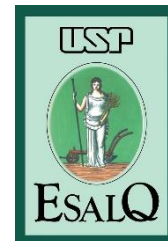




Universidade de São Paulo
PPG em Solos e Nutrição de Plantas
Matéria Orgânica do Solo 2020/01
Seminário II



Formation of soil organic matter via biochemical and physical pathways of litter mass loss

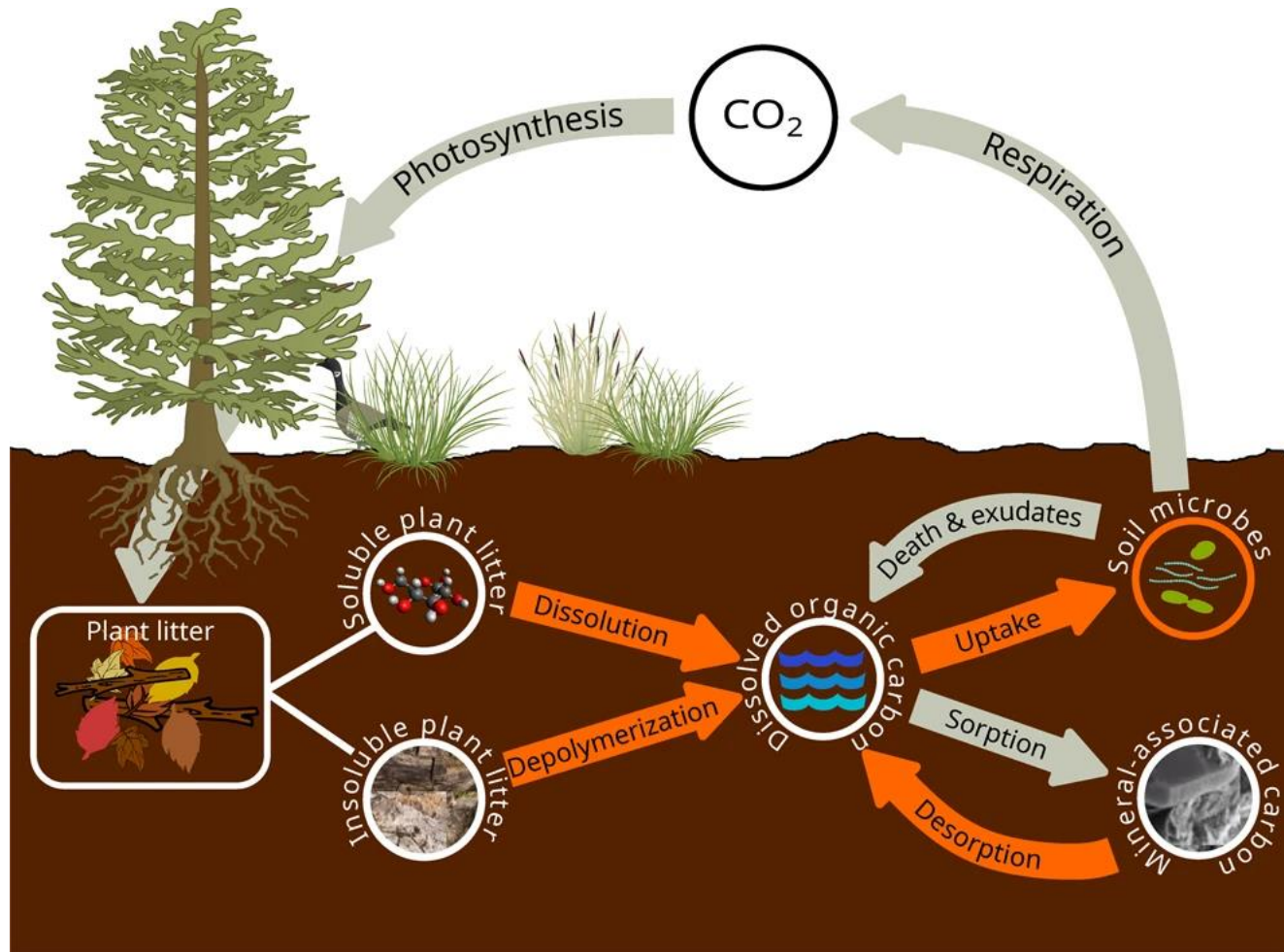
M. Francesca Cotrufo et al.

Nature Geoscience 8, 776–779 (2015)

Docente: Carlos Eduardo Pellegrino Cerri
Discentes: Marina Melo e Martha Carvalho



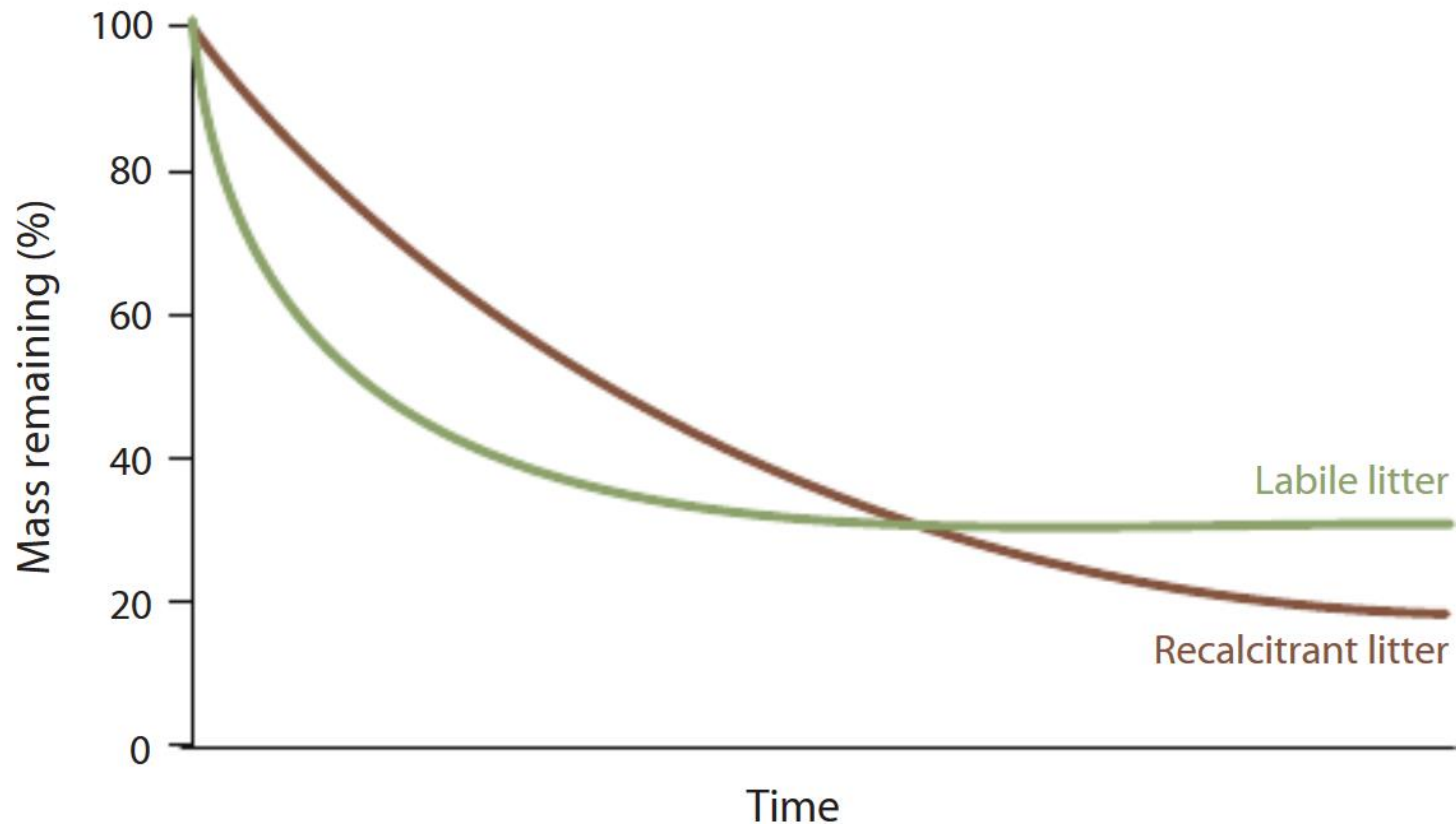
Introdução



Woolf, D., Lehmann, J. (2019) Microbial models with minimal mineral protection can explain long-term soil organic carbon persistence. *Sci Rep* **9**, 6522. doi: 10.1038/s41598-019-43026-8

Introdução

Dinâmica hipotética da massa remanescente durante a decomposição de um material vegetal lábil (i.e. alta qualidade de C e concentração de N) e um material vegetal recalcitrante (i.e. baixa qualidade de C e concentração de N).



Cotrufo, M.F. et al. (2013) The Microbial Efficiency-Matrix Stabilization (MEMS) framework integrates plant litter decomposition with soil organic matter stabilization: do labile plant inputs form stable soil organic matter? *Global Change Biology*, 19, 988–995. doi: 10.1111/gcb.12113

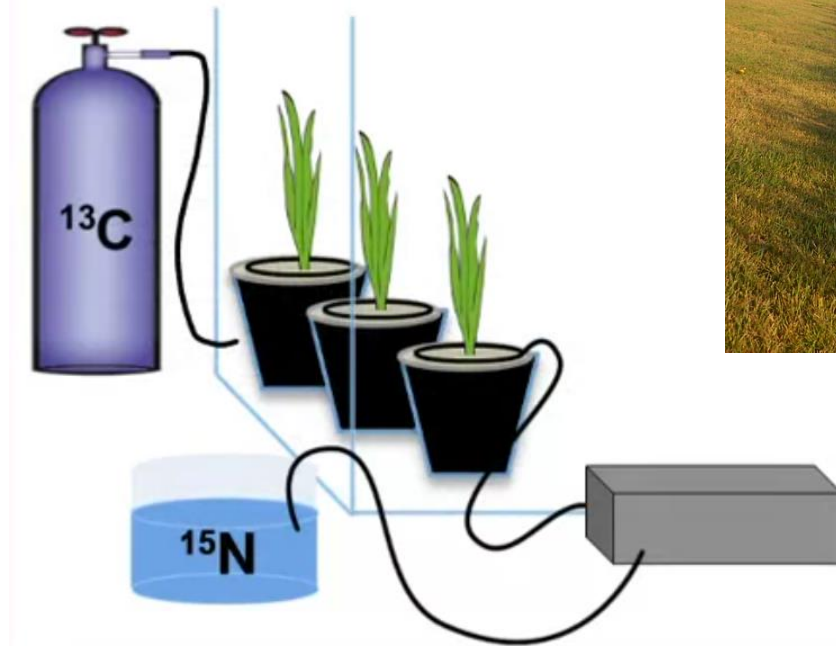
Introdução



Método tradicional de quantificação de decomposição da liteira – *litter mesh bag method*.

Mjöfors, Kristina & Johansson, Maj-Britt & Nilsson, Åke & Kärnbränslehantering, Svensk. (2020). Input and turnover of forest tree litter in the Forsmark and Oskarshamn areas R-07-23.

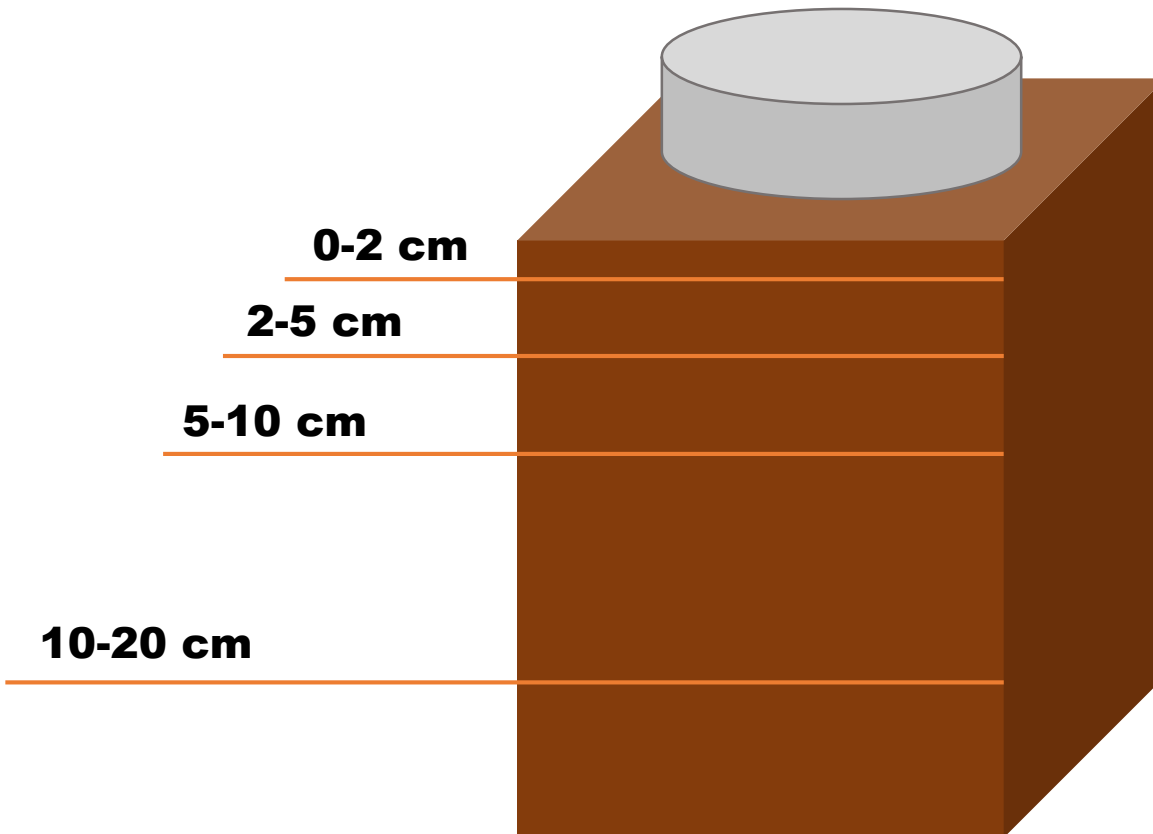
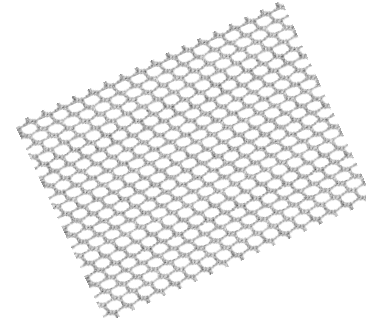
Isotopic labelling



Andropogon gerardii

Soong, Jennifer L et al. (2014) Design and operation of a continuous ^{13}C and ^{15}N labeling chamber for uniform or differential, metabolic and structural, plant isotope labeling. *J. Vis. Exp.*, **83**, 1-9. doi:10.3791/51117

Experimento



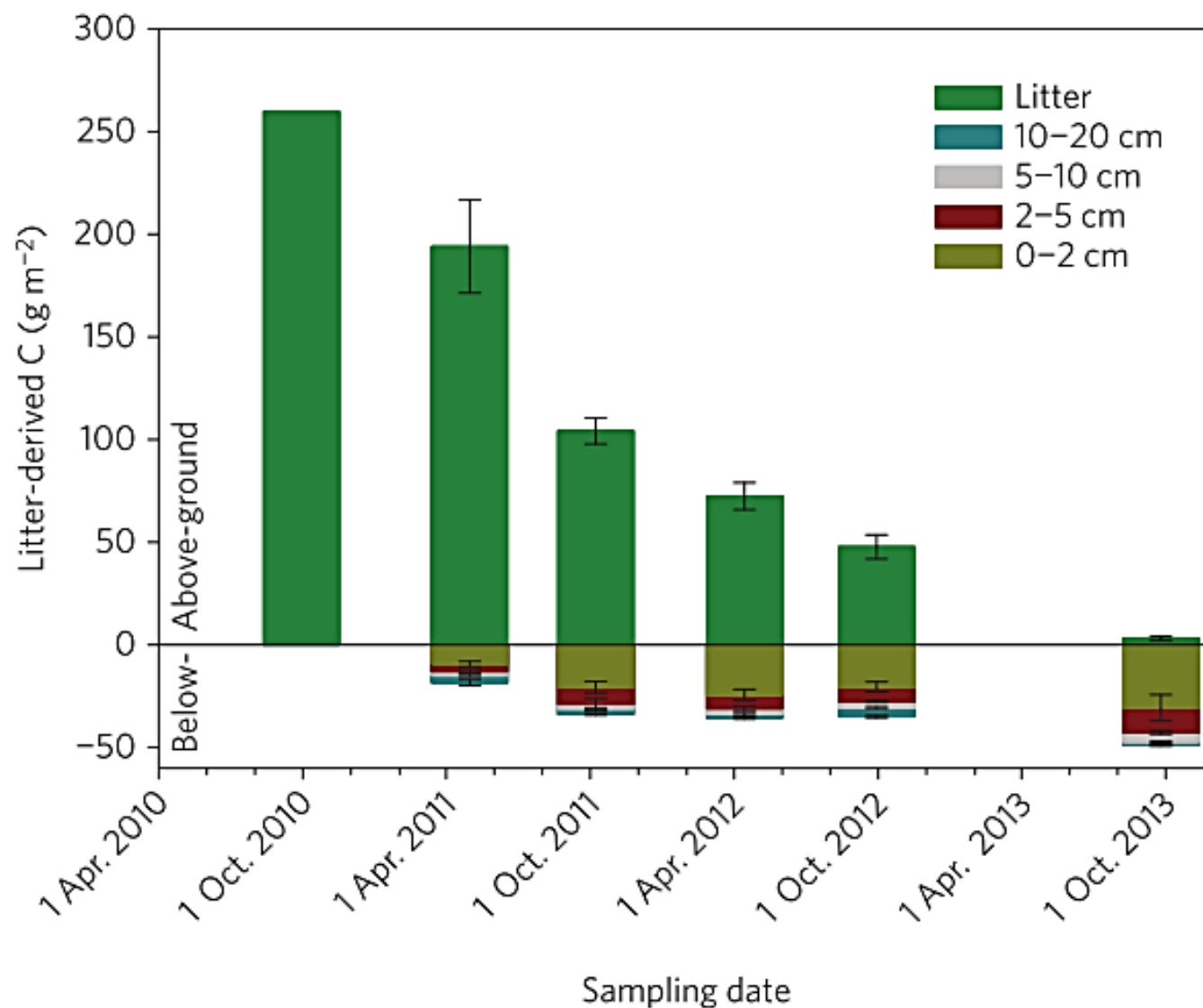
Cinco coletas:

- 7 meses
- 12 meses
- 18 meses
- 24 meses
- 36 meses

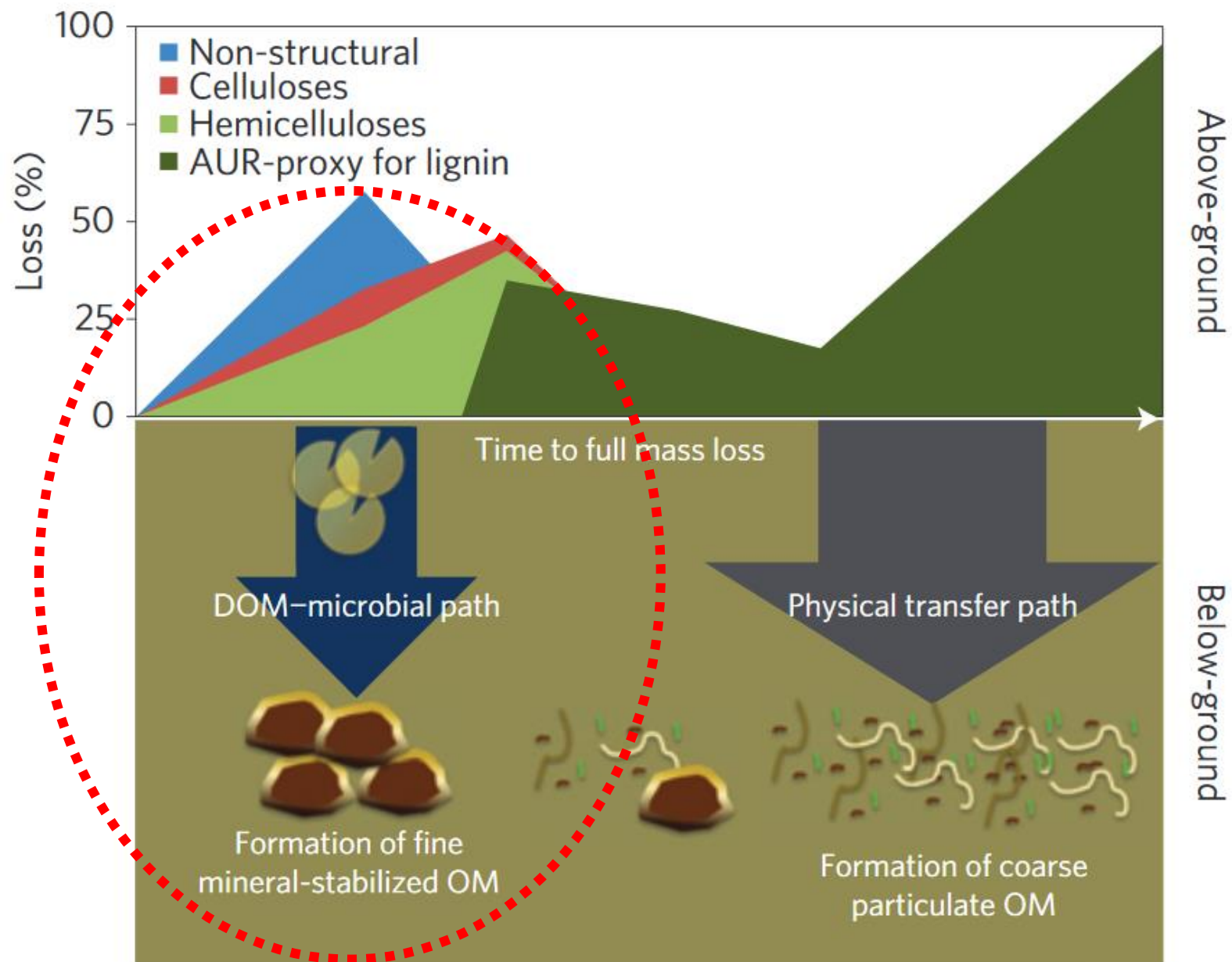
Análises

- Análise de concentração de C e N
- Análise isotópica
- Fracionamento químico da liteira
- Fracionamento físico da MOS (camadas I e II) – densidade e tamanho
 - Fração leve ($LF < 1.85 \text{ g cm}^{-3}$)
 - Fração pesada (areia, associada ao silte, associada à argila)
- Phospholipid fatty acid (PLFA) – biomarcador de comunidade microbiana

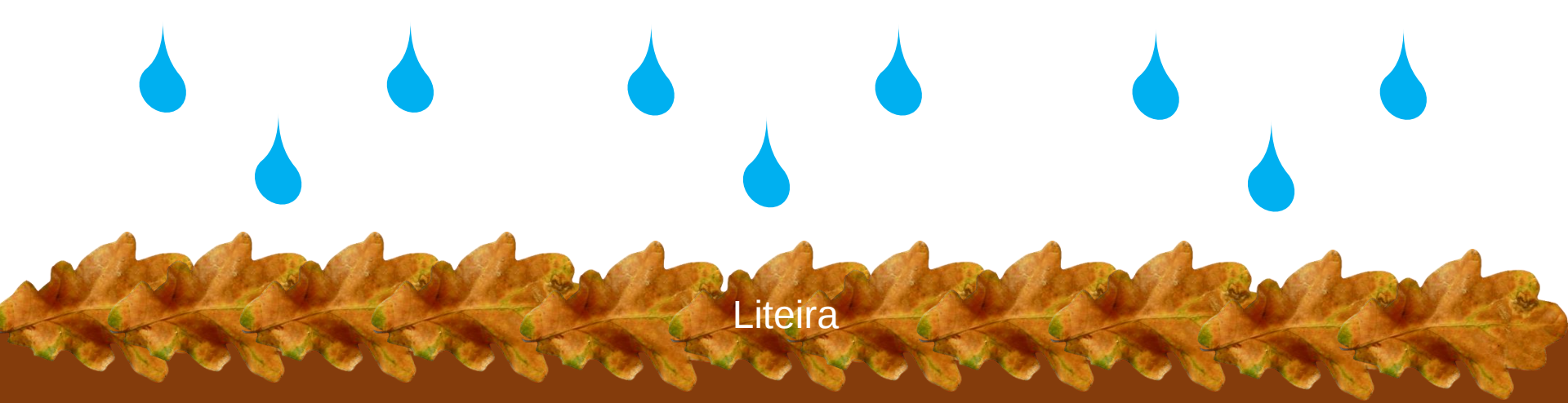
Resultados



MOD e incorporação microbiana



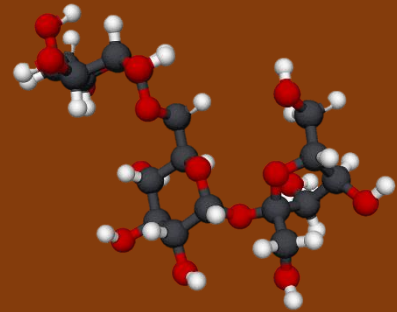
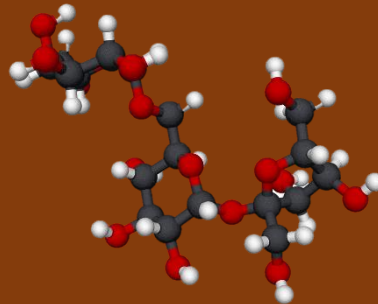
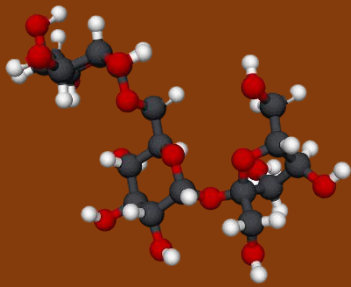
Cotrufo, M.F. et al. (2015) Formation of soil organic matter via biochemical and physical pathways of litter mass loss. *Nature Geoscience* **8**, 776–779. doi:10.1038/ngeo2520

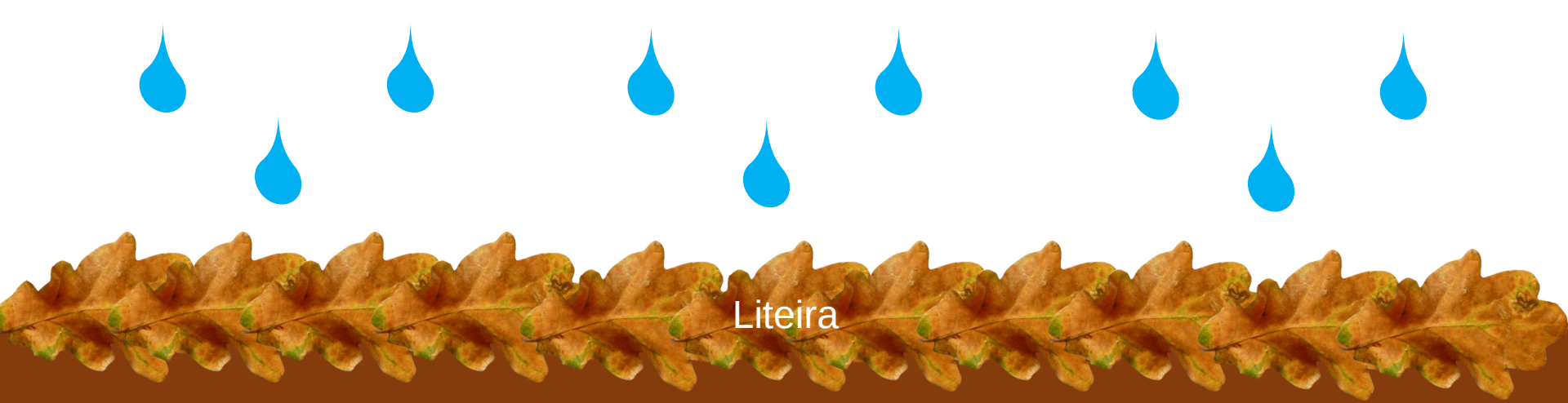


Littera



Material não estrutural solúvel liberado no solo (ex: mono e dissacarídeos)

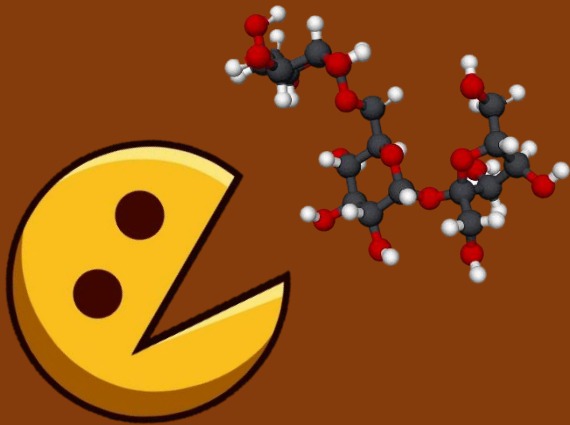




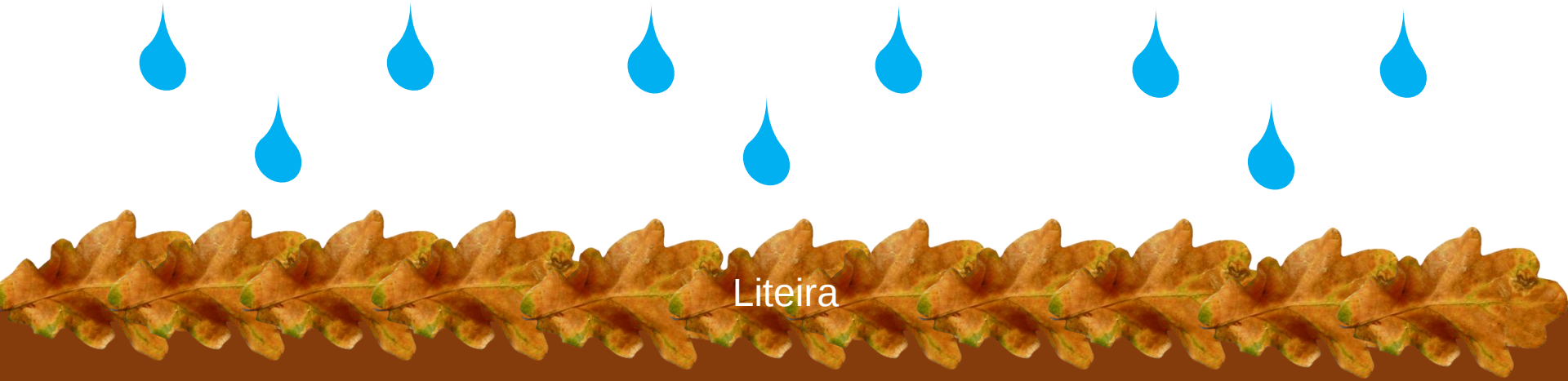
Littera



Material não estrutural solúvel liberado no solo (ex: mono e dissacarídeos)



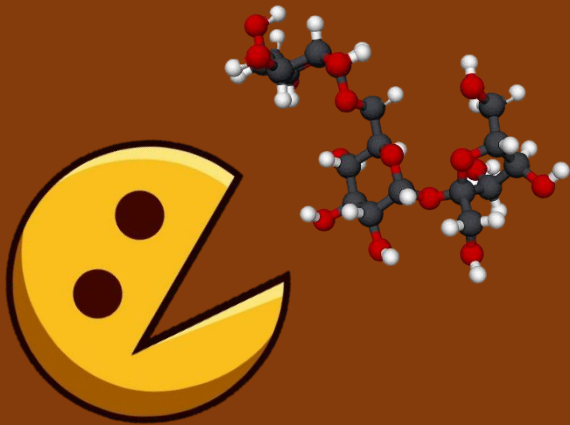
Incorporação pela microbiota



Littera

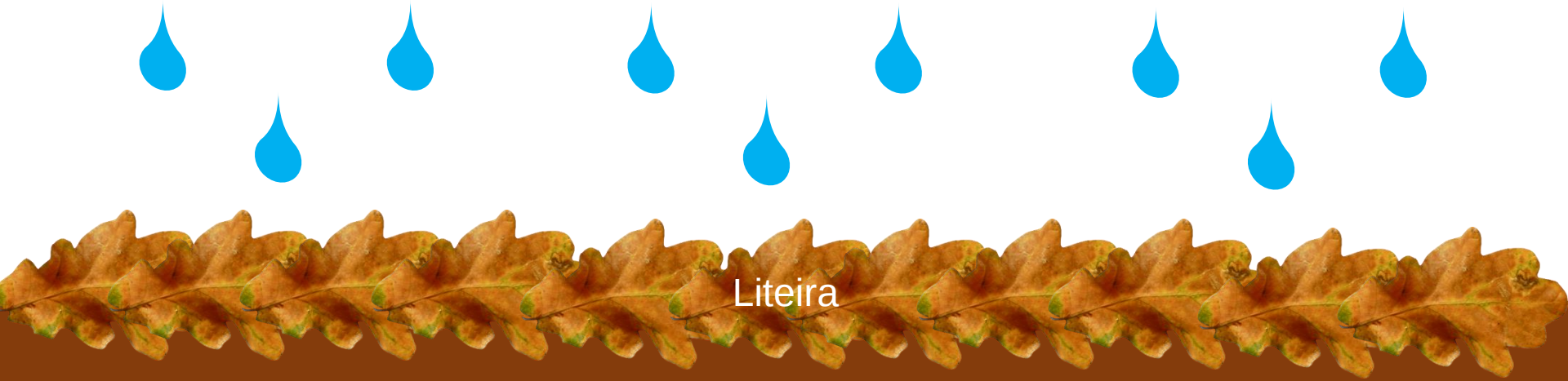


Material não estrutural solúvel liberado no solo (ex: mono e dissacarídeos)



Formação de compostos microbianos de baixo peso molecular a partir de C-littera

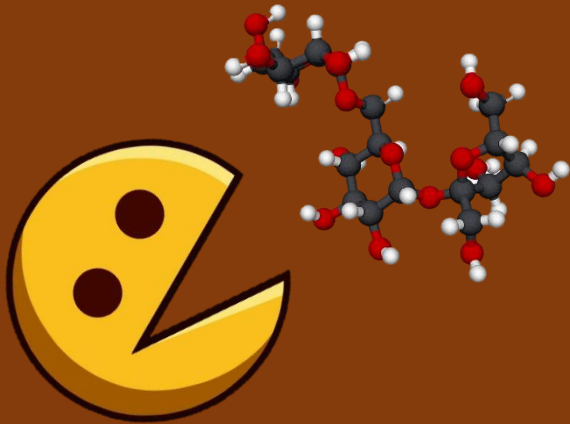
Incorporação pela microbiota



Littera



Material não estrutural solúvel liberado no solo (ex: mono e dissacarídeos)

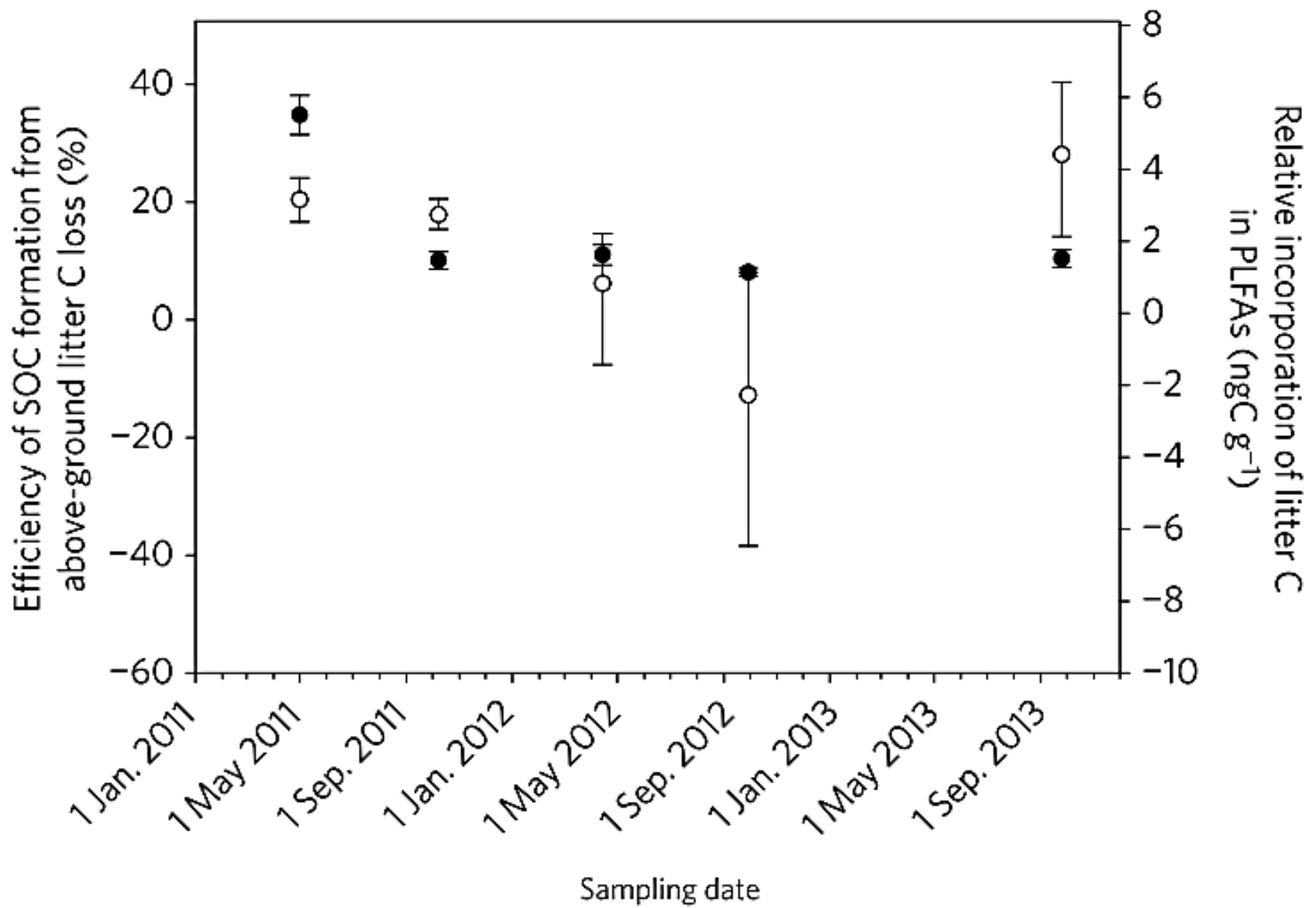


Formação de compostos microbianos de baixo peso molecular a partir de C-littera

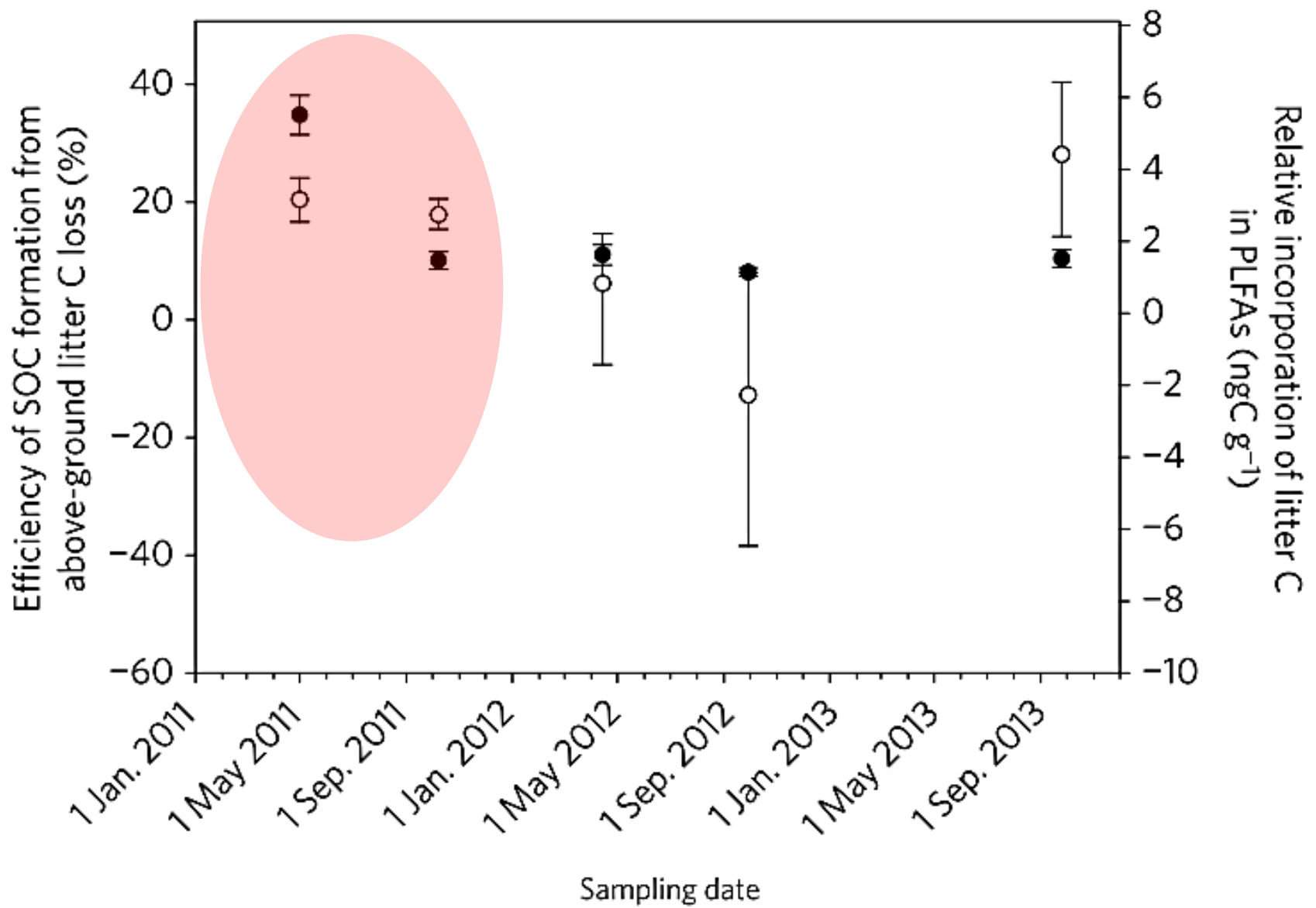


Incorporação pela microbiota

Formação de MOS estável por interações organo-minerais!

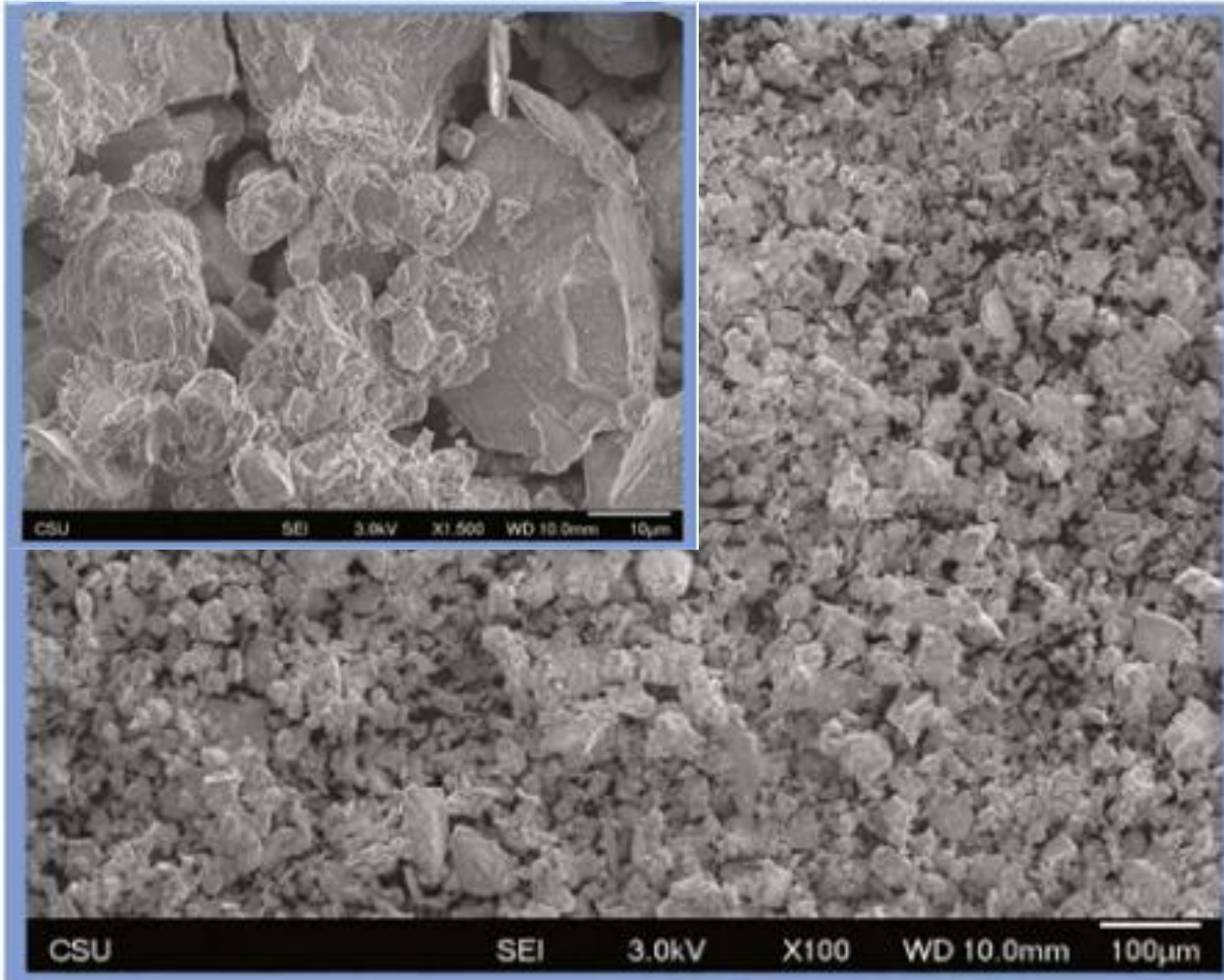


Eficiência da formação de C orgânico a partir da perda de C da liteira e incorporação relativa de C microbiano derivado da liteira durante a decomposição de *A. gerardii*.



Eficiência da formação de C orgânico a partir da perda de C da liteira e incorporação relativa de C microbiano derivado da liteira durante a decomposição de *A. gerardii*.

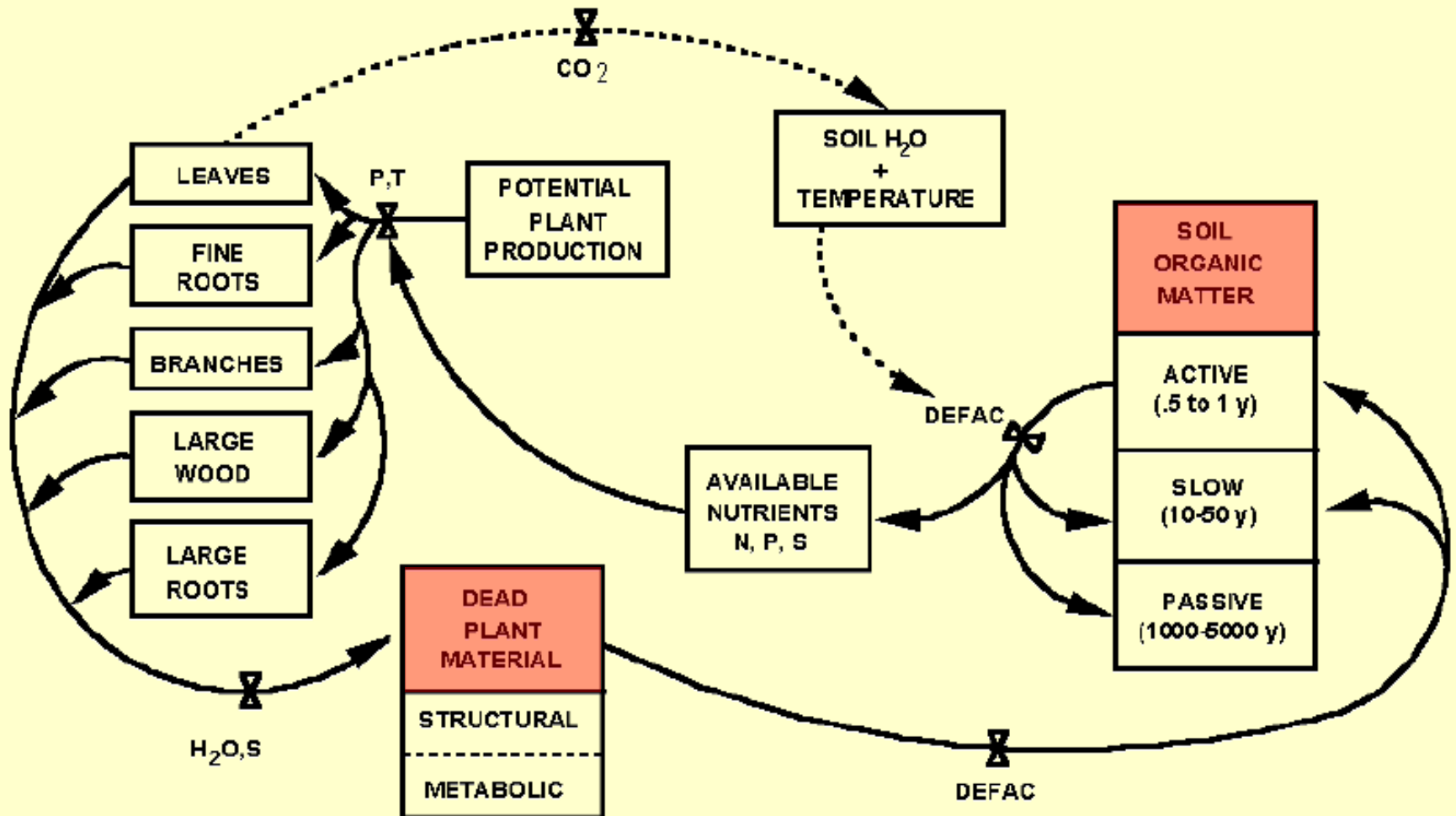
Durante os estágios iniciais da decomposição, a liteira perde compostos solúveis não estruturais que são incorporados eficientemente pelos micróbios, resultando em matéria orgânica fina associada a minerais.



Imagens de microscópio eletrônico de varredura de matéria orgânica associada a minerais, incluindo visão geral e detalhe em solo sob pastagem.

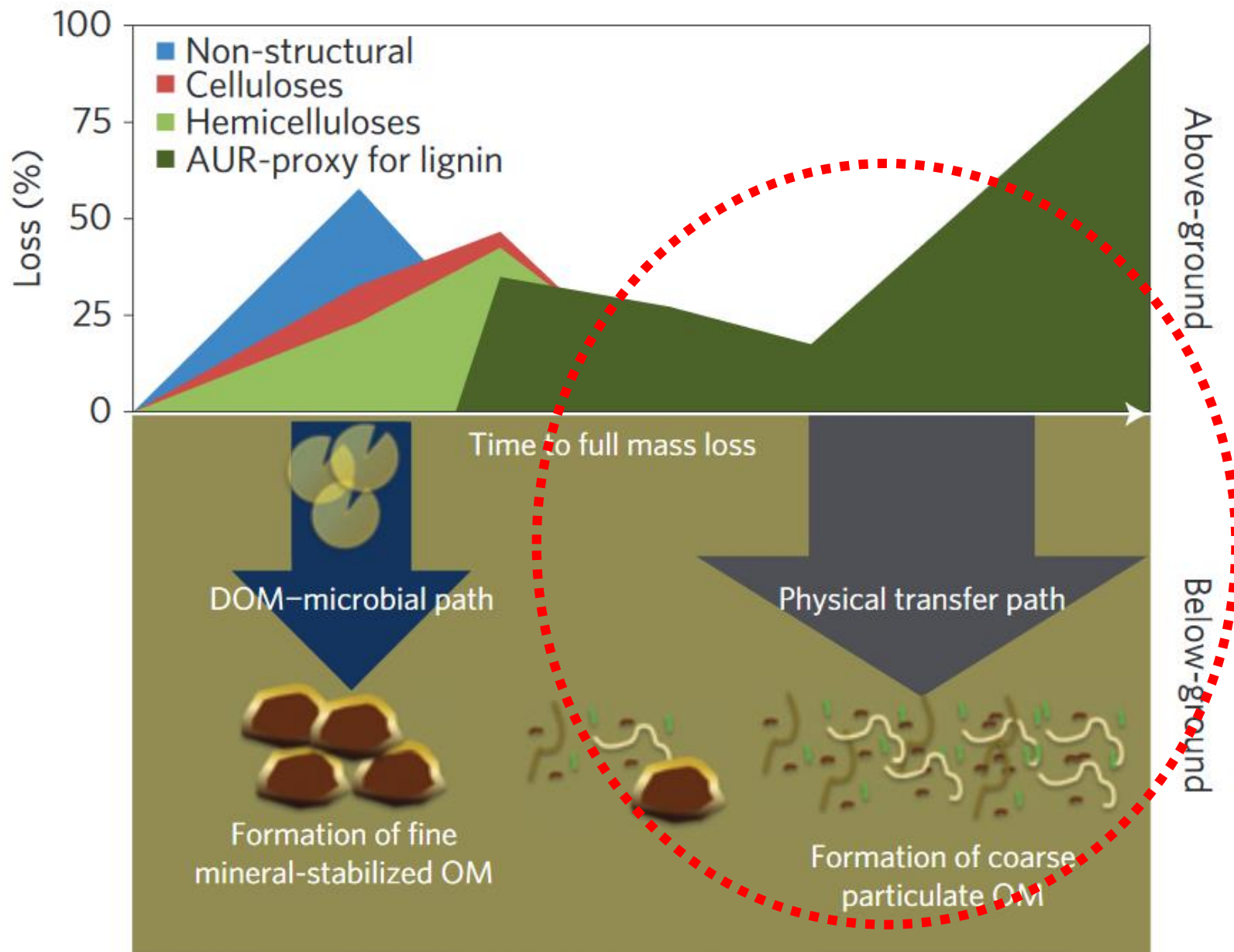
LAVALLEE et al. Conceptualizing soil organic matter into particulate and mineral-associated forms to address global change in the 21st century. **Global change biology**, v. 26, n. 1, p. 261-273, 2020.

MODELO CENTURY



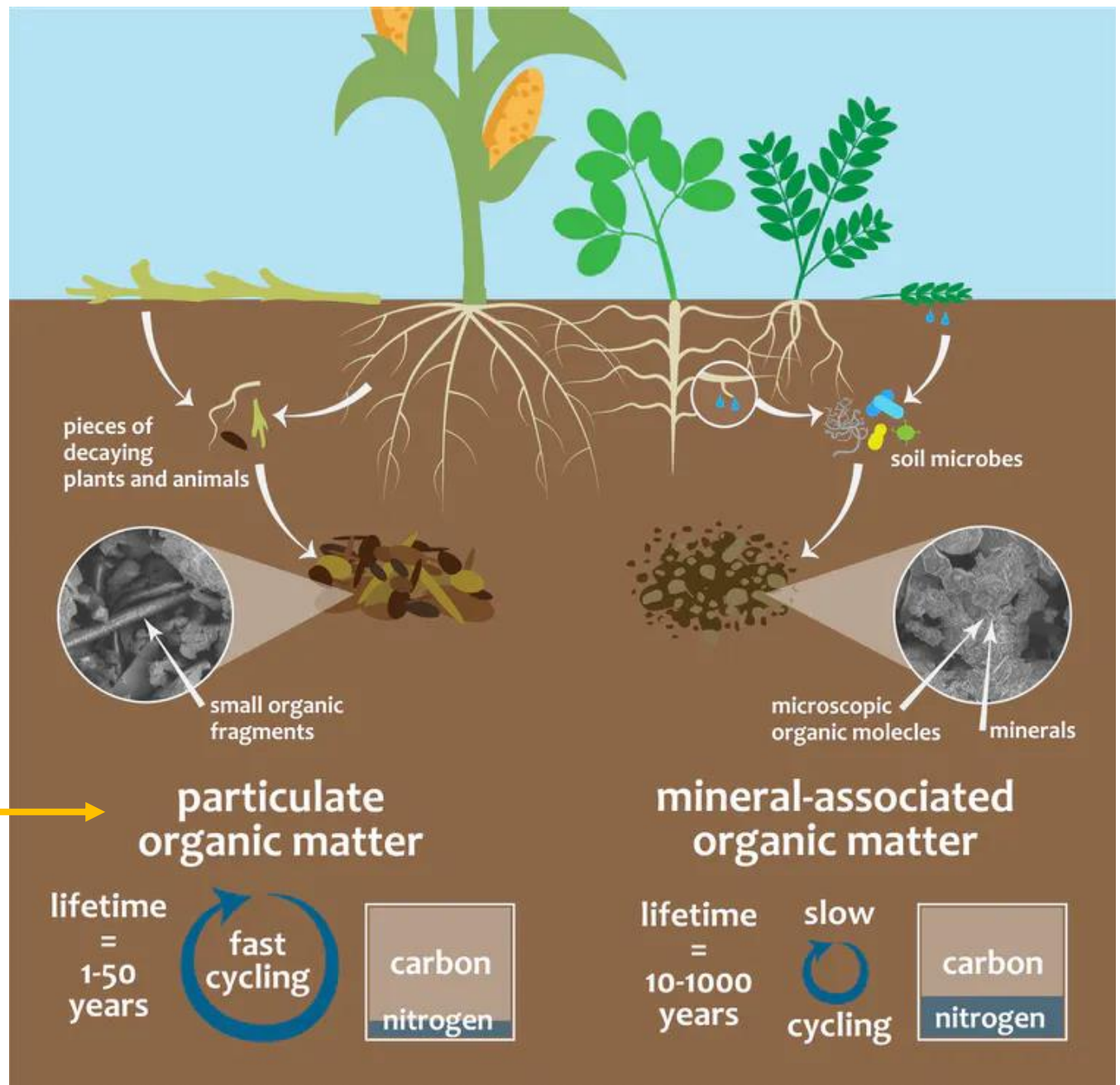
Nova abordagem necessária na modelagem: compostos lábeis podem formar MOS estável pela atividade dos microrganismos.

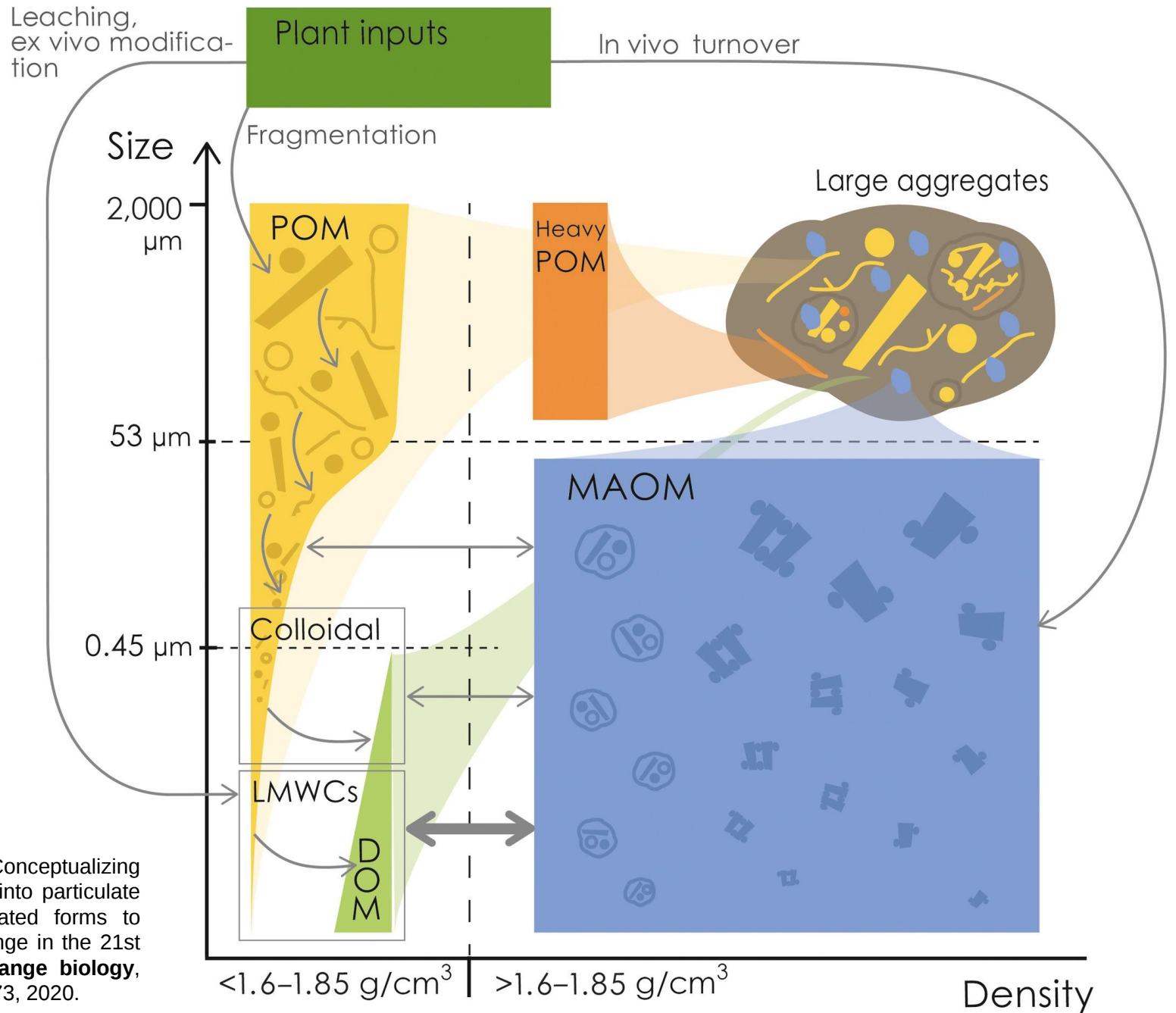
Transferência física



Cotrufo, M.F. et al. (2015) Formation of soil organic matter via biochemical and physical pathways of litter mass loss. *Nature Geoscience* **8**, 776–779. doi:10.1038/ngeo2520

“light
fraction”





LAVALLEE et al. Conceptualizing soil organic matter into particulate and mineral-associated forms to address global change in the 21st century. **Global change biology**, v. 26, n. 1, p. 261-273, 2020.

Obrigada!

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