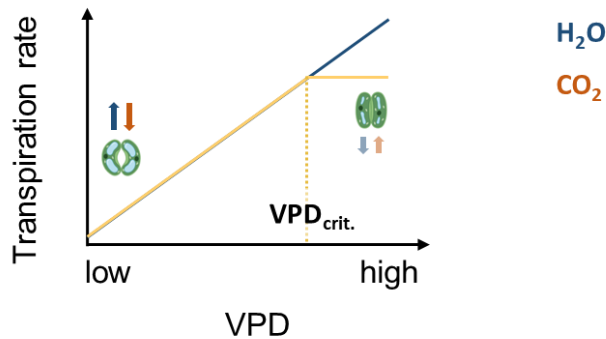


# How do plant water status dynamics shape plant water use regulation during atmospheric drought?

## Motivation

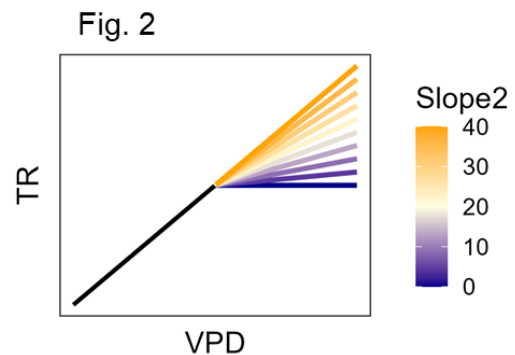
The global rise in vapor pressure deficit (VPD), i.e., the “desiccating strength” of the atmosphere, is a consequence of global climate change and poses a threat to crop production. Plants mitigate high atmospheric water demand by regulating their water loss via dynamically opening and closing microscopically small pores on the surface of plant leaves that regulate plant water and gas exchange (stomata). Stomatal regulation is controlled by a complex cocktail of hormonal and hydraulic drivers shaping leaf water status (i.e., leaf water potential), making it challenging to understand and predict genotypic differences in plant water use during atmospheric drought.



**Fig. 1:** As VPD rises, plant water loss (i.e., transpiration rate, TR) increases. Through stomatal closure, plants may limit their water loss at a critical VPD ( $VPD_{crit.}$ , yellow line). If stomatal closure is not able to compensate for the water loss as driven by rising VPD, plants transpire linearly with increasing VPD (blue line). How do plants “decide” what to do?

## Objectives and Methods

Your task will be to close the knowledge gap of how water potential dynamics feed back on stomatal regulation to shape the slope after  $VPD_{crit.}$  (Slope2, Fig. 2), and to disentangle the underlying drivers. To answer this question, you will use controlled experiments in potted plants, combining established fundamental and novel cutting-edge methods in plant physiology/ hydrology. Ultimately, the aim is to simulate differences in Slope2 using a hydraulic-stomatal optimization-based model.



## Timeline and requirements

The project can be started any time and is supervised by Dr. Tina Koehler. We are looking for a highly motivated master’s student who meets the following criteria:

- Strong interest in plant water relations, root physiology, and drought adaptation
- Willingness and ability to work independently during a 4-6-week experimental campaign
- Enrolled in a master’s program relevant to the topic
- Basic understanding of soil-plant hydraulics/ crop physiology
- Good communication skills and proficiency in English
- Experience in data analysis using R
- Ideally, prior experience in plant physiology or plant hydraulic measurements (i.e., operating Scholander pressure chamber, LICOR LI6800)
- Strong organizational skills, ability to plan and execute experiments
- Motivation to engage in interdisciplinary work (combining empirical data collection with modeling)
- Team player with a collaborative attitude in an international research setting

If you are interested, please contact [tina.koehler@tum.de](mailto:tina.koehler@tum.de)