Environment
TOPICS MARKET

Earth Surface Processes Team

2022

ARE YOU THINKING TO DO A MASTER, PROJECT OR INTERNSHIP IN ENVIRONMENTAL SCIENCES?

We have several opportunities for you!!

University of Aveiro, CESAM & Department of Environment and Planning

The ESP team

The ESP team is based at the Centre for Environmental and Marine Studies (CESAM), Dept. of Environment and Planning (DAO) of the University of Aveiro, since 2005. Research in the ESP team focuses on:

- carbon and nutrient cycling and soil fertility losses, particularly in burnt areas
- sustainably restoring/improving soil functions with biochar
- Impacts of agricultural management practices on ecosystems and human health
- forest hydrology and eco-hydrological modelling
- off-site fire effects of wildfires, namely the impacts on aquatic ecosystems, and post-fire management
- stakeholder participation in sustainable land management (forest and agricultural areas)
- prescribed fire effects on soil-system

And guess what?

We need students like you! If you wish to do your internship / BSc / MSc with us…

Go ahead send an e-mail!

University of Aveiro, CESAM & Department of Environment and Planning

Impacts of emergent pollutants in aquatic ecosystem: organismal and sub-organismal response

Ana Belén Muñiz González
Margarita Salas Postdoctoral Researcher
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My **research interests** are focus on the **emergent pollutants** (MPs, NMs, pharmaceuticals, pesticides, UV filters) effects on **aquatic organisms**, mainly **invertebrates**. The impact of single, mixtures and combined NMs and xenobiotics will be evaluated trough **sub-organismal response** (Gene expression (RT-PCR), biochemical biomarkers)

ORCID iD: 0000-0001-8285-7582

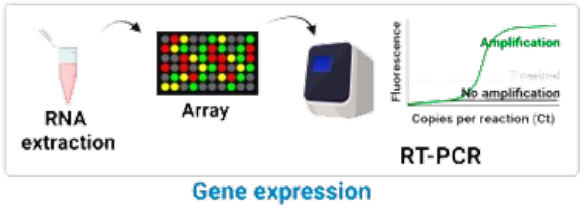
Research opportunities:

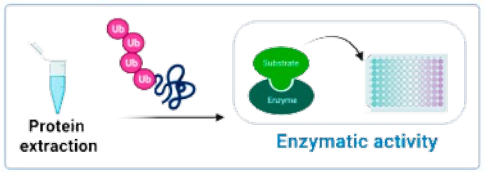
- Wildfires effects: AQUAFIRE project (FCT)
- Pesticides mixtures impacts: SPRINT Project (H2020)
- Microplastics effects in single exposure and combined with emergent pollutants

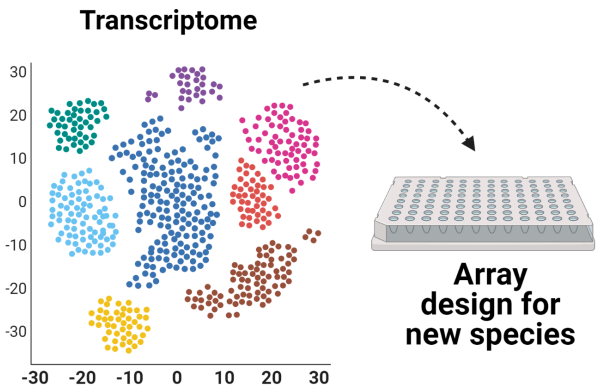
•Modulation on organismal and/or sub-organismal response in aquatic organisms (acute and chronic response)

- Survival, reproduction , life cycle (emergence, growth, development), feeding inhibition
- Molecular response: Gene expression, biochemical biomarkers or genotoxicity (comet assay)

- Ecological impact: mesocoms studies
- Organisms available:
  - Crustacea: *Daphnia magna, Daphnia longispina, Hyalella*
  - *Fishes: Danio rerio or Gambusia holbrooki*
  - Insect: *Chironomus riparius*
  - Microalgae: *Pseudokirchneriella subcapitata*







University of Aveiro, CESAM & Department of Environment & Planning

POLLINATE

Soil-biochar-biota interactions: improving soil quality & ecosystem services

Ana Catarina Bastos, PhD

Researcher

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My research topics focus on how environmental management tools, such as biochar, impacts on soil quality and functional biodiversity. I work with soil scientists, biologists and ecologists, aiming to unravel the opportunities and challenges associated to biochar use in agroforestry, benefiting from long-standing collaborations with the relevant stakeholders.

Project description

Biochar (i.e. product of biomass pyrolysis) is a soil amendment for improving soil functions, many of which are mediated by biota.

POLLINATE combines pot and field experiments, focusing on improving specific soil, vegetation and floral characteristics in Portuguese pasture soils, in order to enhance functional biodiversity, with focus on invertebrate and pollinator communities, as well as plant productivity, community structure and pollinator feeding resources.

MSc research opportunities

Much is yet to be discovered and your contribution is valuable!

We **invite you to join** our interdisciplinary research team on the following MSc topics:

- Assessing biochar impact on biodiverse seed mixtures, including germination, plant growth, floral attraction cues and feeding resources for pollinators;
- Improving and/or restoring soil physical and/or biochemical properties, including ground-nesting conditions for biota;
- Screening and biomonitoring soil invertebrate behaviour and/or activity.

University of Aveiro, Dept. Environment & Planning

STUDENT OPPORTUNITY

Impact of different agricultural production systems on soil biodiversity and ecosystem functions

Ana Luísa Caetano , PhD
Ecotoxicology and Environmental Biology

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ana.caetano@ua.pt

My research are mainly focus on the effects of different agricultural production systems on soil quality, with a special interesse on soil biodiversity and ecosystem functions.

Project description

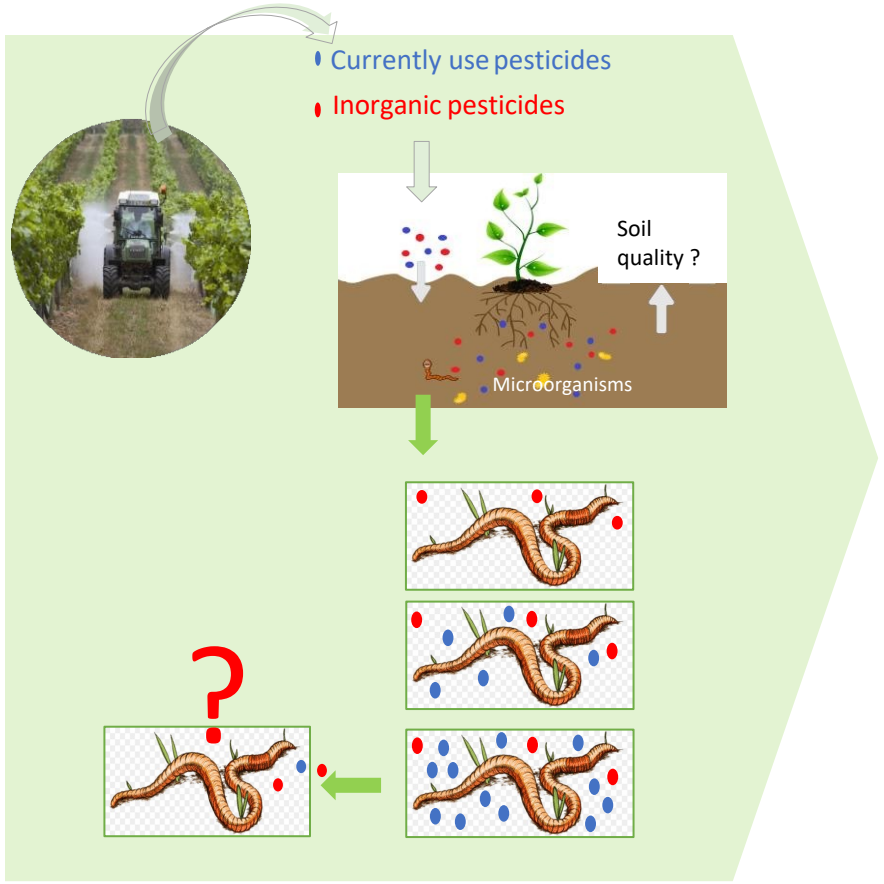
Potential changes in soil quality as result of intensive agriculture are increasingly raising concerns about associated impacts. New agricultural practices as conservative, integrated or biodynamic agriculture had been adopted as alternative to conventional agriculture to promote soil properties and ecosystems services.

Research opportunities

If this research topic is interesting for you and you wish to do your internship or MSc in this area, the following proposals may interest you:

- Bioaccumulation of pesticides in earthworms under conventional, integrated and biological production scenarios

- Macro and mesofauna abundance and diversity of soil and ecosystem function assessment in vineyards under different production systems (conventional, integrated and organic).



CESAM centro de estudos do ambiente e do mar

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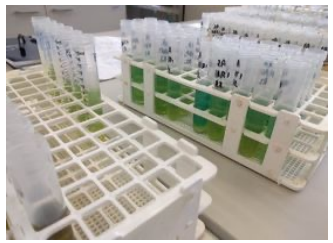

University of Aveiro, CESAM & Department of Environment and Planning

Ecotoxicological tools to assess impacts on fresh, estuarine and marine waters

Ana Ré

Researcher

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My research is focused on the ecotoxicological effects of potential toxic elements on aquatic ecosystems particularly the impacts of diffuse sources (e.g. wildfires effects on planktonic and benthic organisms, scrubber-water effects on estuarine and marine larval development).

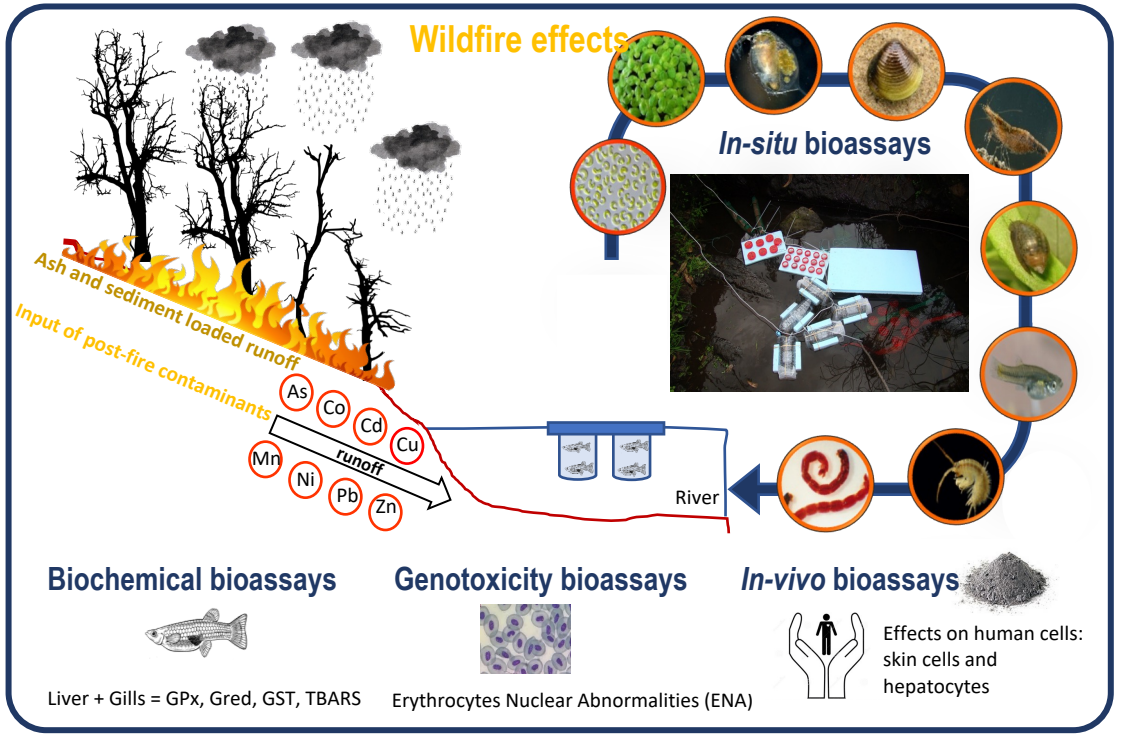
Project description

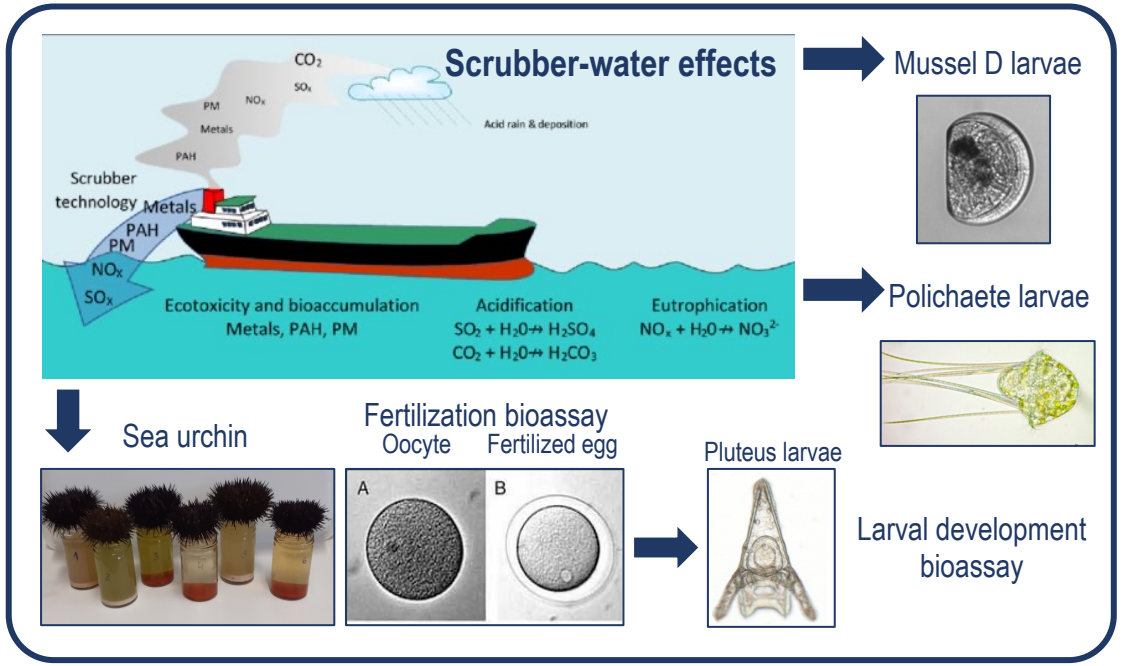
The quality of aquatic systems has been degraded by the incoming of potentially toxic contaminants. The anthropogenic activities are one of the main sponsors of this degradation. Pollutants such as toxic metals, PAHs and complex mixtures can have adverse effects on aquatic ecosystems and human health.

Research opportunities

Within this thematic, you can find the following opportunities:

- Impacts of **wildfires** on planktonic and benthic freshwater organisms using:
  - *in-situ,* laboratorial and *in-vivo* bioassays;
  - ecotoxicological tools – individual, cellular and subcellular levels bioassays (e.g. behaviour, biochemical, genotoxicity and cytotoxicity assessment);
- Impacts of **scrubber-water** on estuarine and marine species using:
  - fertilization and larval development bioassays (e.g. sea urchin, mussels, oysters, polychaetes, cockle, etc)





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ModelEco – Modeling Ecosystem fluxes with time-since-wildfire

Bruna R F Oliveira

Researcher

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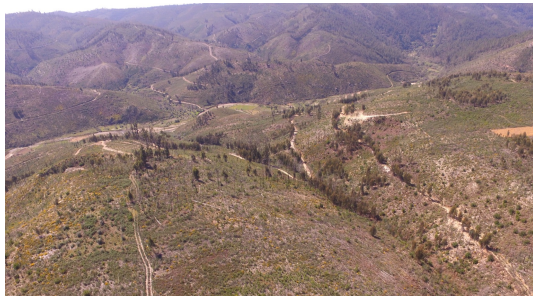
Environmental Engineer and Technologist, graduated from Wageningen University and Research in the Netherlands, with experience in soil formation, soil amelioration, soil respiration and ecosystem fluxes.

Project description

ModelEco aims at understanding the behavior of ecosystem H_2O and CO_2 fluxes with time-since-wildfire from remotely sensed (satellites and multispectral drone) information used in models which are validated with field measurements.

This transdisciplinary project offers to students the opportunity to work with **remote sensing, modeling, laboratorial analysis and field work.**



Research opportunities

(You can choose one!!!)

1. The use of **multispectral** images acquired by drones to map **vegetation** traits (biomass, LAI, etc.);
2. Development of methodologies to analyze temporal series of **drone** and **satellite** images of burnt areas;
3. Daily, seasonal, and yearly patterns of ecosystem and soil **respiration and evapotranspiration,** and **photosynthesis** in burnt woodlands;
4. **Modeling** ecosystem evapotranspiration and/or carbon **fluxes** from drone and satellite data.

University of Aveiro, CESAM & Department of Environment & Planning

MODELLING THE TOXIC EFFECTS OF FIRE-RELATED CONTAMINANTS ON AQUATIC SPECIES

Dalila Serpa
Researcher
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My research focuses on the impacts of wildfires on aquatic ecosystems, more specifically, on the development of a modelling tool to reproduce the physical, chemical and biological processes in fire-impacted water bodies, to aid resource managers in anticipating the risks posed by wildfires.

Project description

Ashes and post-fire runoff contain a wide diversity of contaminants, such as metals and polycyclic aromatic hydrocarbons. When reaching aquatic systems, this cocktail of contaminants may cause toxicity to the biota. So, to realistically assess the risks posed by wildfires on the aquatic biota it is crucial to evaluate the toxicity of these complex chemical mixtures, in particular on benthic species, which are more likely to be affected by these contaminants as they preferentially adsorb to sediment particles.

Requirements

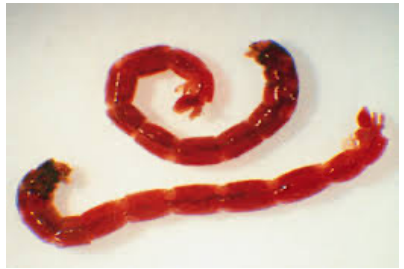
This project requires a background in biology or environmental sciences and enthusiasm for field and laboratory work.

Research opportunities

We offer the following research topics:

1. Assessment of the ecotoxicological effects of ash and post-fire runoff on aquatic species from different trophic levels.

2. Modelling of the ecotoxicological effects of fire-related contaminants (metals and PAHs) on the aquatic biota.



University of Aveiro, CESAM & Department of Environment and Planning

Collaboration opportunities
BSc, MSc thesis or internships

The FEMME project

This project aims at developing an erosion risk modelling tool that provides estimations in case of a wildfire considering several emergency solutions for soil protection and impact reduction under various environmental and socio-economic scenarios (e.g. climate change, costs, burn severity). This will help forest managers in post-fire decision-making, ensuring the application of the most adequate and efficient mitigation measures.

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Ana Rita Lopes
PhD Student
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Dalila Serpa
Researcher
Post-fire ecological modelling
dalila.serpa@ua.pt
www.cesam.ua.pt/dalilaserpa

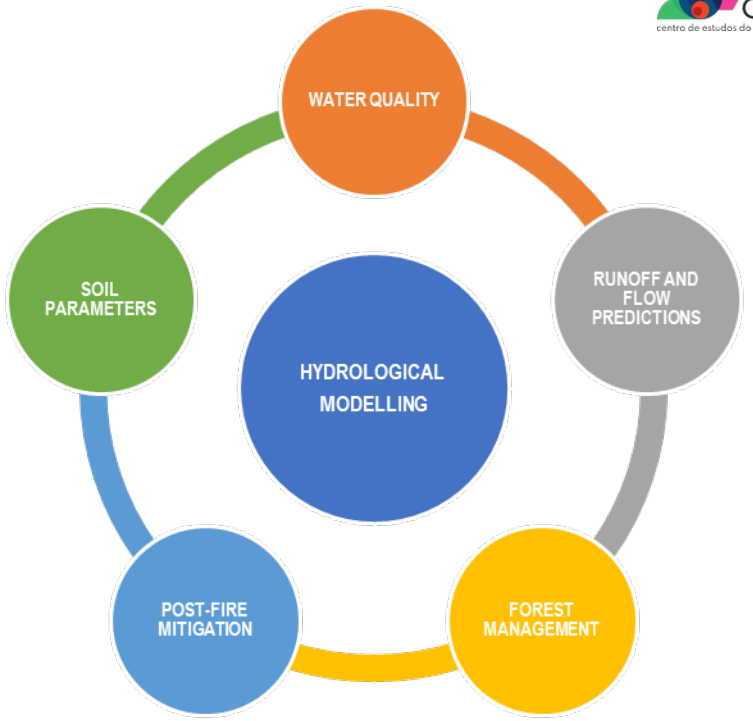
Within this project, you can find a multidisciplinary range of opportunities for your BSc, MSc or internship!

DO YOU HAVE A THING FOR MODELLING?

We need students like you!

Send us a email!

P.S. Mandatory participation in fieldwork campaigns.



Modelling soil erosion and hydrological responses in burned and unburned forests

University of Aveiro, CESAM & Department of Environment and Planning

Biochar to improve the soil sponge function of biodiverse pastures to combat desertification

Frank Verheijen

Auxiliary Researcher

www.cesam.ua.pt/frankverheijen

Google Scholar Profile

verheijen@ua.pt

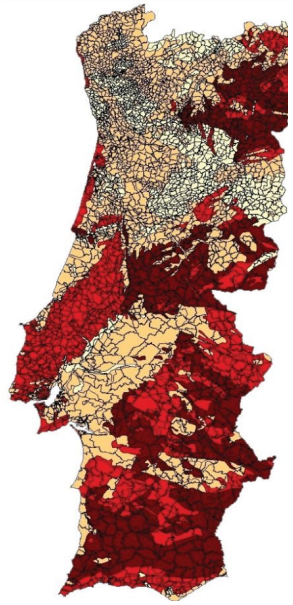
Frank Verheijen is a physical geographer who received his PhD in soil science in 2006. He has focused his research on soil organic matter, how to manage it, and how it interacts with the wider environment. Currently he is an FCT Auxiliary Researcher at CESAM where he focuses on elucidating positive as well as negative effects of biochar in soil, and identifying trade-offs in order to build a sustainable biochar system

Project description

Poor soils

The Available Water Capacity (AWC) – how much water the soil can retain – is low for Portuguese soils compared to other Mediterranean countries (see top right). The AWC is simply computed from clay and soil organic carbon data. A more practical concept is the Sponge Function of soil.

The soil clay and organic matter content along with how they are structured – aggregate distribution – determine how much water can be retained. But surface processes – vegetation cover, hydrophobicity, crusting – determine how much of the rainfall enters the soil in the first place and how much evaporates. Together they determine the Sponge Function of soils, and it is very important to combat the risk of desertification (see right).



Desertification risk

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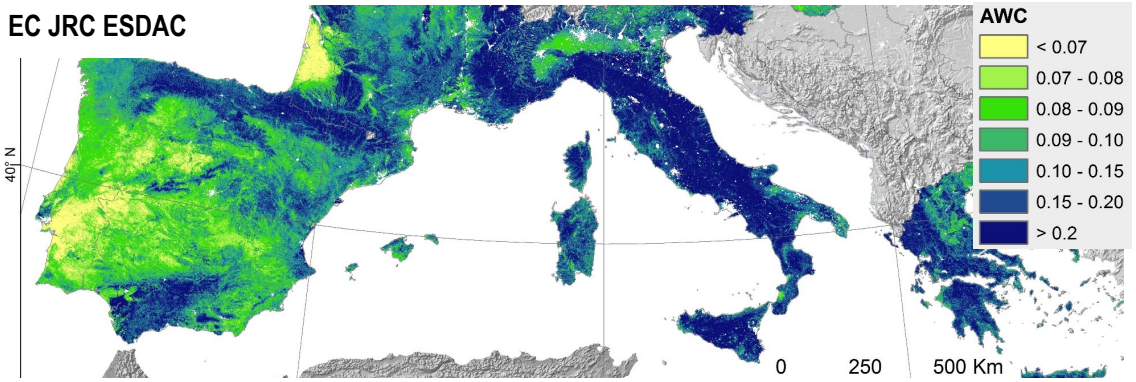


Research opportunities

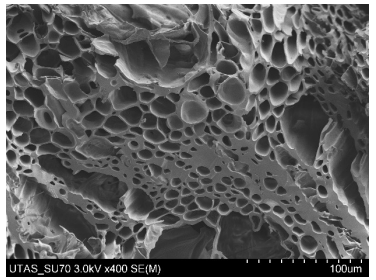
Biochar

Our work in the SOILCOMBAT and TRUESOIL projects has shown that when we add the right biochar to the right soil (critical matching) we can increase infiltration by 50%, reduce erosion by 60%, and double the amount of water in the soil in between rainfall events.

SOILCOMBAT aims to engineer the sponge function of Portuguese pasture soils to sustainably combat desertification.

The following topics are open:

- The effects of biochar on soil moisture and evaporation
- The effects of biochar on plant growth and rooting depth
- Interactions between soil moisture, structure and temperature



Biochar

Low AWC pasture soil

SOIL COMBAT .COM

TRUESOIL

University of Aveiro, CESAM & Department of Environment & Planning

Fate and Impacts of post-fire contaminants on the aquatic ecosystems

Isabel Campos
Researcher
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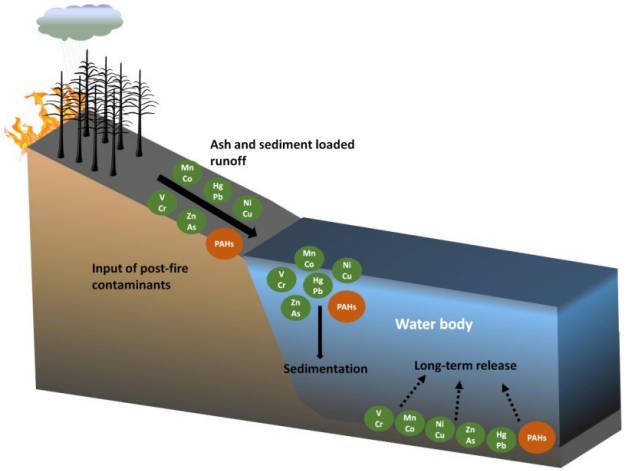
icampos@ua.pt

My research focus on the chemical and (eco)toxicological effects of potentially toxic elements (such as metals and PAHs) on both terrestrial and aquatic ecosystems.

AQUAFIRE project

Wildfires can create serious damages to the freshwater ecosystems, because of the release of potentially toxic elements (PTEs), such as polycyclic aromatic hydrocarbons (PAHs) and metals. AQUAFIRE addresses the fate and impacts these post-fire contaminants on water quality, allowing to estimate their risks to ecosystem services and human health.



Requirements

You just need to be interested in this thematic and enthusiastic in participating in field, laboratory and data analysis work.
If you wish to do your internship, BSc and MSc under the topics of the AQUAFIRE project, go ahead and send us an email.

Research opportunities

The AQUAFIRE project can offer students research opportunities on the following topics:

- The effectiveness of mulching to reduce post- fire export of PTEs to water bodies.
- Fate and mobilization of PTEs in wildfire-affected freshwater bodies.
- Ecotoxicological impacts of wildfires on freshwater ecosystems: assessment of genotoxicity and biochemical endpoints.
- Investigation the collateral effects of wildfires in freshwater fish: alterations of fish behaviour upon exposure to ashes from burned areas.
- Toxicological impacts of post-fire PTEs: assessment of cytotoxicity through the use of relevant human cell models.

University of Aveiro, CESAM & Department of Environment & Planning

SPRINT
SUSTAINABLE PLANT PROTECTION TRANSITION

Impacts of pesticides mixtures on ecosystems

www.sprint-h2020.eu

Isabel Campos
Researcher
www.cesam.ua.pt/icampos
icampos@ua.pt

My research focus on the chemical and (eco)toxicological effects of potentially toxic elements (such as metals and PAHs) on both terrestrial and aquatic ecosystems.

SPRINT project

Agriculture is highly dependent on the use of pesticides to maximise crop yields. However, some pesticides are potentially harmful to environmental, animal and human health. Data on the risks and impacts of pesticides are, at present, fragmented and incomplete. There is, therefore, a need to deliver an integrated approach to fill this data gap.

Hence, the European Project SPRINT-Sustainable Plant Protection Transition: A Global Health Approach (https://sprint-h2020.eu/) will develop and test an integrated global health approach to assessing the risks and impacts of pesticides on environmental, crop, livestock and human health, thus contributing to accelerate the transition towards more sustainable pesticide use.

Research opportunities

The SPRINT project can offer students research opportunities on the following topics:

- **Impacts of pesticides mixtures on beneficial insects;**
- **Bioccumulation of pesticides and biochemical responses on fish;**
- **Bioaccumulation and effects of of pesticides on native earthworms.**

Requirements

You just need to be interested in this thematic and enthusiastic in participating in field, laboratory and data analysis work.

If you wish to do your internship, BSc and MSc under the topics of the SPIRNT project, go ahead and send us an email.

University of Aveiro, Dept. Environment & Planning

STUDENT OPPORTUNITIES

Field monitoring of forest runoff and soil erosion processes from plot to catchment

Jacob Keizer, PhD
Fire eco-hydrologist
email: jjkeizer@ua.pt
url: www.cesam.ua.pt/jjkeizer

My research focuses on forest hydrology and soil erosion, with a special emphasis on the indirect impacts of wildfires runoff generation and the associated soil, organic matter and nutrient losses across spatial scales, from plots to swales to catchments.

Earth Surface Processes Team
espteam.web.ua.pt/

The ESP team

The ESP team has been integrated in the Centre for Environmental and Marine Studies (CESAM), Dept. of Environment and Planning (DAO) of the University of Aveiro since 2005. The ESP team has a long-standing tradition of field studies of hydrological and soil erosion processes, with a special emphasis on recently burnt areas and testing so-called emergency stabilization measures that aim to reduce wildfire-enhanced runoff generation and associated transport of sediments (soil and wildfire ash), organic matter and C, nutrients and contaminants.

Since 2005, well over 100 national and international students and trainees from across Europe have made significant contributions to the ongoing studies and projects of the ESP team, while collecting data and samples in the field, analyzing these samples in the laboratory, analyzing and interpreting the obtained field and laboratory results, and writing it all up in their theses and reports. In numerous cases, these theses/reports have been the basis for articles in international journals, co-authored by the students/ trainees in question.

And guess what?

We continue having excellent opportunities for thesis studies and traineeships, **so consider joining us!!!!**

115 kg of eroded sediments captured by the sediment fence at the outlet of one of the EPyRIS swales in the Penouços burnt area - these sediments were produced by the first post-fire rainfall event and are black because they contain much wildfire ash and charcoal

Opportunities for 2021/22

The following 5 ongoing/starting research projects are offering opportunities for carrying out traineeships and BSc/MSc thesis studies that involve a combination of fieldwork, laboratory work, and data analysis:

1) ASHMOB - quantifying the mobilization of wildfire ash by water erosion;
2) FoRES - field validation of post-fire erosion risk predictions in the Lombada Forest Intervention Area (LFIR);
3) REFOREST - assessing the effectiveness of geotubes and mulching to reduce post-fire soil erosion at the plot scale;
4) EPyRIS - assessing the effectiveness of trunk barriers to reduce post-fire soil erosion at the scale of swales;
5) WAFLE - analyzing the role of forest type and management in the hydrological response and surface water quality at plot to catchment scale.

The ASHMOB and FoRES project will be looking for suitable study areas (to be) burnt during the summer of 2022, while the EPyRIS and REFOREST projects will continue monitoring erosion plots and swales in 2020-burnt areas.

WAFLE will continue operating 4 experimental catchments in north-central Portugal that are dominated by eucalypt or pine stands.

outlet Ermida catchment during runoff event

University of Aveiro, Dept. Environment & Planning

STUDENT OPPORTUNITIES

Integrated impact assessment of certified practices on eucalypt forest management on soil quality and functions

Joana Silva
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Jacob Keizer
EcoHydrologist
jjkeizer@ua.pt
www.cesam.ua.pt/jjkeizer

The ESP team

The ESP team has been integrated in the Centre for Environmental and Marine Studies (CESAM), Dept. of Environment and Planning (DAO) of the University of Aveiro since 2005. The ESP team has a long-standing tradition of field studies of hydrological and soil erosion processes, hydrological modelling, post-wildfire management and carbon and nutrient cycles and soil fertility losses.

http://espteam.web.ua.pt/

SOILFORCER project

It's a PhD project that will compare the impact of certified and non-certified forest management practices. The use of heavy machinery has been reported as promoter of disruption on soil functions, impacting soil quality. Forest Certification Schemes (FCS) intend to address sustainable practices to manage forest soils, however those practices are not yet identified neither the real benefit compared to the old non-certified practices.

Opportunities for 2022

Develop field work on soil:

Soil sampling methods, physical properties (soil water repellency, soil infiltration capacity, soil profile, erosion mitigation measures)

Perform laboratory work: soil texture and agreggate stability analysis, nutrientes assessment, edaphic fauna identification and basal respiration

Come to the team!

If you wish to do your internship MSc with us, go ahead send us an email!

Soil physico-chemical properties

Edaphic invertebrates

Carbon efluxes

Earth Surface Processes Team

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Simulating wildfire ash mobilization using openLISEM

Marta Basso
PhD student
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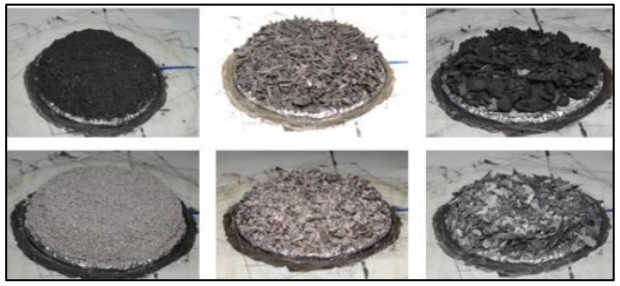
martabasso@ua.pt
Post-fire and hydrological modelling

Ricardo Martins
Post-doctoral researcher
www.ua.pt/pt/risco/ricardo-martins
ricardo.d.martins@ua.pt
Lab. wildfire ash erosion experiments



Project description

Rural fires can greatly increase the risk of on-site soil loss and associated off-site impacts, such as surface water contamination.

Post-fire erosion rates have been quantified and modeled for fire-prone areas worldwide. However, the contribution of wildfire ash to erosion has not been modeled in any study to date. This is probably because of the lack of a reliable methodology to separate the ash component from other eroded sediments. Therefore, the ASHMOB and ASHES projects have conducted several laboratory and lysimeter experiments and are planning a follow-up field experiment this summer.

Tasks

- Set-up and parameterize the rainfall-runoff model OpenLisem (https://blog.utwente.nl/lisem) to simulate wildfire ash mobilization observed in the ASHMOB/ASHES laboratory and/or lysimeter and/or field experiments;
- Participation in fieldwork campaigns in summer 2022 to-be-burnt area, installing runoff-erosion plots, measuring rainfall and runoff, and collecting ash and runoff samples.

Who?

We are looking for an enthusiastic students to help with our work, so if you are considering to do your BSc, MSc thesis or an internship on this topic.

Don't be shy and send us an e-mail!

University of Aveiro, CESAM & Department of Environment and Planning

Integrated tools to assess diffuse pollution

Nelson Abrantes

Researcher

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njabrantes@ua.pt

My research interests are mainly focused on the on-and-off-site impacts of wildfires on both terrestrial and aquatic compartments, on the impacts of diffuse sources of pollution (e.g. agricultural activities) and on the impacts of microplastics in freshwater systems.

Project description

Contamination of freshwater ecosystems is one of the major threats to the biota worldwide. Anthropogenic activities are one of the main contributors to the degradation and pollution of freshwater systems. Toxic pollutants, such as toxic metals, PAHs, and pesticides can have adverse effects on aquatic ecosystems and human health.

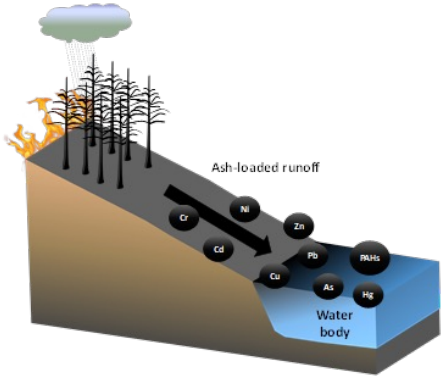
Research opportunities

Within this thematic, you can find the following opportunities for MSc:

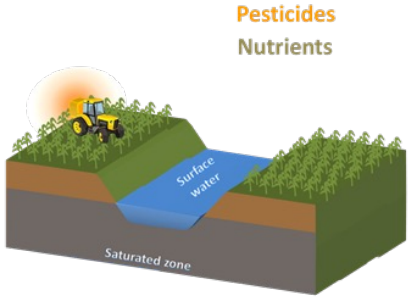
- Impacts of **wildfires** on freshwater ecosystems: potential for trophic transfer of post-fire contaminants – project AQUAFIRE (FCT)

- Impacts of **pesticide mixtures** on freshwater species – project SPRINT (H2020)

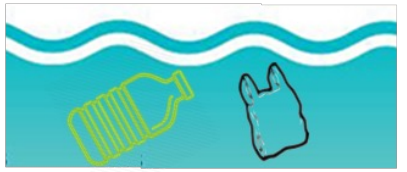
- Impacts of **microplastics** in freshwater ecosystems



Post-fire contamination

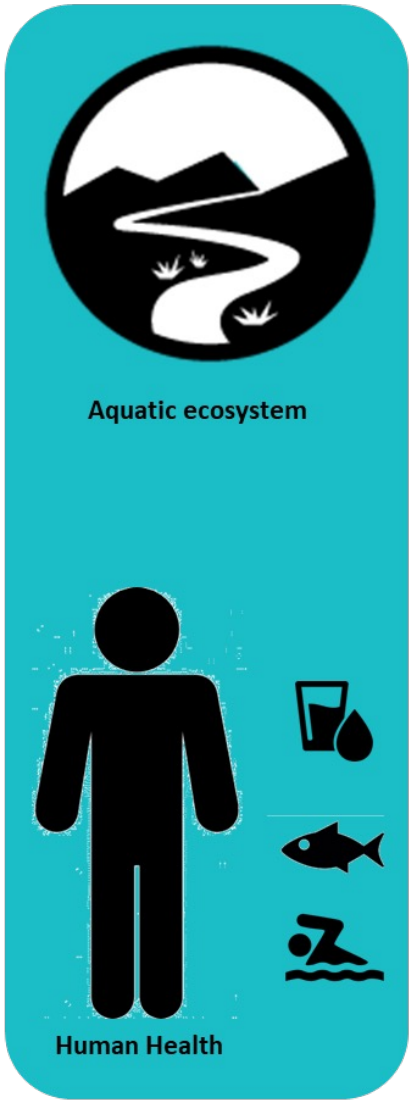


Agricultural diffuse pollution



Freshwater contamination by microplastics

Risk assessment:



University of Aveiro, CESAM & Department of Biology

Sustainable forest management of eucalyptus plantations

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My research interests are mainly related to the investigation of the impacts of forest management practices, such as e.g prescribed fire, on soil quality, biodiversity, fire risk and productivity of forest plantations.

Project description

Suitable forest management strategies have been proven to diminish the occurrence and severity of upcoming wildfires while increasing forest productivity and resilience.

Prescribed fire can be a highly efficient method in diminishing fire risk in forest areas but its impact on eucalyptus plantations remains unclear.

Research opportunities

Within this thematic, you can find the following opportunities for MSc:

- Impacts of **prescribed-fire** on the productivity of eucalyptus plantations – project FirEProd (FCT)

- Assessment of **forest management practices** on the biodiversity of commercial plantations – project FirEProd (FCT)

FirEProd