



The University of Hong Kong  
School of Biological Sciences

Qualifying  
Seminar

# Tropical rainforests vulnerability to elevated air drought stress: mechanisms, models, and implications

**Date: 29<sup>th</sup> January 2026**

**Time: 10 am**

**Venue: 6N-11**



## About the speaker:

Yuhao Pan is a PhD student under the supervision of Prof. Jin Wu. His research focuses on fundamental mechanisms that regulate tropical rainforests and air drought interactions in the context of ecophysiology



## Abstract:

Tropical rainforests are crucial for regulating large-scale biogeochemical cycles and climate, yet their functioning is increasingly threatened by intensifying atmospheric drought stress (approximated by vapor pressure deficit, VPD). Understanding how dry-season gross primary productivity (GPP) responds to rising VPD stress is essential for robust projections of future carbon uptake, but it remains challenging to disentangle the direct effects of VPD from co-varying drivers such as phenology. Here, we quantify the sensitivity of dry-season GPP to VPD (defined as the change in GPP per unit change in VPD) across tropical rainforests over the past decade, and relate this sensitivity to environmental conditions and phenological dynamics using eddy-covariance and satellite observations. Specifically, we (1) develop and apply a framework to separate the effects of VPD and phenology on GPP and assess whether negative VPD impacts on GPP are widespread; (2) investigate the mechanisms underlying intra-seasonal acclimation within sites and cross-site adaptation along environmental gradients; and (3) benchmark Earth System Models (ESMs) against the observed GPP–VPD sensitivities and mechanisms. Together, these analyses provide new constraints on how tropical rainforest productivity responds to atmospheric drying and highlight an elevated risk of approaching critical tipping points under continued climate change.