FICHE DE POSTE

Fonctions :	Chargé(e) de recherche en écohydrologie
Métier ou emploi type* : *REME, REFERENS, BIBLIOFIL	Ingénieur(e) de recherche en écohydrologie
Fiche descriptive du poste	
Catégorie :	A
Corps :	Ingénieur(e) de recherche
Projet:	ANR HYDROPOP
Affectation	
Administrative :	UMR PVBMT, Campus Moufia, Faculté des Sciences, Bat S6C
Géographique :	Saint-Denis, Ile de La Réunion

Missions

Contexte du projet :

Nous visons à tester l'hypothèse selon laquelle la plasticité phénotypique de la morphologie des « splash cups » chez les espèces de Marchantia (hépatique à thalle) permet une dispersion optimale des propagules végétatives pour la reproduction asexuée de ces espèces. Dans le cadre de ce projet, les travaux menés par l'équipe interdisciplinaire à l'Université de la Réunion réunissant le laboratoire UMR PVBMT (Peuplements végétaux et bioagresseurs en milieu tropical) et l'UMR LaCy (Laboratoire de l'atmosphère et des cyclones) se concentreront sur le WP1.1 (Détermination des facteurs environnementaux corrélant avec la morphologie des corbeilles à propagules sur le terrain le long d'un gradient altitudinal) et sur le WP2.2 (Propriétés des gouttes atteignant ces corbeilles in situ).

Activités principales :

L'IGR en Ecohydrologie interviendra dans le cadre du projet ANR HYDROPOP, à l'UMR PVBMT. Ce projet est réalisé en collaboration avec l'Ecole Polytechnique de Palaiseau et le Muséum National d'Histoire Naturelle.

Il/Elle sera chargé(e) de contribuer au projet en menant à bien les missions suivantes :

1) Caractériser les caractéristiques locales des gouttes de pluie dans une forêt tropicale de montagne de La Réunion (archipel des Mascareignes) ainsi que les microclimats forestiers, à l'aide de disdromètres optiques déployés au sein du dispositif expérimental de l'Observatoire de la zone critique de La Réunion.
2) Identifier les paramètres environnementaux qui influencent la morphologie des corbeilles à propagules
3) Tester la plasticité phénotypique des corbeilles à propagules de *M. globosa* sur l'île de la Réunion en réalisant des expériences de transplantation réciproque.

Les approches proposées incluront de l'écologie, l'écophysiologie, les processus hydrologiques et la physique atmosphérique. Nous recherchons des candidats ayant une formation en écologie ou en écophysiologie, avec une expérience en analyse de mesures climatiques, de bonnes compétences en traitement et analyse de données, et très motivés à travailler au sein d'une équipe interdisciplinaire.

Conditions particulières d'exercice :
Travail sur le terrain et en laboratoire selon les règles d'hygiène et de sécurité mises en œuvre.
Conditions de terrain en milieu tropical.

Encadrement : Non | **Nb agents encadrés par catégorie : A. B. C.**

Conduite de projet : Oui

Compétences

Connaissance, savoir :

- Connaissance approfondie (niveau doctorat) en écologie ou écohydrologie ou écophysiologie
- Connaissances générales en physique atmosphérique
- Bonnes aptitudes à l'analyse de données climatiques.

Savoir-faire :

- Participation aux réunions de l'équipe du projet et à la production des livrables du projet
- Bonne capacité rédactionnelle
- Maîtriser les techniques de présentations orales et écrites
- Pratiquer et maîtriser l'anglais scientifique .

Savoir-être :

- Communiquer et gérer les relations avec les interlocuteurs internes et externes
- Grande rigueur scientifique
- Savoir travailler en équipe
- S'adapter à des environnements de travail sur le terrain en milieu tropical
- Faire preuve de conscience professionnelle et d'intégrité scientifique.

Diplôme et formation :
Niveau Doctorat, expérience Post doctorale souhaitée en écohydrologie.

Domaine de formation : Ecohydrologie, Ecologie, Ecophysiologie et/ou Physique de l'atmosphère avec appétence pour le domaine de l'écologie en milieu naturel

Poste en CDD à pourvoir sur 18 mois (renouvelable 1 fois).
Temps plein.

Candidatures à adresser au plus tard : lettre de motivation, CV à :
recrutement-biatss[a]univ-reunion.fr
Des informations peuvent etre obtenues auprès de madame Claudine AH PENG et de monsieur Joel VAN-BAELEN
Contact : Claudine AH-PENG (claudine.ahpeng@univ-reunion.fr)
Joël VAN BAELEN (joel.van-baelen@univ-reunion.fr)

UNIVERSITÉ DE LA RÉUNION

anr agence nationale de la recherche

POST DOC POSITION in ECOHYDROLOGY

The fixed life of plants and fungi requires specific strategies to disperse progeny. Here, we investigate how plants adjust their dispersal to their environment, using splash-cups as a model. These are specialised cup-shaped organs producing reproductive bodies (spores, propagules, or male gametes) that are entrained by raindrops bouncing off the cups. Splash-cups enable spreading or fertilisation close to parental organisms, increasing the probability of effective establishment and maintenance in an already colonised habitat. Splash-cups have evolved independently in liverworts (mostly *Marchantia* genus), mosses, flowering plants, fungi, and lichens (Brodie, 1951).

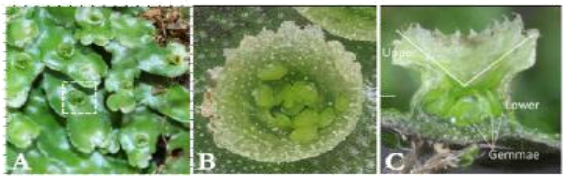

Figure. Splash-cups in *Marchantia* (A) The splash-cups (aka gemma-cups) develop on the dorsal side of thalli, and **(B)** produce and store multiple vegetative propagules (aka gemmae). **(C)** Cross-section showing gemmae and the funnel-shaped top part of the cup (Edwards et al., 2019). Species: *M. globosa* in A, *M. polymorpha* in B and C.

We aim at testing the hypothesis that phenotypic plasticity of splash-cup morphology in *Marchantia* species (spp.) enables optimal dispersal of vegetative propagules (gemmae). We chose to work on liverworts from the *Marchantia* genus for the following reasons (also see Laplaud et al. 2024). First, *Marchantia polymorpha* is the only well-established genetic model (Bowman et al. 2022) among all splashcup making plants and fungi. Second, *Marchantia* spp. are distributed worldwide from tropical to arctic climates and from seashore to mountaintops. Third, *M. globosa* colonies are broadly distributed along the elevational gradient in La Réunion island, and are likely phenotypically plastic (Bischler & Boisselier-Dubayle, 1993). *Marchantia* spp. reproduce asexually by developing gemmae, inside an organ known as the gemma-cup (Figure). The upper part of the cup functions as a splash-cup, with rain ejecting gemmae as far as 1 m. We found that splash-cup size of *M. globosa* correlates with altitude in La Réunion island (our preliminary field data), but we have not identified environmental factors potentially sensed. Gemma-cups in *M. polymorpha* are phenotypically plastic (our preliminary data).

The postdoc project aims at:

1) Characterizing the local raindrop characteristic in a tropical montane cloud forest in La Réunion island (Mascarene archipelago) along with the forest microclimates', using optical disdrometers deployed within the experimental set up of the Observatory of the critical zone of La Réunion. However, spatial and temporal patterns of rainfall are highly heterogeneous and vary according to rain regimes and local terrain (Porcù 2013; Zwiebel et al. 2016), while raindrop characteristics (distributions of size, terminal fall velocity, kinetic energy…) can be modified by orographic effects (altitude and local slope) that affect the microphysical processes at play. Furthermore, raindrop characteristics are disrupted by canopy which can make drops explode into smaller drops upon impact or, to the opposite, allow the generation of larger drops by collecting multiple rain drops on a leaf before letting it fall, while elevation of the canopy above ground may modify the associated fall speed. Hence, the "under-canopy" rain characteristics with respect to "free" precipitations need to be investigated in conjunction with splash-cup morphology.

2) Identifying environmental parameters that influence splash-cup morphology. We will follow *in situ* colonies yearlong and record comprehensive information about colonies and their environment. Plants will be collected with distinctive splash cup size for 3D reconstruction of cup morphology using optical coherence tomography. As plants generally adapt to their environment, we will gather meteorological data (temperature, pressure, humidity, wind, rainfall, radiance) from available stations (e.g., Météo France) and from dedicated stations placed in contrasting microclimates

(lowland forest, cloud forest, subalpine region). We will determine which meteorological factor better correlates with splash-cup morphology, considering temporal aspects, e.g. splash-cup size could be better predicted by total rainfall during its development. This will involve reconstruction of spatiotemporal fields of environmental parameters from stations and extensive multivariate analyses, using classical approaches from spatial statistics. Climatic variability in temperature and precipitation is likely to select for increased phenotypic plasticity in response to temperature and water for plants (Vázquez et al. 2017). We will test if this holds true for splashcups phenotypic plasticity by investigating the effect of seasonal and inter-annual climatic variables such as inter-annual temperature variation, inter-annual precipitation variation, mean annual temperature and mean annual precipitation.

3) Testing phenotypic plasticity of splash cups of *M. globosa* in the island of la Réunion by performing reciprocal transplantation experiments for a few pairs of colonies with contrasted splash-cup size. Individuals from each pair will be transplanted at the location of the other colony. After plants are transplanted, we will measure parameters of new splash-cups formed (density, size…) compared to individuals from the other colony. We will also assess general health of colonies at home and destination sites, by measuring *in situ* chlorophyll-a content and efficiency of photosystem II (in dark-adapted state based on Fv/Fm). In both lab and field experiments, we will quantify phenotypic plasticity of splash-cups using the simplified Relative Distance Plasticity Index (Valladares et al. 2006).

Approaches may include ecology, ecophysiology, hydrological processes and atmospheric physics. We are seeking candidates with a background in ecology or ecophysiology with experience in analysis of climatic measurements, good data processing and data analysis skills, and highly motivated in working in an interdisciplinary team.
The postdoc will have access to all necessary materials and equipment.
The post doc will be based on the Northern campus of the **University of la Réunion** at the **UMR PVBMT**, on the Northern campus, in Saint-Denis and will be interacted with colleagues from the Observatory of the critical zone of Réunion and from the **LaCY** (Laboratory of the atmosphere and cyclones).

The start date is relatively flexible although expected by mid-February 2025 while the initial contract will be for 18 months (renewable for another 18 months). For questions and formal applications (a curriculum vitæ including contact information of two references and a one-page letter describing your motivation, assembled in a single pdf file titled "HYDROPOP Postdoc application_your name"), please contact both Dr. Claudine Ah-Peng (claudine.ahpeng@univ-reunion.fr) and Dr. Joël van Baelen (joel.van-baelen@univ-reunion.fr). It is expected that official applications will be open from December 15th 2024 to January 20th 2025 at sfecodiff@sfecologie.org and on other websites and platforms.

References:

HJ Brodie 1951 The splash-cup dispersal mechanism in plants. Can J Bot 29 224
H Bischler & C Boisselier-Dubayle 1993 Variation in a polyploid, dioicous liverwort, *Marchantia globosa* Am J Bot 80 953
Porcù F et al. (2013) Effects of Altitude on Maximum Raindrop Size and Fall Velocity as Limited by Collisional Breakup. J Atmos Sci 70:1129
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J Edwards, M Laskowski, TI Baskin, N Mitchell & B DeMeo 2019 The Role of Water in Fast Plant Movements Integ Comp Biol 59 1525
H Kato et al. 2020 Gemma cup and gemma development in Marchantia polymorpha New Phytol 228 459
V Laplaud, E Muller, V Demidova, S Drevensek & A Boudaoud 2024 Assessing the hydromechanical control of plant growth. J. Roy. Soc. Interface 2 20240008
Zwiebel J et al. (2016) Impacts of orography and rain intensity on rainfall structure. The case of the HyMeX IOP7a event. Q J Roy Meteor Soc 142:31
Vázquez DP et al. (2017) Ecological and evolutionary impacts of changing climatic variability. Biol Rev 92: 22
Valladares F et al. (2006) Quantitative estimation of phenotypic plasticity: bridging the gap between the evolutionary concept and its ecological applications. J Ecol 94: 1103