Ecosystem functioning on high temporal resolution using signal processing and machine learning

54000 Nancy

INRAE presentation

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Work environment, missions and activities

Background Stomatal openings in plant leaves are at the crossroad of carbon and water exchange between plants and the atmosphere. Photosynthesis ($A_n$) can respond immediately to fast environmental changes while stomatal conductance needs time to adjust, taking between a few minutes to almost an hour. This decoupling of photosynthesis and stomatal conductance ($g_s$) leads to sub-optimal water-use efficiency. It is a well-known process in the laboratory but its relevance at the ecosystem scale is unknown.

Aim We propose to determine whole-canopy photosynthesis and conductance in one-minute time resolution at an eddy covariance flux tower site, taking advantage of ecosystem data in high temporal resolution as well as methodological advances in data processing. Applied methods will include continuous wavelet transform to estimate ecosystem fluxes at high temporal resolution as well as artificial neural networks to estimate photosynthesis from the high-resolution ecosystem fluxes.

We are looking for an enthusiastic researcher familiar with machine learning and time-frequency signal processing techniques who is motivated to study the functioning of ecosystems at high temporal resolution.

The successful candidate will work closely with Nikola Besic (LIF-IGN), Matthias Cuntz, Oliver Brendel.
Ecosystem functioning on high temporal resolution using signal process...

and Emilie Joetzjer (UMR Silva) located in Nancy, France. A PhD student, starting in October 2022, and master students (2023) will be characterizing uncoupled photosynthesis-stomatal conductance via in situ measurements at the same time. The work will be performed at the ecosystem station FR-Hes, which is part of the European network ICOS.

Training and skills

PhD

PhD in suitable fields (physics – signal processing – data mining – machine learning – statistics)
Strong programming skills (e.g. Python)
Good spoken and written English language skills
Ability to carry out independent and well-organised research, as well as work as part of a team Interest in eco-physiology, forest functioning or biogeochemical cycles

INRAE's life quality

By joining our teams, you benefit from (depending on the type of contract and its duration):

- up to 30 days of annual leave + 15 days "Reduction of Working Time" (for a full time);
- parenting support: CESU childcare, leisure services;
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- social support: advice and listening, social assistance and loans;
- holiday and leisure services: holiday vouchers, accommodation at preferential rates;
- sports and cultural activities;
- collective catering.

How to apply

Applicants should submit a complete application package by email to the contacts above. The application package should include (1) a curriculum vitae including a publication record, (2) statement of motivation, (3) names, addresses, phone numbers, and email addresses of at least two references.

OFFER REFERENCE

- **Contract:** Postdoctoral position
- **Duration:** 12 months
- **Beginning:** 01/10/2022
- **Remuneration:** 2500 à 2900 € depending on experience
- **Reference:** OT-16294
- **Deadline:** 30/09/2022

CENTRE

Grand-Est - Nancy
Silva

© 54000 Nancy

CONTACT

NIKOLA BESIC
+33 6 03 50 34 78
nikola.besic@ign.fr

MATTHIAS CUNTZ
+33 3 83 39 73 03
matthias.cuntz@inrae.fr

LIVING IN FRANCE AND WORKING AT INRAE
Our guide for international scientists

Headquarters: 147 rue de l'Université 75338 Paris Cedex 07 – tél. : +33(0)1 42 75 90 00

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