

Incorporating connectivity in the OpenlISEM model: a first try for fire-affected areas in Portugal & strengthening collaboration with the University of Aveiro on connectivity

Period: 8 – 12 January 2018 | **Host institution:** CESAM, University of Aveiro, Portugal

1. Purpose of the STSM

The aim of this STSM was twofold:

- (i) To explore how to incorporate connectivity into the OpenLISEM soil erosion model and test it using data from fire-affected areas susceptible to increased erosion in Portugal.
- (ii) To strengthen collaboration between the applicant and the host institution (J. Keizer and colleagues – University of Aveiro, Portugal) by discussing new ideas for future research projects, including MSc thesis research, PhD and post-doc projects and possibly larger (EU) projects.

The applicant is an Early Stage Researcher. For her, this STSM will lead to (i) expansion and intensification of her academic network, (ii) experience abroad and (iii) acquisition of future projects on the longer term. These are all important for the tenure track career in which the applicant is enrolled at Wageningen University. Scientifically, connectivity, especially related to modelling sediment dynamics, is a core topic of the applicant's research and she is actively involved in WG3 (modelling connectivity) and eager to advance this topic.

2. Description of the work carried out during the STSM

Day 1 (08 Jan 2018) :

- Arrival in Porto, picked up by the host (Jan Jacob Keizer) and drive to Aveiro.
- Discussion of work in general, field sites and programme of the rest of the STSM period
- Meeting CESAM team and having lunch together
- Visiting field site (São Pedro de Alva, Penacova municipality) and emptying sediment fences with Diana and Alda (Fig 1). The field site features are the following :
 - o It is a recently (Oct 2017) burnt strawberry tree slope
 - o A total of 6 plots, each 5x2m
 - o Set up in three coupled plots adjacent to each other: one mulched (straw), one untreated
 - o Steep slope
 - o Clear difference between mulched and untreated plots in terms of sediment yield (about 9 versus 1 t/ha of sediment yield at field moisture conditions, respectively)
- Discussion with Diana about post-fire erosion modelling, both in general and of post-fire emergency stabilization measures in particular.



Fig. 1 : Two adjacent sediment plots in the burnt strawberry tree field, one mulched with straw (left), one untreated (left). Photo taken by Jantiene Baartman on 08 Jan 2018.

Day 2 (09 Jan 2018) :

- Presentation and discussion on my research work (see ppt attached). Topics discussed included :
 - o General introduction of Wageningen University and SLM group
 - o Introduction of my background and research topics, methods and concepts
 - o Connectivity
 - o Modelling
 - o Field and laboratory experiments
 - o Examples of (PhD) projects that I am involved in
 - o Teaching

The discussion was very lively and the team was really interested in the various aspects of the work. They had many questions and we had an open discussion of about 1.5h.

- Discussion on the CESAM team's expertise :
 - o Nelson: ecotoxicologist, soil&water pollution, pesticides, aquatic environment, microplastics, fire impact on water quality, experiment in vineyards
 - o Sandra: stakeholders perceptions, participatory, adoption of forest management, policies, factors driving / limiting solutions, ecosystem services, tools / methods to participate with stakeholders
 - o Frank Verheijen: Organic Matter, biochar, soil organic matter and hydrology, lysimeter experiment, dust deposition. Interest in modelling OM – hydrology effects
 - o Martinho: terraces in eucalypt forests: soil physical, chemical and biological effects
 - o Oscar: Soil physics biology, prescribed fires, soil surface (2 cm; O-layer), soil water repellence
 - o Diana Vieira: modelling runoff and erosion after fires
 - o Coimbra laboratory: experiments, testing SWC (mulching) effects
- Discussion on possible MSc thesis subjects for students to be presented during the thesis fair on 1 Feb 2018 and to be put on the SLM website (three posters attached)
- Tour and explanation of the different laboratories (soil physics, toxicology, chemistry)

Day 3 (10-01-2018):

- Fieldtrip to Castanheira de Pêra, (burnt in June 2017, Fig. 2)
 - o Demonstration sediment plots (2x8 m) in pine forest, with and without needle mulch (spontaneous as well as applied) and shrub barriers on slopes without mechanical soil preparation and without treatment on contour-ploughed slope section (n=13)
 - o Demonstration sediment plots in eucalypt forest (n=6)
 - o Sediment fences on two neighbouring forest tracks, one with and without spontaneous mulching of scorched leaves.
 - o rills with runoff on main track and moving downslope over road network (it was raining heavily when we were there!)
- Fieldtrip to RECARE field site in Semide, Mirando do Corvo municipality (burnt in August 2015)
 - o Sediment and runoff plots (2x8m) with different intensity of logging traffic
 - o Sediment and runoff plots (2x8m) on steep slope (with reduced post-fire erosion due to elevated moss cover soon after the wildfire, probably reflecting the humid micro-climate of a north slope facing the Ceira river)
 - o Microplots (0.5x0.5 m)
- Dinner with the team and with visiting scientists Joao Pedro Nunes and Amandine Pastor (University of Lisbon) and MSc student Myke Koopmans.



Fig. 2 : Explanation near two sediment fenced plots – heavy rain caused runoff on the (forest) road). Photo taken by Jantiene Baartman on 10 Jan 2018.

Day 4 (11-01-2018) :

- Discussion with MSc student Myke Koopmans and Joao Pedro Nunes on progress and planning of Mykes MSc thesis
- Meeting with Joao, Jan Jacob and Diana on project proposals
- Field visit to Macieira catchment (~1km²) (Fig. 3)
 - o Monitored from 2011 - 2014

- Land use is half agricultural (maize) and half forest (eucalypt, pine and cork oak)
- Walled channel at the outlet
- Repeated Rill measurements on agricultural fields as well as on burnt and, subsequently, ploughed oak plantation
- Fire in 2011 of relatively small part of catchment



Fig. 3 : View of the Macieira catchment (Joao explaining to Myke) with half agricultural fields and half forest.
Photo taken by Jantiene Baartman on 11 Jan 2018.

Day 5 (12-01-2018):

- Travel back to Wageningen

3. Main results

- Three posters with MSc thesis subjects to be presented on the MSc thesis fair on 1 Feb 2018 and on the SLM website;
- Better knowledge and insight on the different field sites that the team has installed and/or worked on in the past – this enables me to better supervise MSc/BSc student who work in these field sites and /or use the data from these sites in their theses. It also enhances future collaboration because having personally seen these sites makes collaboration e.g. project proposals much easier.
- Meeting the CESAM team (in person) and discussing their expertise (in relation with mine and in relation to connectivity) positively stimulates future collaborations
- In-depth discussion with Diana on modelling post-fire effects on erosion. We discussed possible ideas on how to incorporate connectivity into the LISEM model. We decided to use the newest version of LISEM, which incorporates the full St. Venant equations (ref – personal communication with V. Jetten in Dec 2017). There seems to be a distinct seasonal effect in the runoff and erosion effect, which may be best incorporated through adapting soil moisture content. The details will be discussed during the planned STSM visit of Diana to Wageningen in Feb-March 2018, when the modelling will be executed and a draft paper will be written.

4. Contribution to the Action aims

This STSM contributed to the COST Action ‘Connecteur’ in several ways:

- The discussions and plans on incorporating connectivity into the LISEM model is closely related to WG3 (modelling connectivity) in which the grantee plays an active role. In the present STSM, a start was made

and these ideas will be further elaborated and tested (i.e. modelled) in the planned STSM of Diana Vieira to Wageningen in Feb-March 2018.

- The visits to the various field sites were important, because the grantee could see how runoff and erosion after fire, and post-fire management strategies are being tested in the field. The data from these field experiments are being used for model calibration and observations in the field and analysis of the field data is important to get ideas how connectivity is important in these fire-affected systems. We were lucky to have a 'bad weather' (heavy rain) morning in the field, so that we could actually see runoff and erosion in action at the field site.
- Meeting and discussing with the CESAM team (in person and all together) was very good to strengthen collaboration, to discuss connectivity in our work and to discuss how we can combine each other's expertise in future collaboration within connectivity-related research. This will result in increased future collaboration and with that boost the grantee's scientific career.

In conclusion, by combining discussions on advancing modelling connectivity, field visits and discussions to strengthen (future) collaboration on connectivity, greatly contributed to the Action's aims and slogan 'Connecting European Connectivity Research'.

5. Confirmation by the host institution

As Chair of the Ecohydrology Laboratory of the Centre for Environmental and Marine Studies (CESAM) of the University of Aveiro, I herewith confirm that Dr. ir. Jantiene Baartman, from Wageningen University, successfully executed the planned STSM mission. Dr. ir. Jantiene Baartman visited us from 8 to 12 Jan 2018 and joined us to the various field locations as described above. We had good discussions on ongoing collaboration as well as on possibilities to further collaboration in the future, with a special context of the role of connectivity in the hydrological and erosion response of fire-affected areas in Portugal.



Dr. Jan Jacob Keizer, CESAM, University of Aveiro, Portugal.

6. Authorization

I hereby authorize the Grant Holder and/or STSM Coordinator to post this report on the STSM on the Action's website.



Dr. Jantiene Baartman, Soil Physics and Land Management Group, Wageningen University, The Netherlands