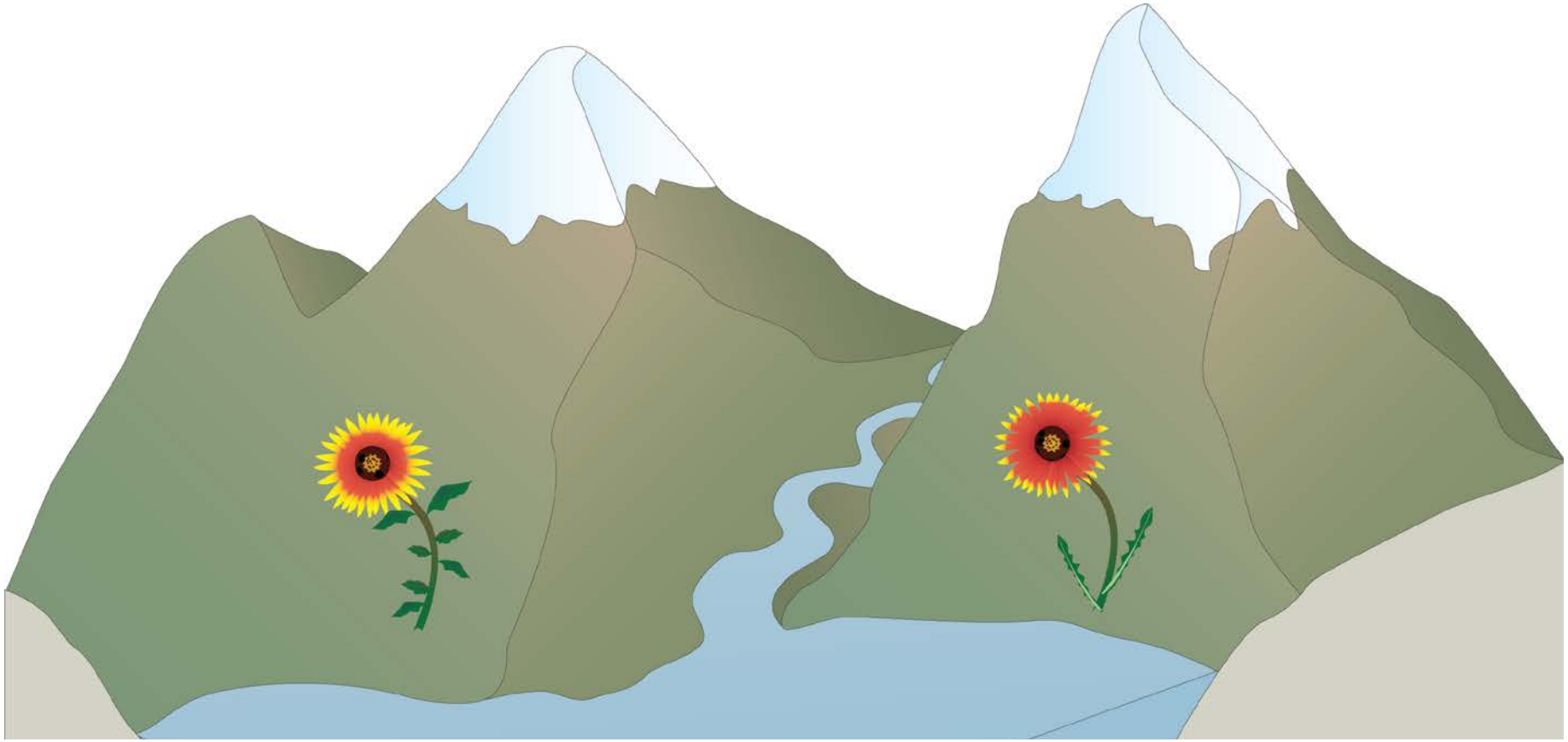
The principal message: Seasonality in temperature and precipitation together with land use / land cover drive microbial community structure and function from lowlands to high mountains

Erika Buscardo[1] and Laszlo Nagy[2]

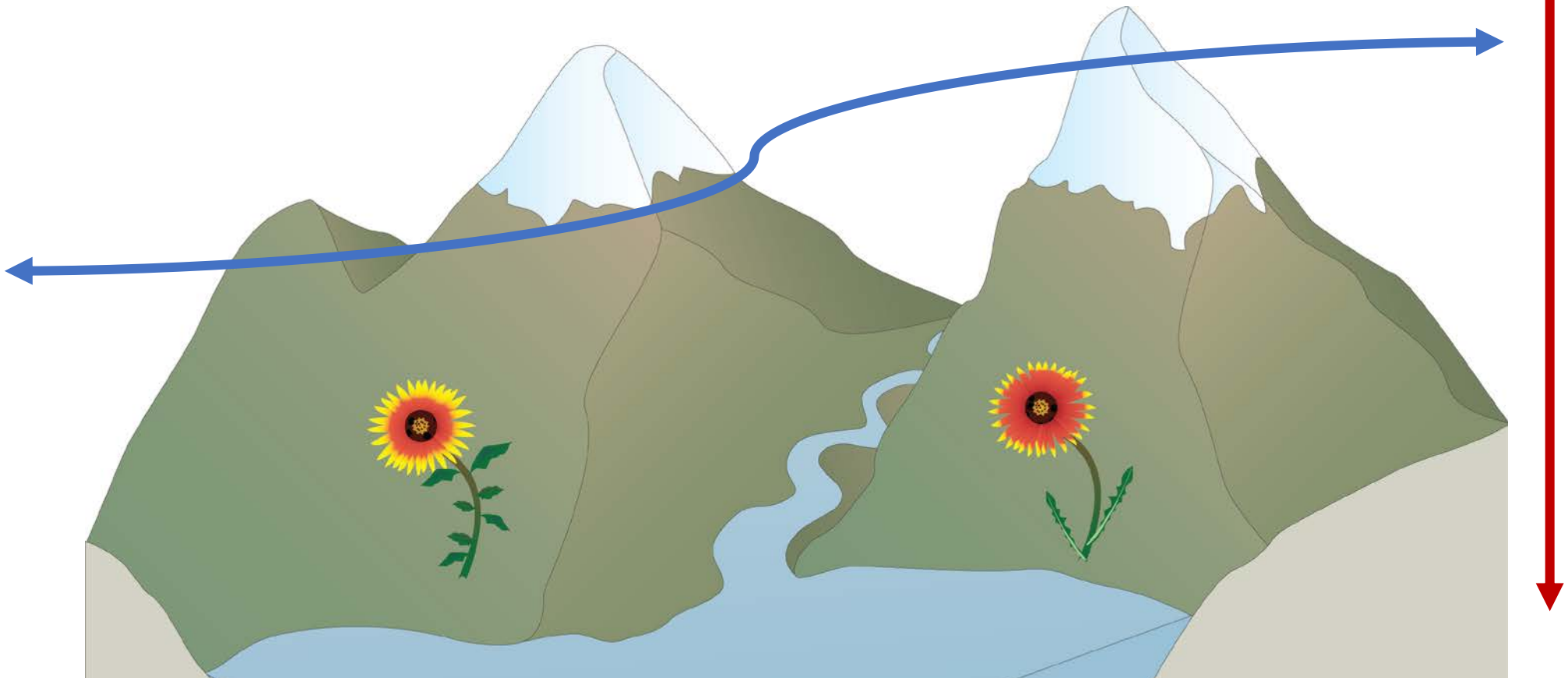
[1]Universidade de Brasília; [2]Universidade Estadual de Campinas, Brasil

Thermal and precipitation seasonality as direct/indirect drivers of microbial community structure and function



Climate gradients in mountains

Precipitation does not follow a predictable pattern

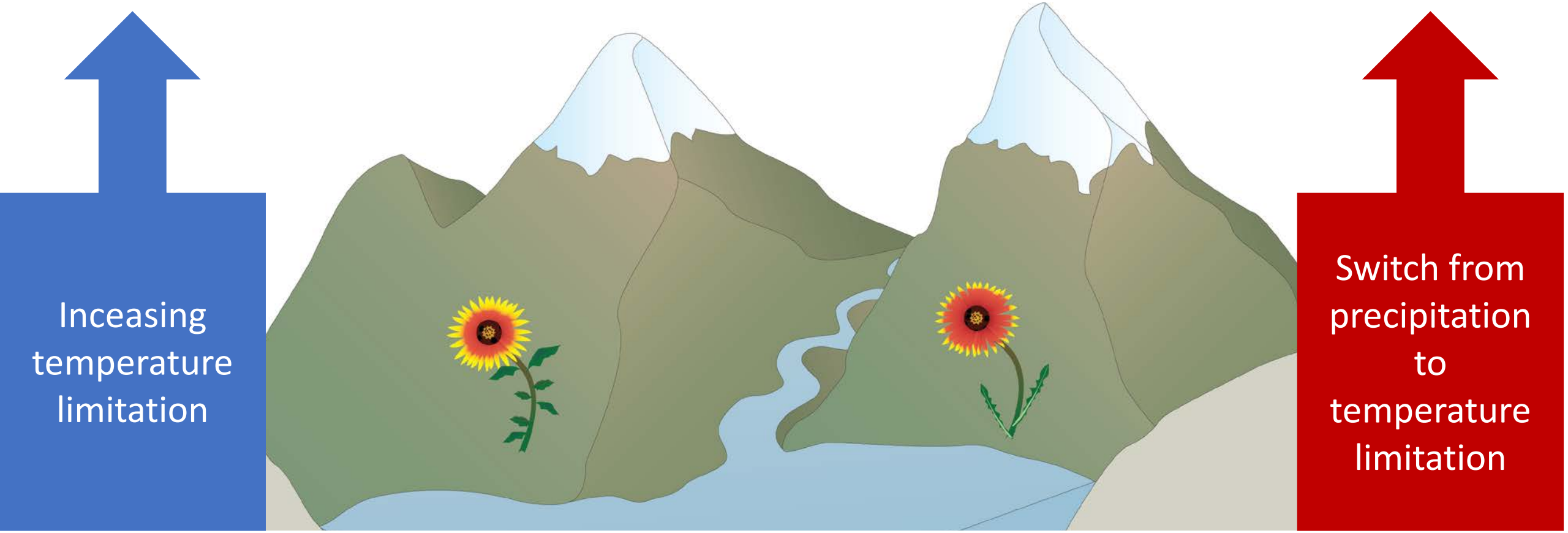


Temperature follows a predictable lapse rate

Seasonality in temperature and precipitation

Extratropical
(Temperature seasonality)

Tropical
(Precipitation seasonality)

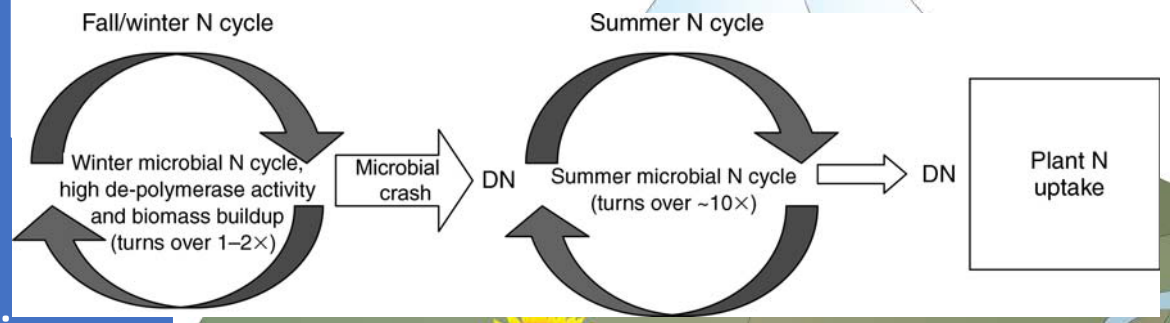


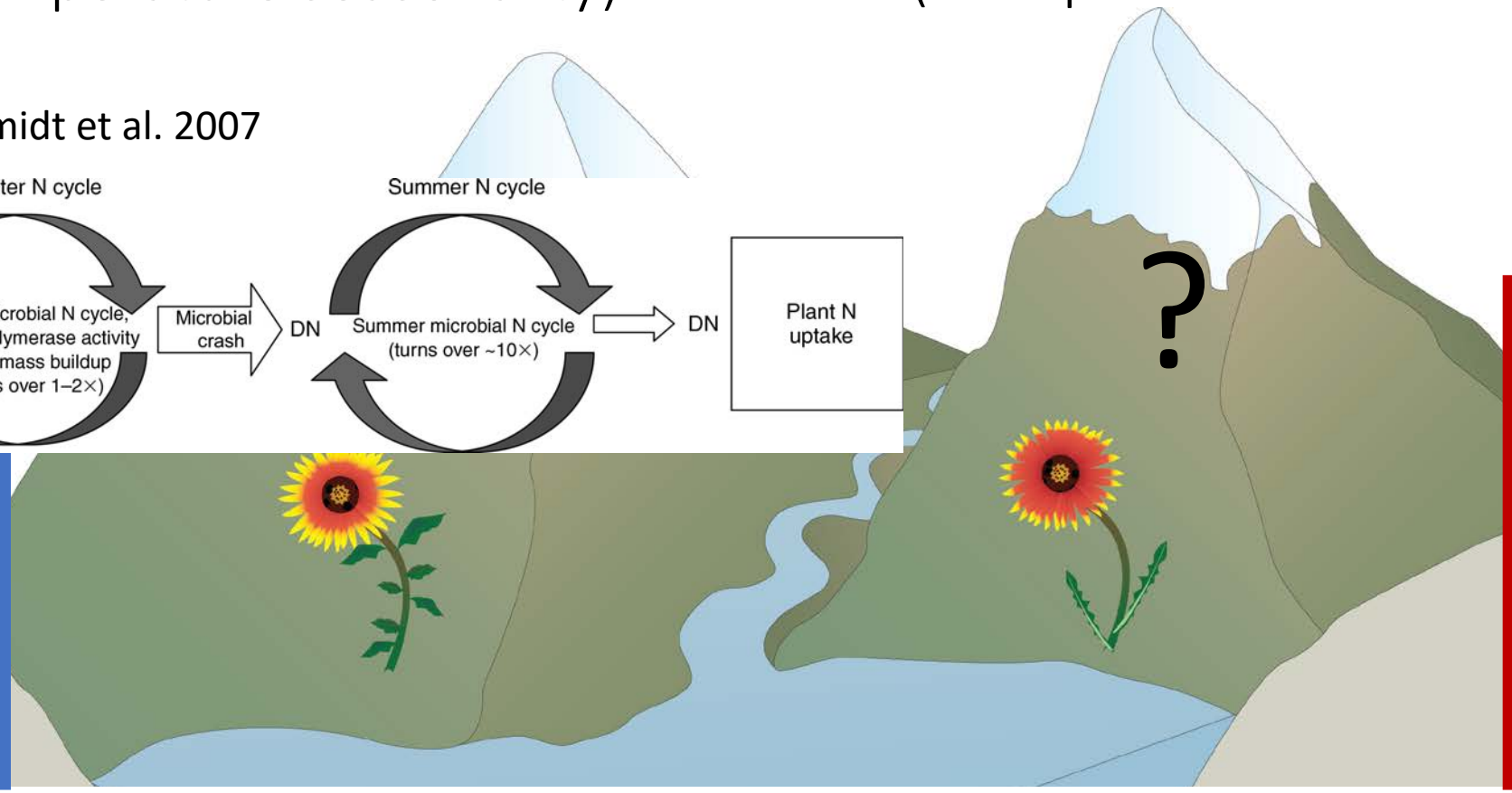
Seasonality and microbial community composition and biogeochemistry

Extratropical
(Temperature seasonality)

Tropical
(Precipitation seasonality)

Schmidt et al. 2007





Inceasing temperature limitation

Switch from precipitation to temperature limitation / **from P to N limitation**

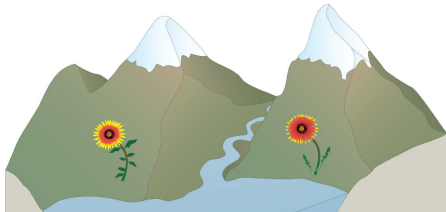
Seasonality and soil microbial community composition and biogeochemistry in the tropics

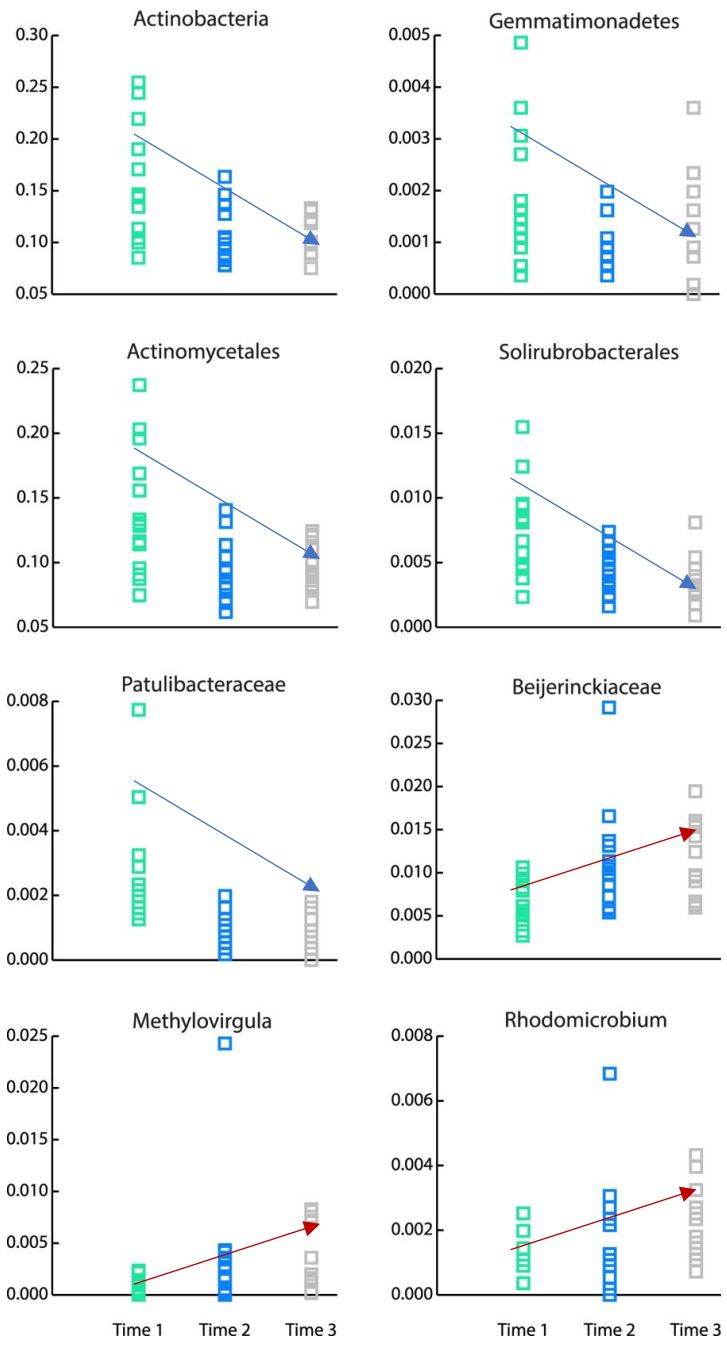
to montane forests

(and alpine ecosystems)

Switch from precipitation to temperature limitation / from P to N limitation

From lowland





SCIENTIFIC REPORTS

OPEN

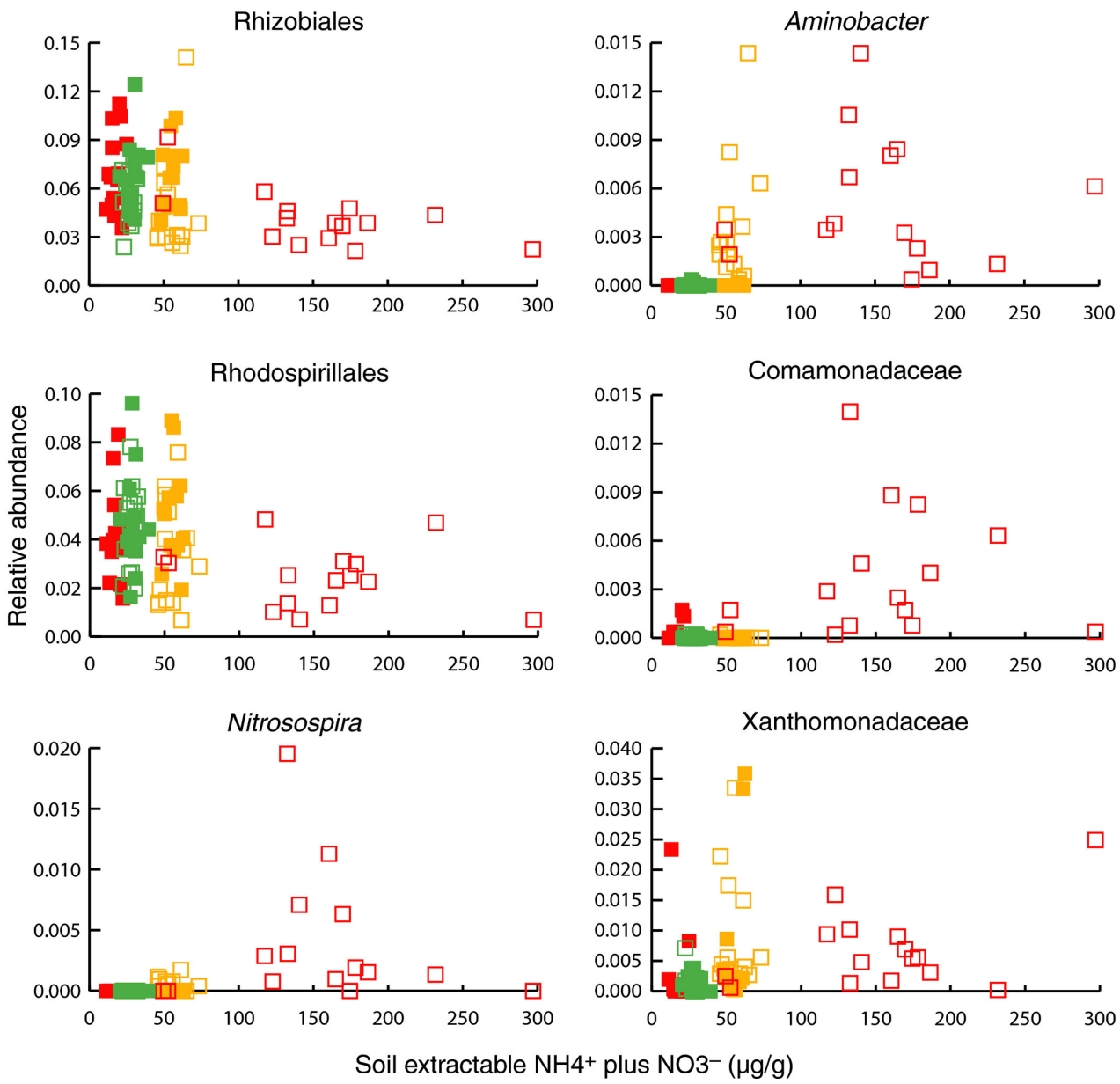
Spatio-temporal dynamics of soil bacterial communities as a function of Amazon forest phenology

Erika Buscardo[1,2,3], József Geml[4,5], Steven K. Schmidt[6], Helena Freitas[1], Hillândia Brandão da Cunha[3] & Laszlo Nagy[2,3]

Received: 22 September 2017
Accepted: 14 February 2018
Published online: 12 March 2018

- community composition ~ pH (higher values in the dry season);
- rainy season: Actinobacteria - major decomposers of complex polymers, anaerobic saprophytes/anaerobic N_2-fixers adapted to fluctuating redox conditions;
- dry season: Beijerinckiaceae (Rhizobiales), free-living N_2-fixers, dominant in the phyllosphere.

Buscardo, E., et al. (2018). "Spatio-temporal dynamics of soil bacterial communities as a function of Amazon forest phenology." Scientific Reports **8**(1): 4382.



RESEARCH ARTICLE

Functional Ecology

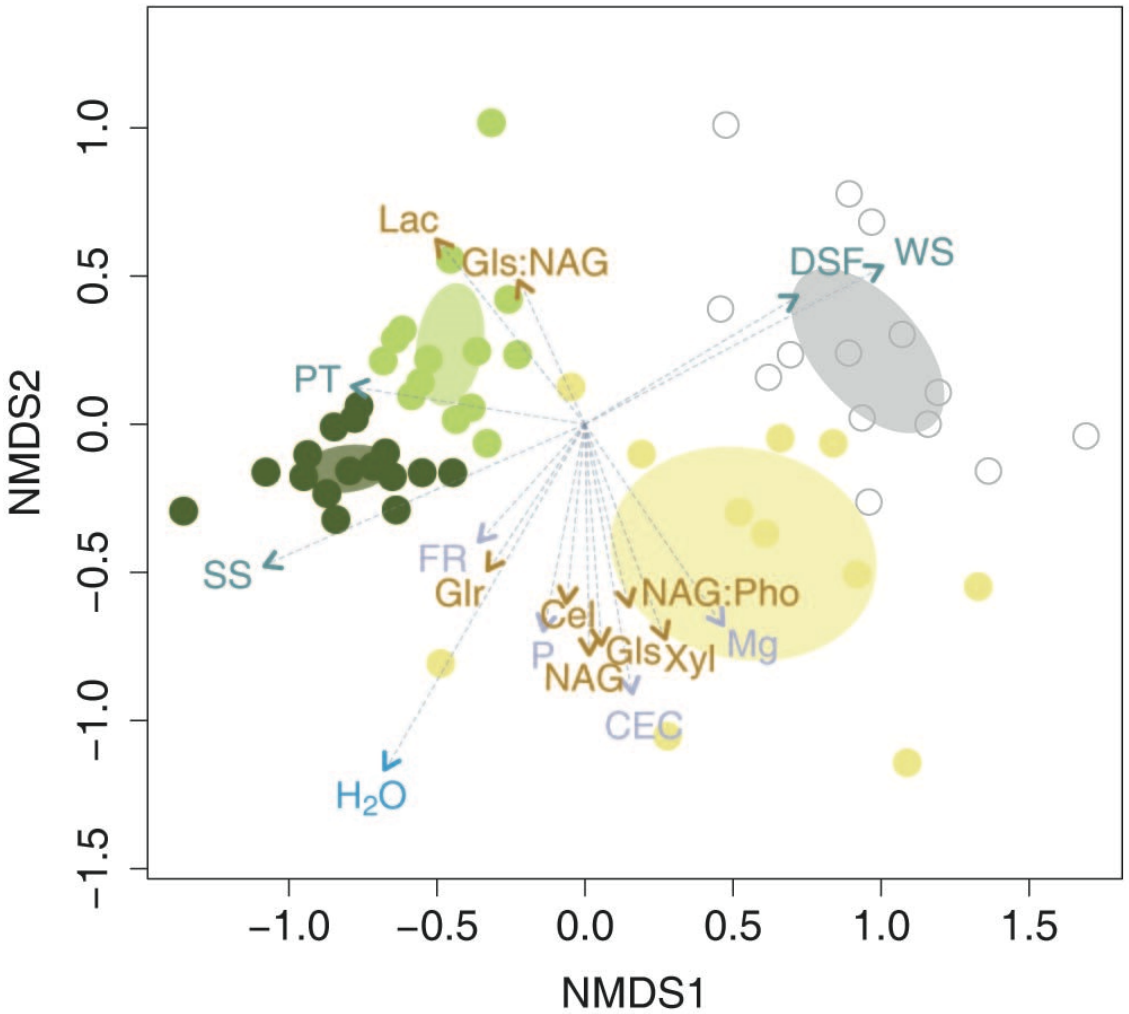
Of mammals and bacteria in a rainforest: Temporal dynamics of soil bacteria in response to simulated N pulse from mammalian urine

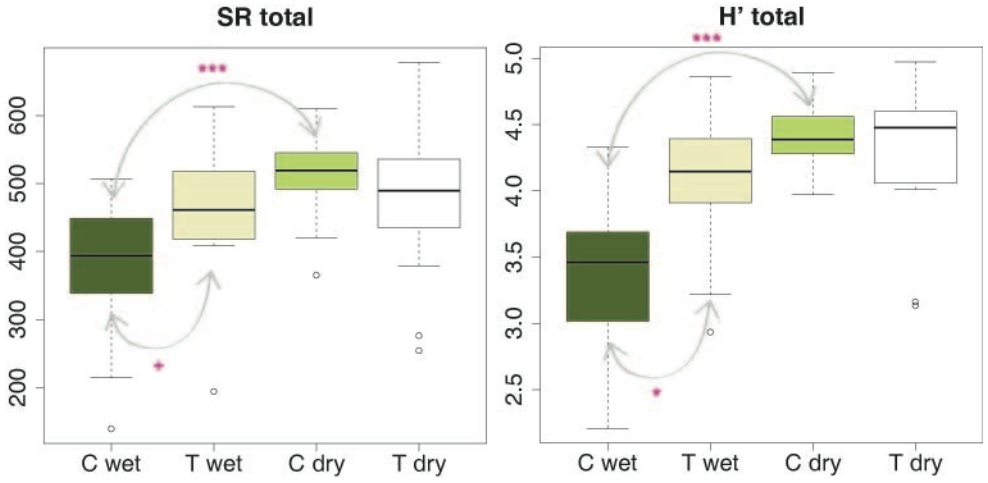
Erika Buscardo[1,2,3] | József Geml[4,5] | Steven K. Schmidt[6] | Artur L. C. Silva[7] | Rommel T. J. Ramos[7] | Silvanira M. R. Barbosa[7] | Soraya S. Andrade[7] | Ricardo Dalla Costa[8] | Anete P. Souza[2] | Helena Freitas[1] | Hillândia B. Cunha[3] | Laszlo Nagy[2,3]

Increased abundance of nitrifiers / denitrifiers and decrease in N-fixers after urea-N input in a **lowland** Amazonia

Buscardo, E., et al. (2018). "Of mammals and bacteria in a rainforest: Temporal dynamics of soil bacteria in response to simulated N pulse from mammalian urine." Functional Ecology **32**(3): 773-784.

Higher soil **fungal** OTU richness and diversity in the dry season in **lowland** Amazonia



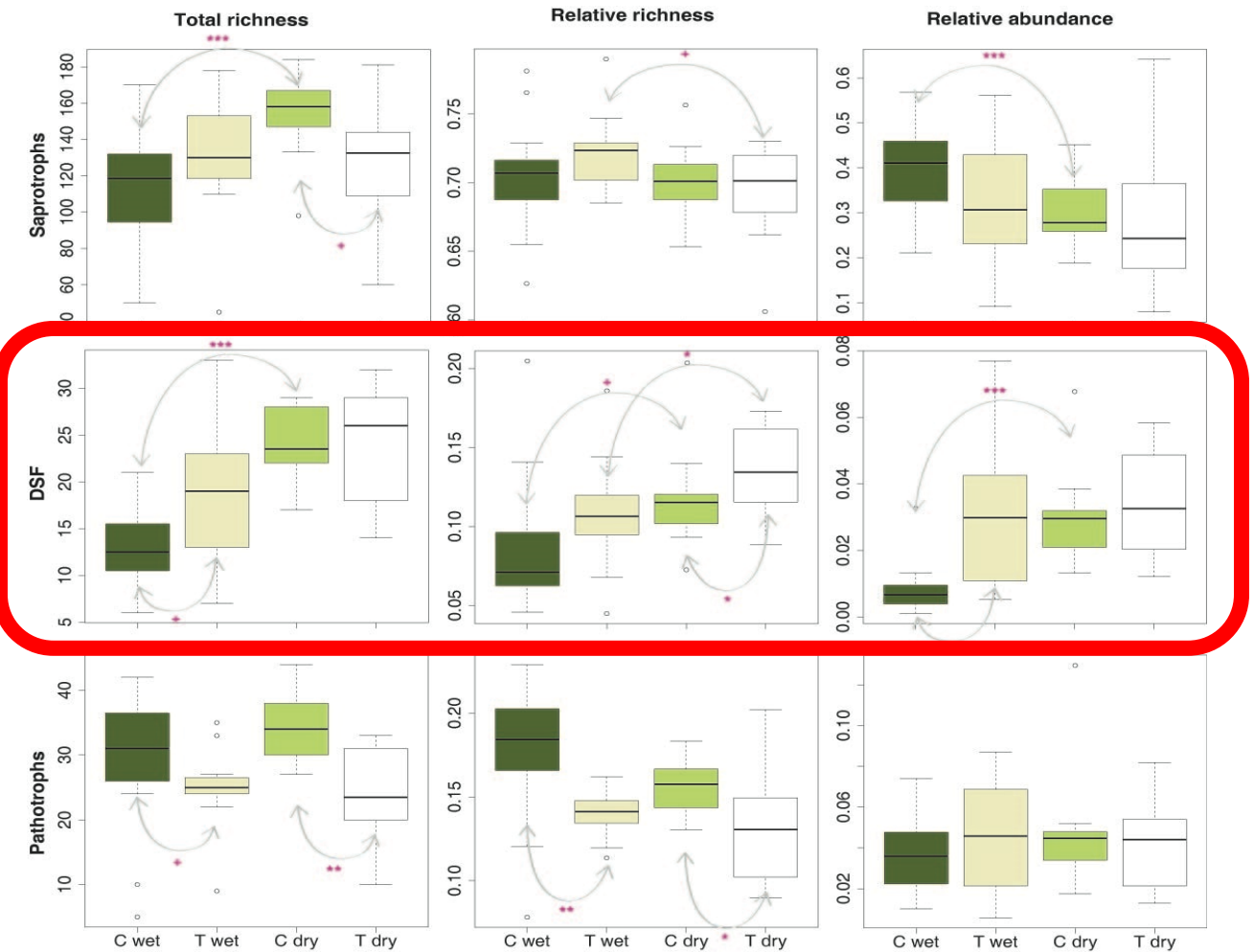


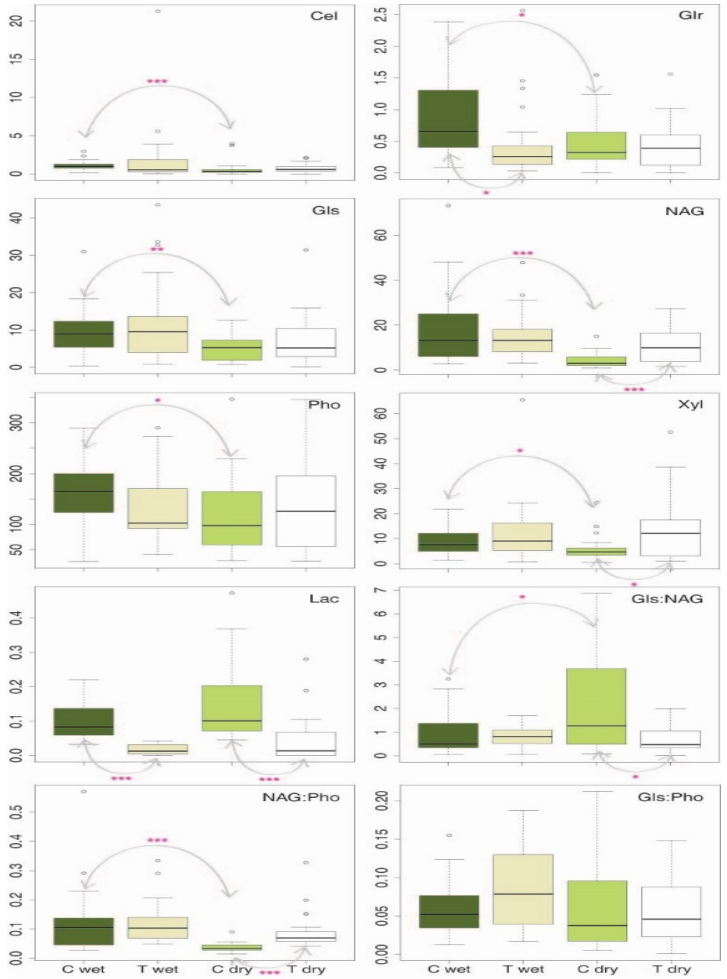
Buscardo et al. in submission

Diversity / abundance of dark-septate fungi seasonally increase with soil drought

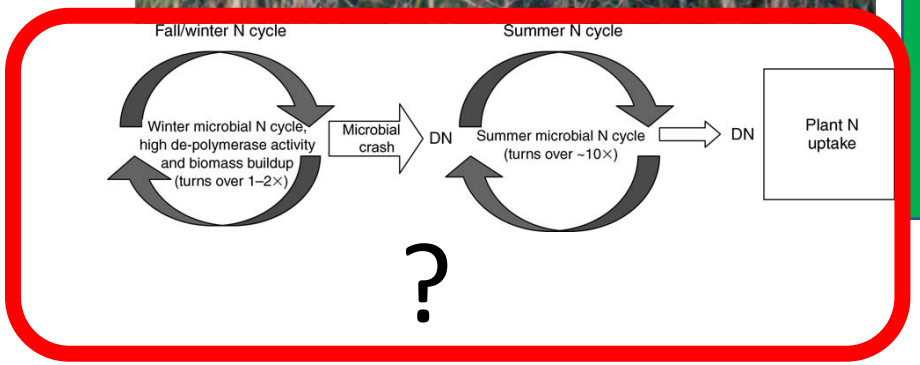
Less extracellular enzyme activity in the dry season in **lowland** Amazonia

Buscardo et al. in submission



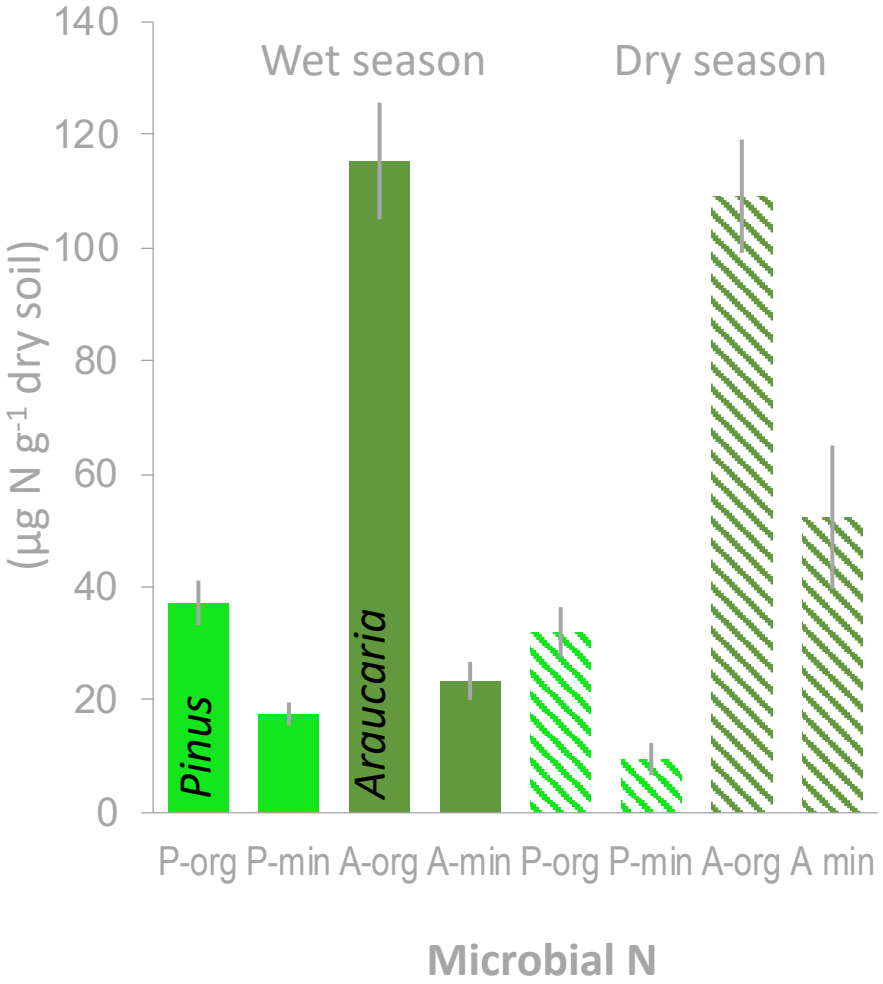


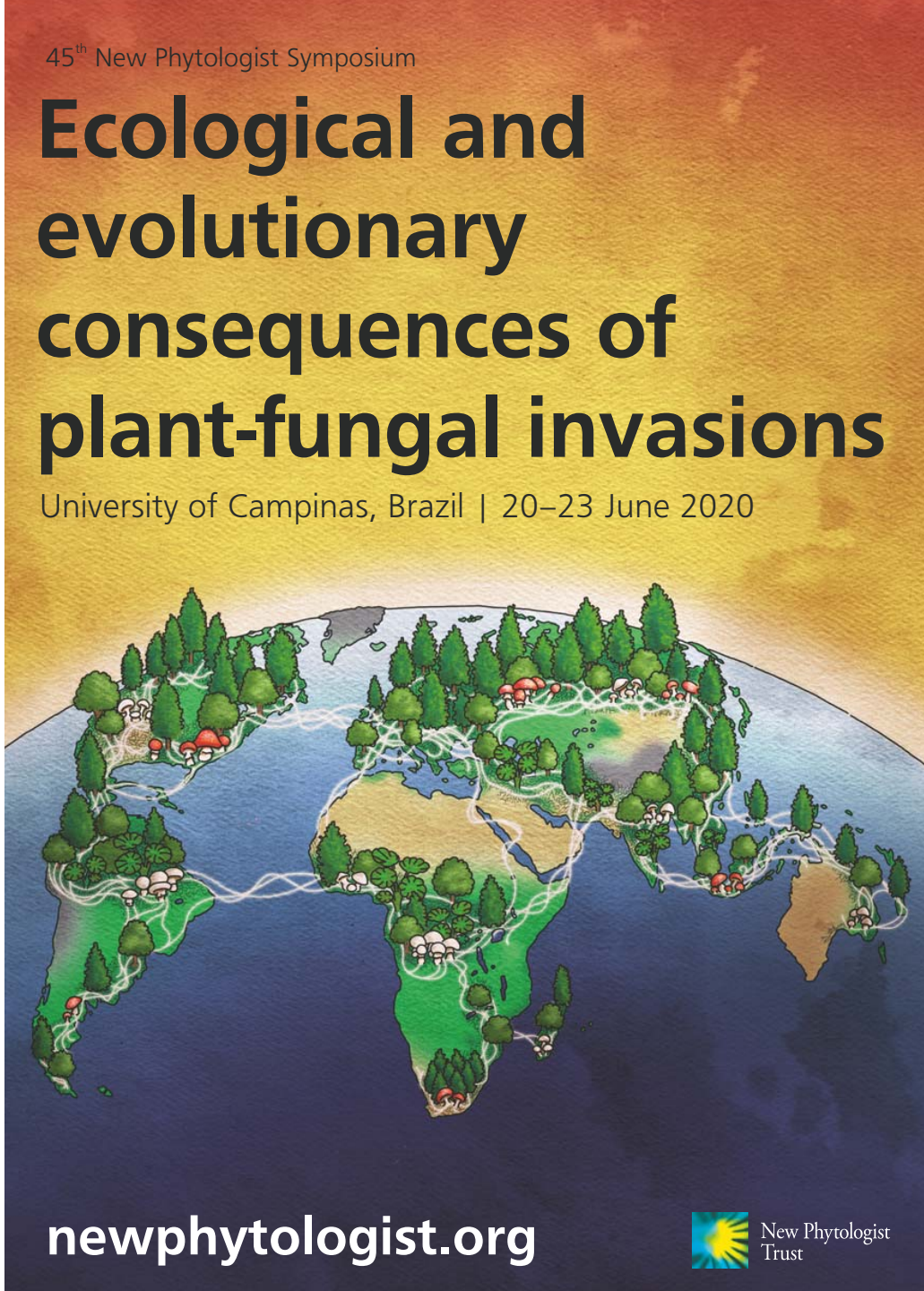
Land use / land cover change and microbial community composition and biogeochemistry in tropical mountains



Switch from *Araucaria* to *Pinus* spp.

Switch from AM to ECM / more efficient N acquisition?



Thank you and come to Campinas next June

The consequences for biodiversity and ecosystem function of altering the distribution and relative dominance of plant and soil fungal communities through introductions and management