

Uncovering the diverging factors that control microbial carbon sequestration and respiration in soils exposed to moisture fluctuations

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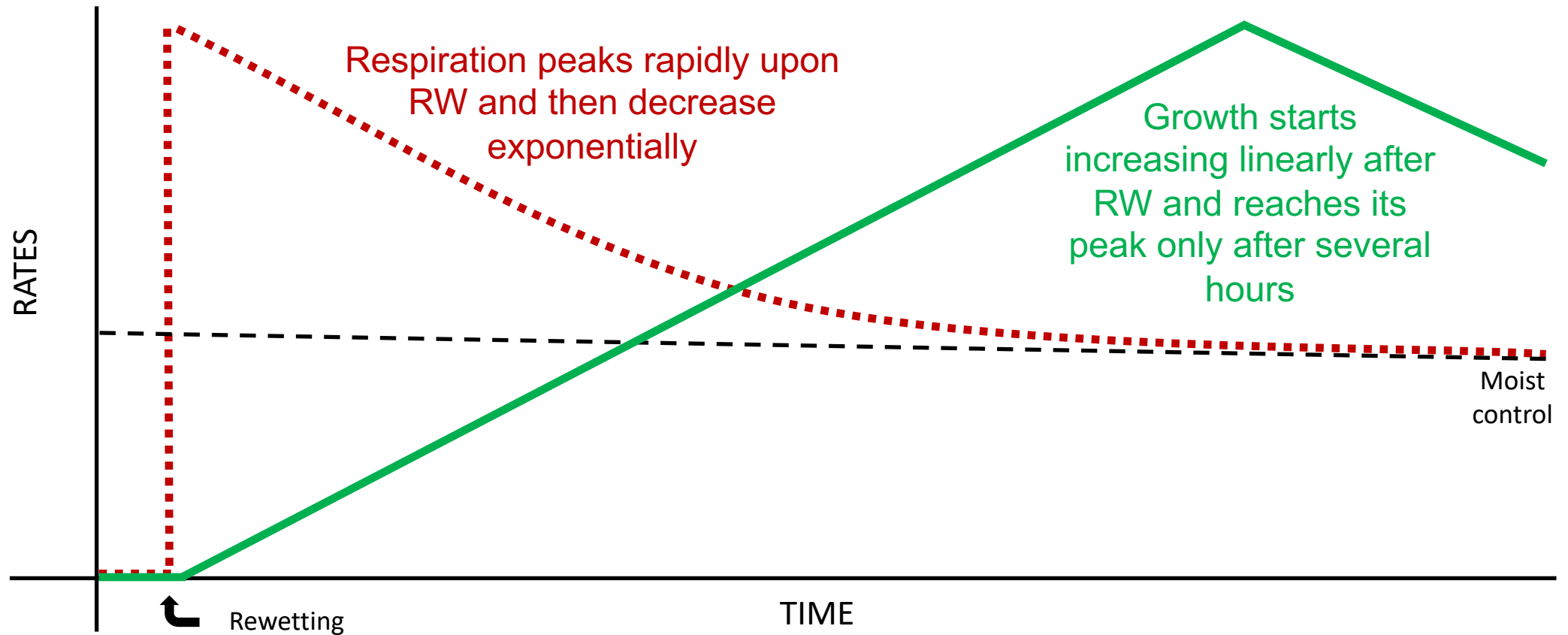
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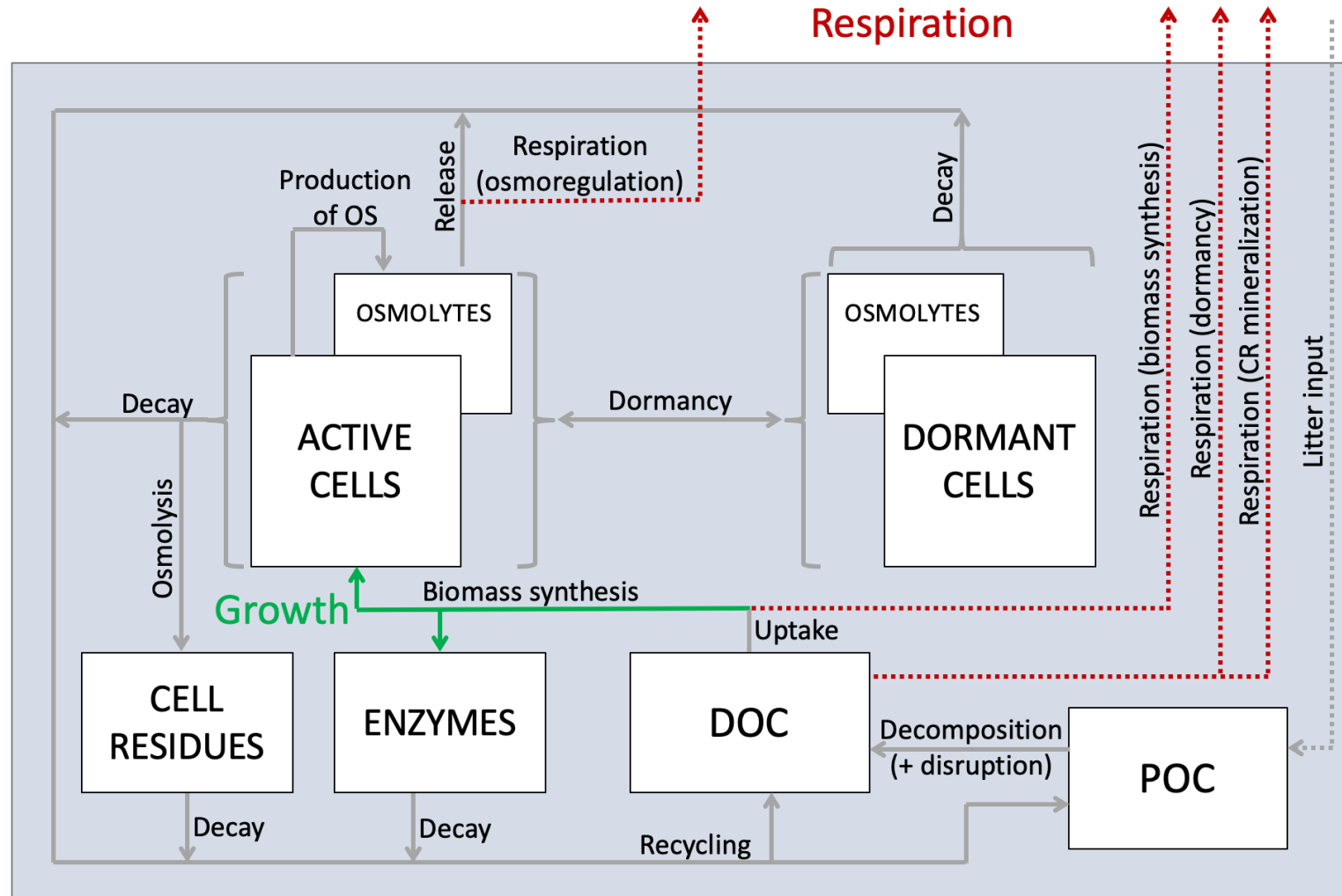
- A new model (EcoSMMARTS) to study SOC dynamics during drying-rewetting (D/RW)
 - Strong decoupling between microbial growth and respiration
 - Unlike previous models, SMMARTS captures growth-respiration decoupling
 - Allows identification of mechanisms governing SOC dynamics during D/RW

Decoupling between microbial growth and CO₂ emissions



[e.g., Blazewicz et al. (2014), de Nijs et al. (2018), Göransson et al. (2013), Meisner et al. (2013)
Tiemann and Billings (2011), Zheng et al. (2019)]

New process-based soil microbial model: EcoSMMARTS

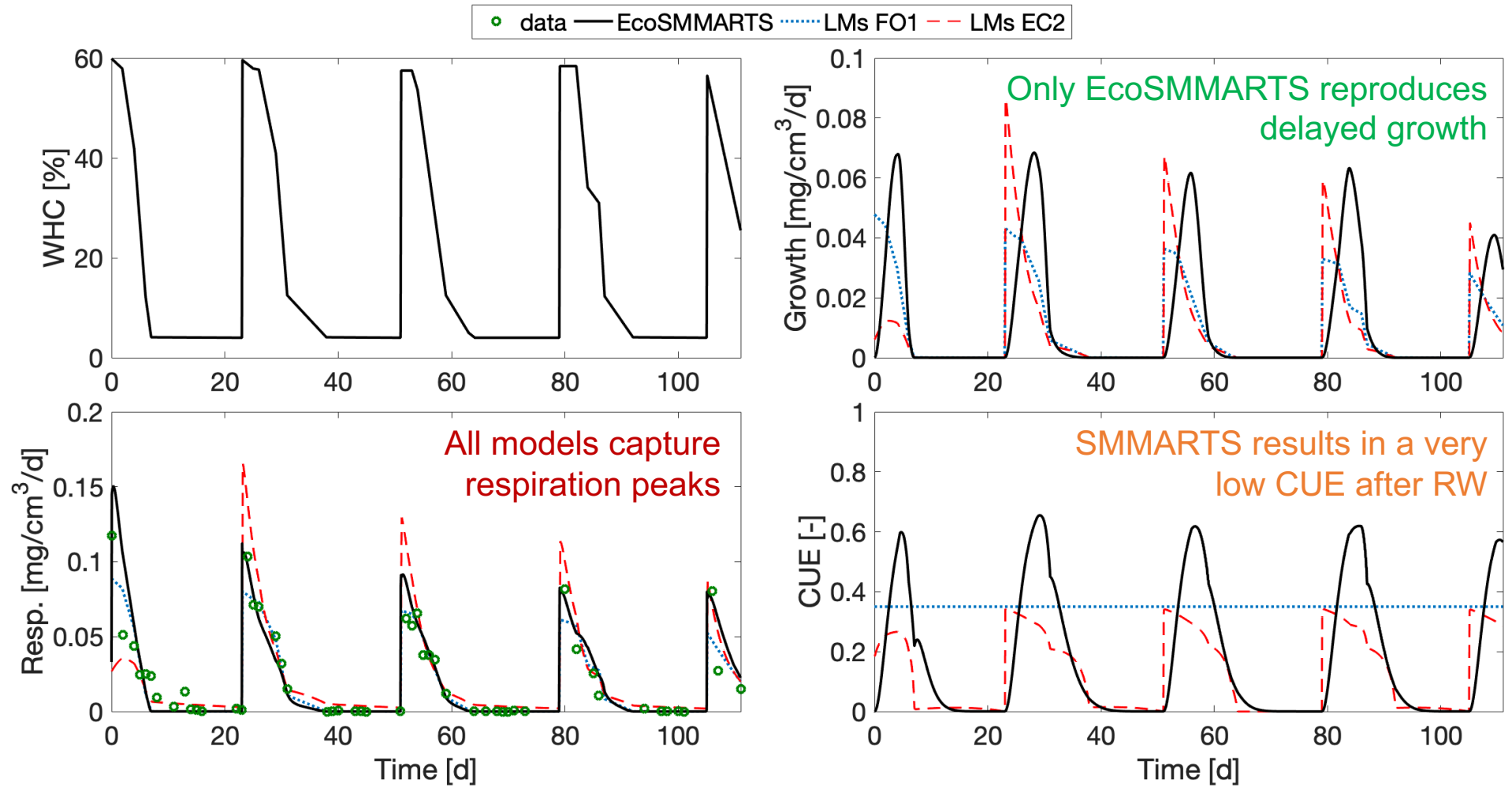


[mod. from Brangarí et al., 2020]

Dynamics under D/RW

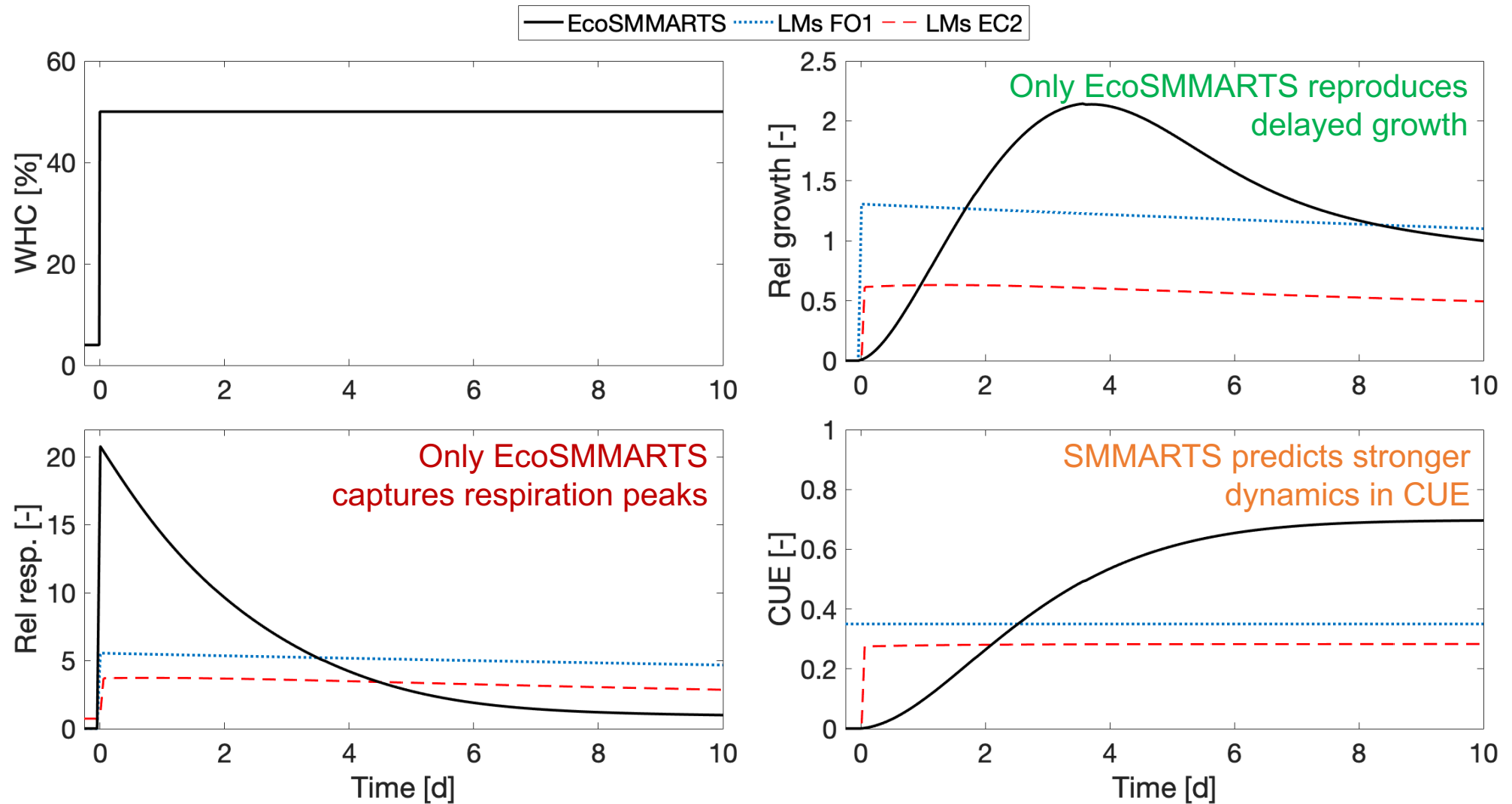
Reproducing the experiment in Miller et al. (2005)

Comparison with models by Lawrence et al. (2009) [LMs]



[mod. from Brangarí et al., 2020]

Dynamics when moisture is kept constant after RW



[mod. from Brangari et al., 2020]

Conclusions

- EcoSMMARTS captures respiration peaks in soils exposed to cycles of D/RW and to constant moisture after RW
- EcoSMMARTS is the first model to reproduce strong decoupling growth-respiration
- Based on calibration, the strongest candidate mechanisms to explain dynamics:
 - C accumulation during dry periods,
 - drought-legacy effects on the synthesis of new biomass,
 - osmoregulation.

Brangarí et al. (2020): A soil microbial model to analyze decoupled microbial growth and respiration during soil drying and rewetting. SBB [under review]!!!

References

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