

## RESEARCH TOPIC FOR THE PARISTECH/CSC PHD PROGRAM

**Field:** *Environment Science and Technology, Sustainable Development, Geosciences*

**Subfield:** Biogeochemistry

**Title:** Soil microbial functioning in land surface models

**ParisTech School:** AgroParisTech

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**Research group/Lab:** UMR Silva

**Lab location:** INRAE Centre Grand-Est – Nancy, 54280 Champenoux

**(Lab/Advisor website):** <https://www6.nancy.inrae.fr/silva>

### **Short description of possible research topics for a PhD:**

Land Surface Models (LSM) are used for projections of future climate change such as in the reports of the Intergovernmental Panel on Climate Change (IPCC). Plant processes are described in great detail in LSMs while soil processes are represented only very coarsely. This project aims at an explicit vertical description of carbon (C) decomposition in soil, moving away from crude kinetically-defined soil organic matter (SOM) pools, but rather linking closer the C cycle with microbial activity, as well as water and energy distribution in soils. The LSM CABLE shall be extended with the SOM decomposition model DAMM, combining effects of temperature, soil water content, enzyme kinetics, and soluble substrate supply. This will give a framework to include new, detailed knowledge about aggregation and the influence of freezing and thawing on it, microbial population dynamics and functioning such as enzyme production.

**Required background of the student:** Natural sciences

### **A list of 5 (max.) representative publications of the group:**

1. Balesdent *et al.* (2018) *Nature* 559, 599–602, doi: [10.1038/s41586-018-0328-3](https://doi.org/10.1038/s41586-018-0328-3)
2. Cuntz & Haverd (2018) *JAMES* 10, 54–77, doi: [10.1002/2017MS001100](https://doi.org/10.1002/2017MS001100)
3. Haverd & Cuntz (2010) *J Hydrolo* 388, 438–455, doi: [10.1016/j.jhydrol.2010.05.029](https://doi.org/10.1016/j.jhydrol.2010.05.029)
4. Haverd *et al.* (2016) *Geosci Model Develop* 9, 3111–3122, doi: [10.5194/gmd-9-3111-2016](https://doi.org/10.5194/gmd-9-3111-2016)
5. Sainte-Marie *et al.* (in revision), *Nature comm* 11, <https://go.nature.com/3ltNMOl>