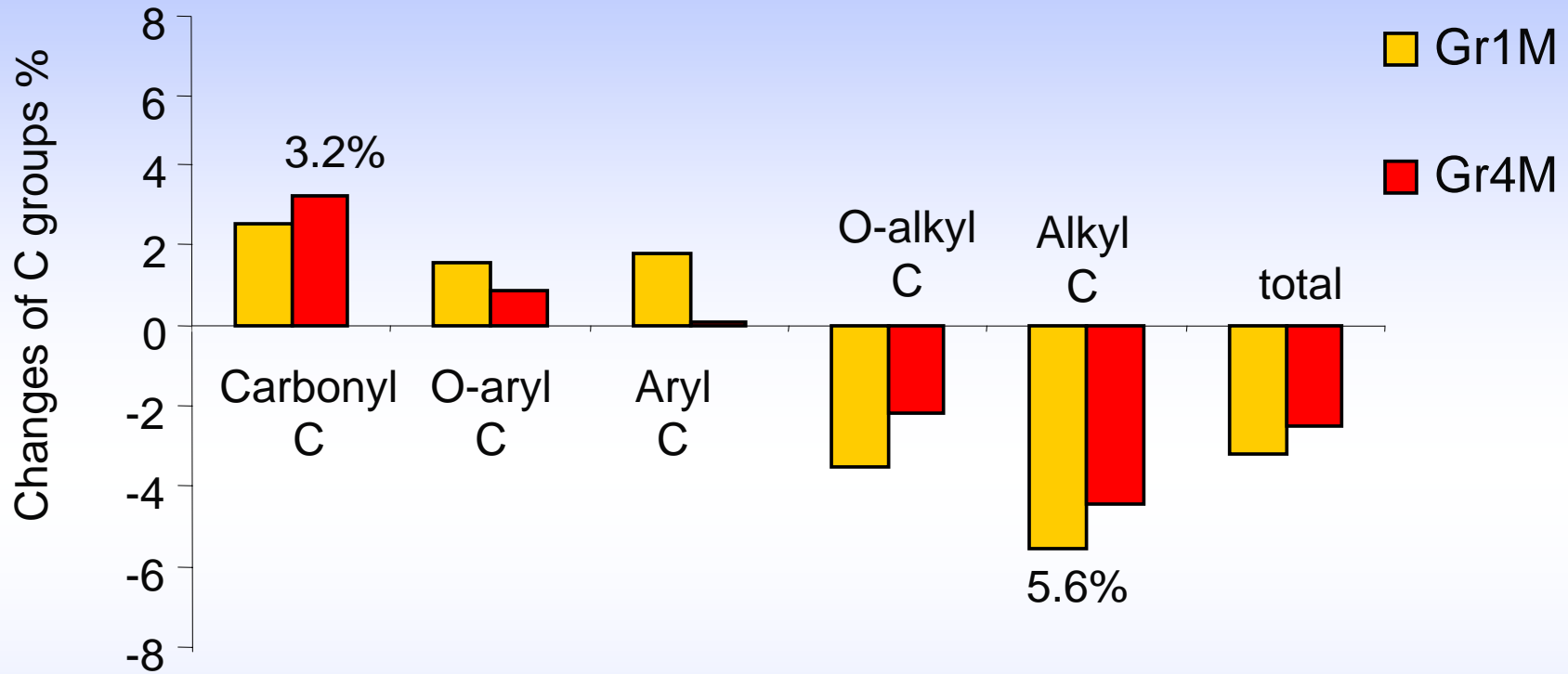


- Presence of low molecular weight acids or carboxyl C directly bound to aromatic rings

-> Decomposable fraction available in PyOM

-> Possible reason for effective attack during the begin of incubation

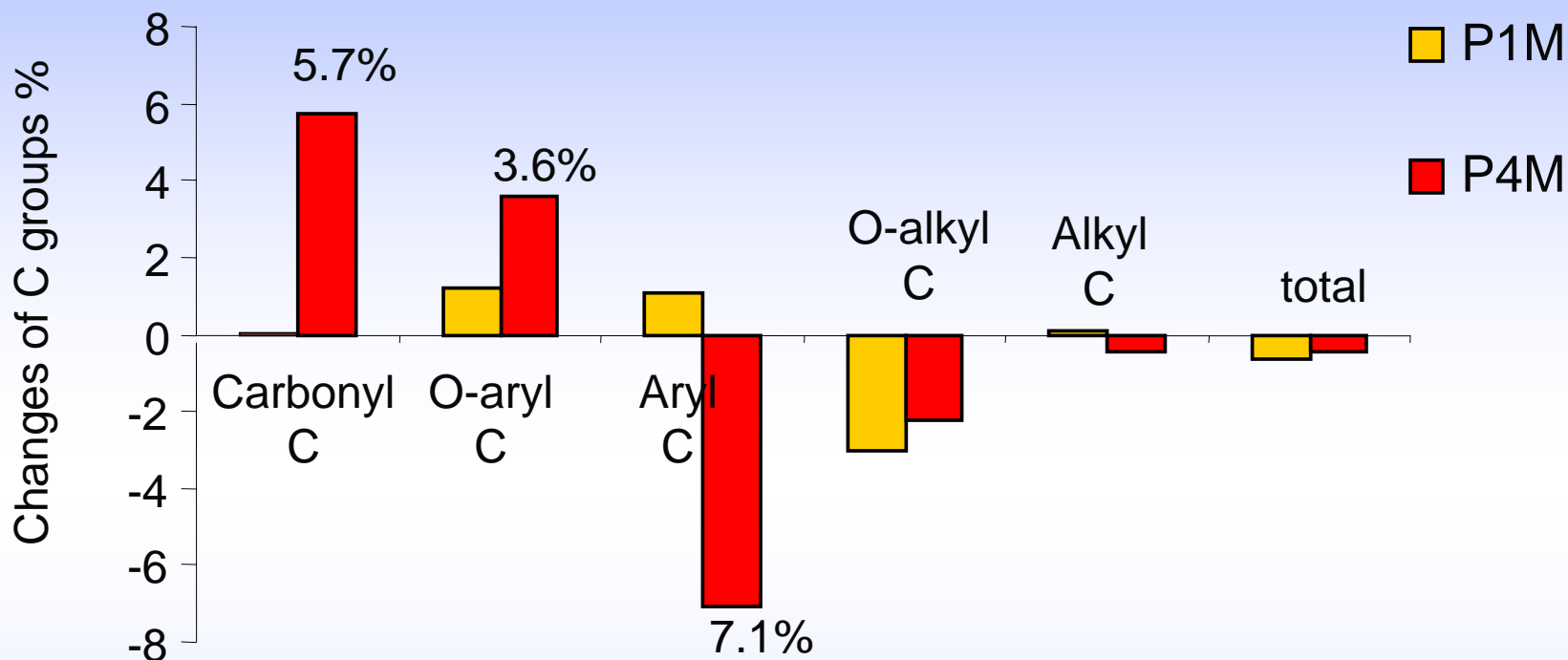
# Chemical modification (Grass)



- Loss of alkyl C for Grass-PyOM
- Increase of carboxyl/carbonyl C

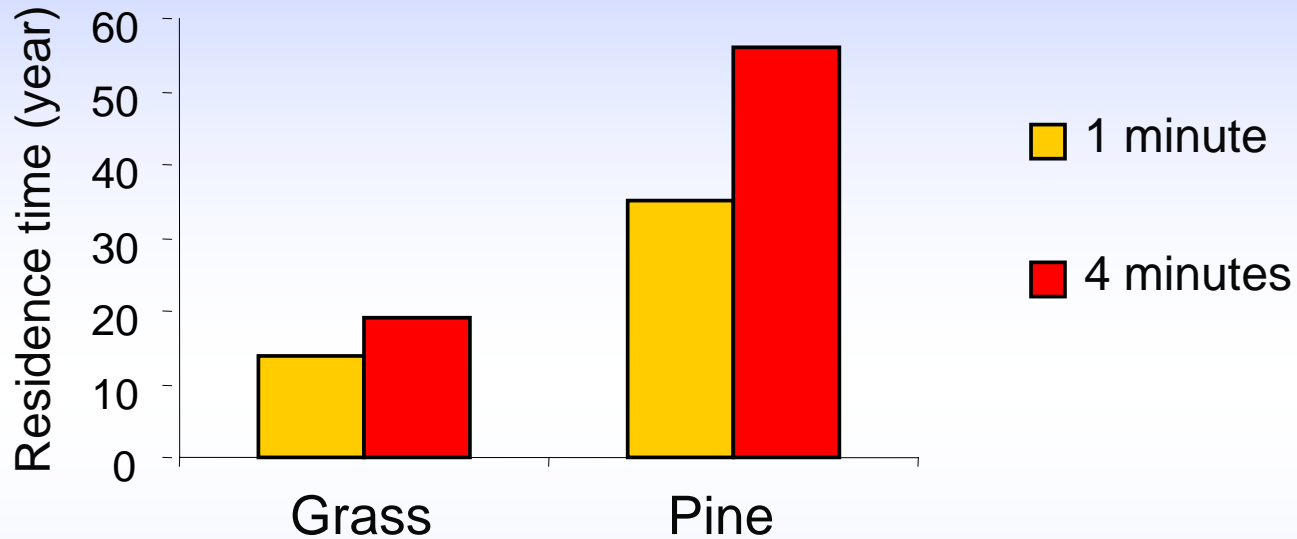
-> *Modification of chemical composition by microbial activity*

## Chemical modification (Pine)



- Formation of carboxyl/carbonyl C and loss of aryl C for P4M
  - > *Opening and partial oxidation of aromatic ring structures*
  - > *More accessible for further microbial attack*

# Residence time



Using the mean mineralisation rate of last 10 days for calculation

Short residence time for PyOM of up to 56 years

But this are minimum times

## Summary and conclusion

Chars derived from different sources or subjected to different thermal treatments show strong differences in their chemical composition which affects their degradability.

PyOM can be microbially attacked and mineralised at rates that are comparable to SOM.

***Pyrogenic sources may not be as recalcitrant as commonly assumed and their role as a highly refractory constituent within the SOM may need re-evaluation.***

# **Acknowledgement**

***Thank you for attention!***

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