Community assembly along stress gradients: the effect of cloud and wind on forest vegetation in Taiwan

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ECOLOGY & EVOLUTIONARY BIOLOGY

Afternoon sea of cloud, eastern part of Taiwan

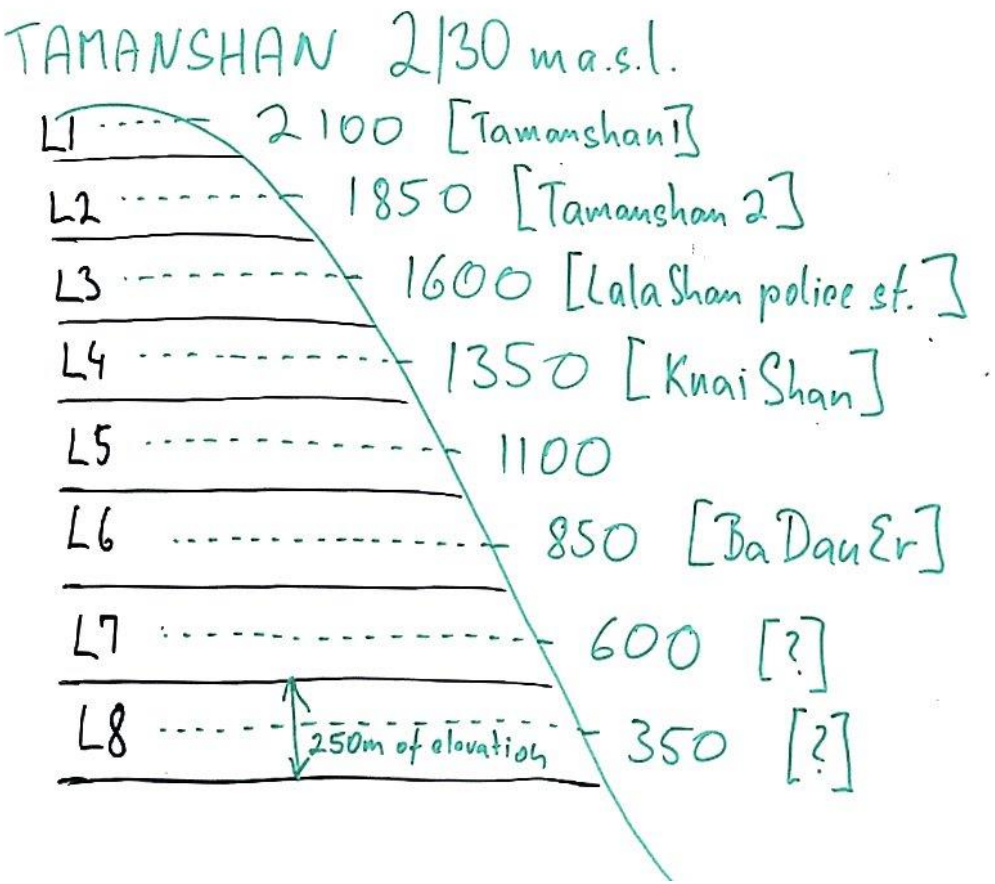
Forest close to Yuan-yang lake

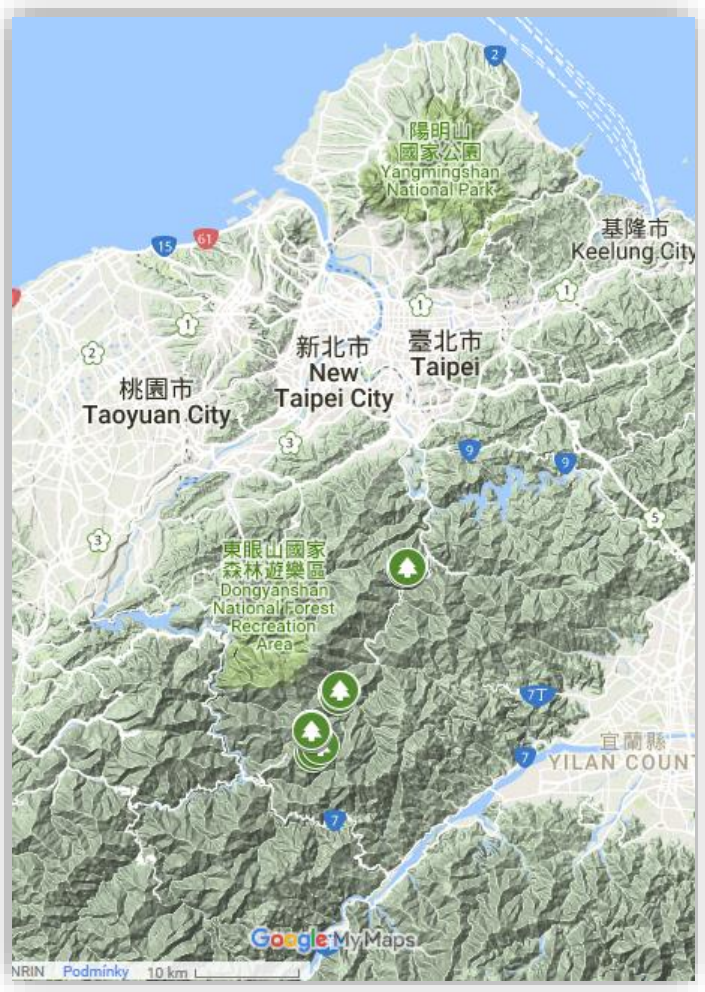
Project aims

For the gradient of **cloud** and **wind**,

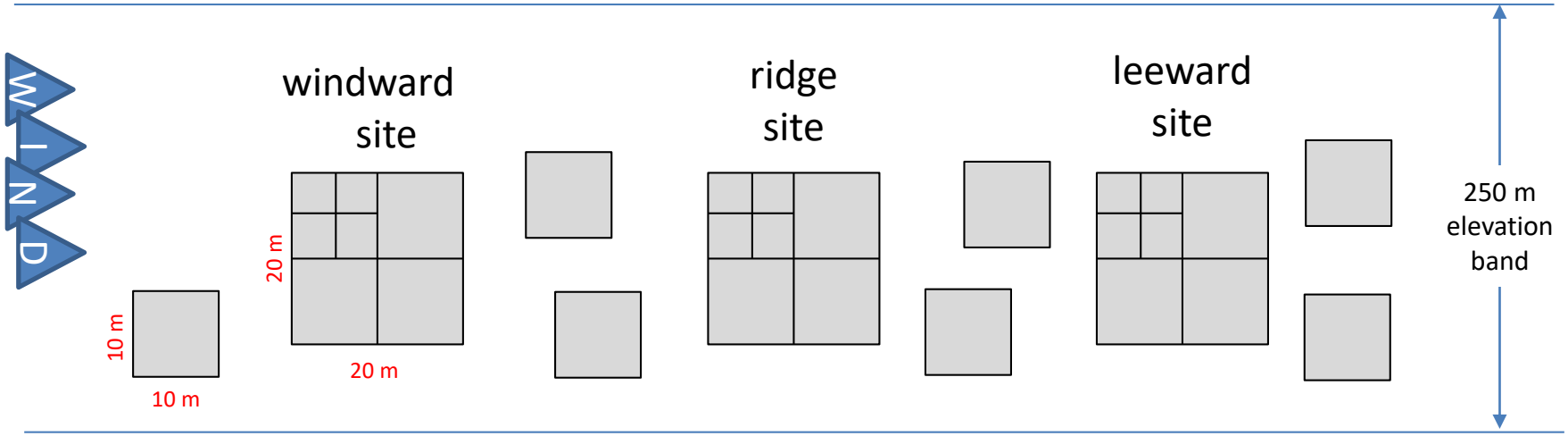
1. analyse changes in species- and community level leaf and wood functional trait,
2. describe pattern of taxonomic and functional diversity,
3. compile Ellenberg-like species indicator values,
4. identify specialists and describe their trait properties.

Study area (Lalashan transect)





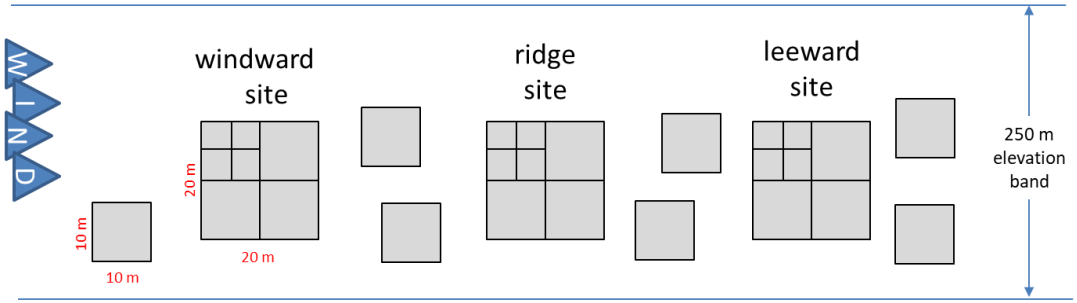
Sampling design (in each elevation zone)

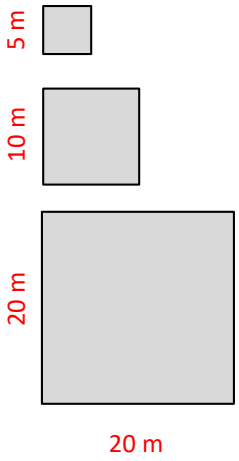


- *Large plots* (20×20 m, permanent, 3 per elevation) – permanently marked, record species composition, measure tree DBH, collect trait data, record long-term microclimatic measurement, measure detail environmental data

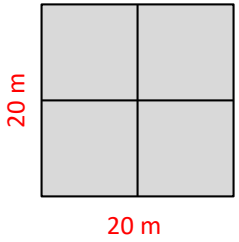
- *Small plots* (10×10 m, non-permanent, 7 per elevation) – evenly distributed, record only species composition, measure only topography and soil

Sampling design (in each elevation zone)

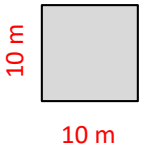




nested plots (3 sets)



standard vegetation plots (3)



small plots (10)

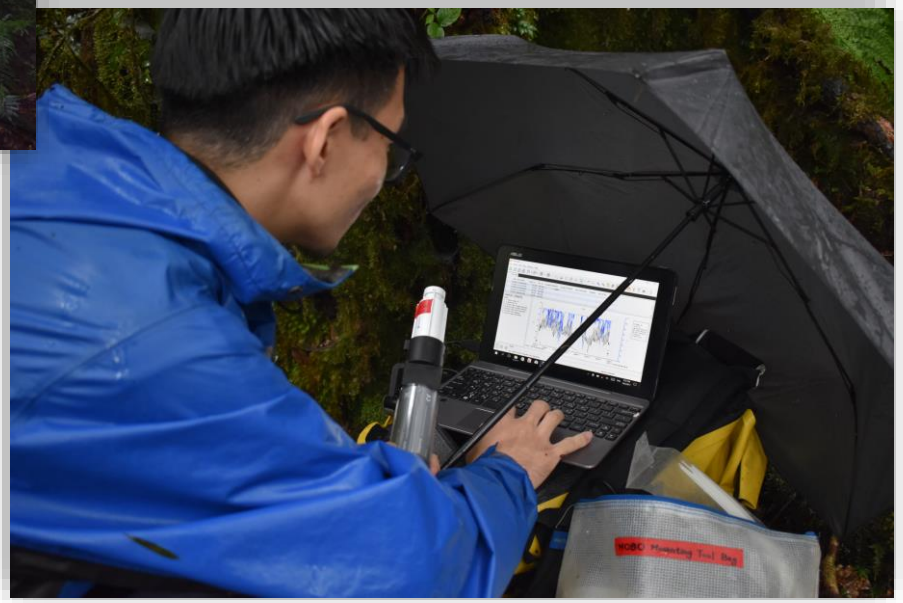
Environmental data

For each permanent 20×20 m plot, we collect

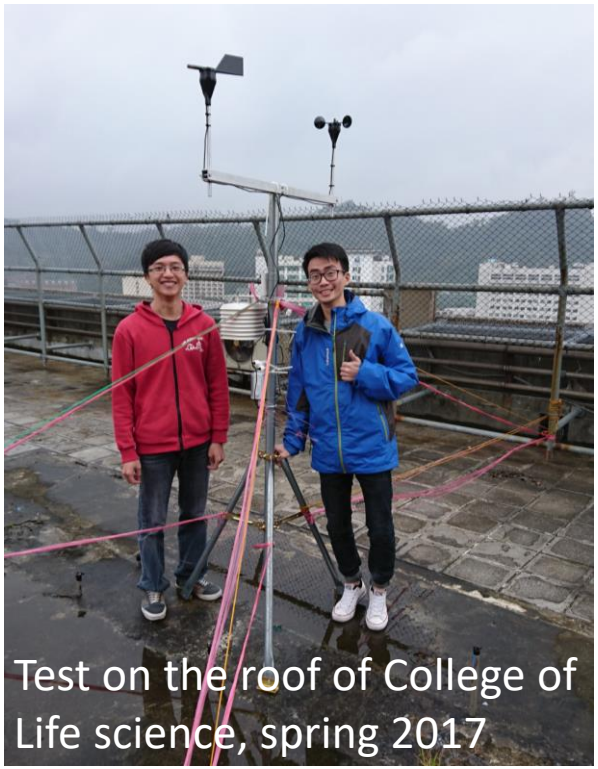
- standard topographical data
- soil samples for chemical analysis
- canopy structure (fish-eye photography)
- long-term air temperature and humidity measurement
- interior wind speed and direction measurement (for selected windward and leeward plots)

Long-term measuring of air temperature and humidity

Lin, Tsung-Yi (林宗儀) installing and downloading the loggers



Wind speed and direction measurement



Test on the roof of College of Life science, spring 2017

Installation in the forest interior, Tamanshan, October 2017

Trait measurements

- Standard leaf traits (woody species & ferns)
  - specific leaf area (SLA), leaf area (LA), leaf thickness, leaf dry matter content (LDMC), leaf chlorophyll content

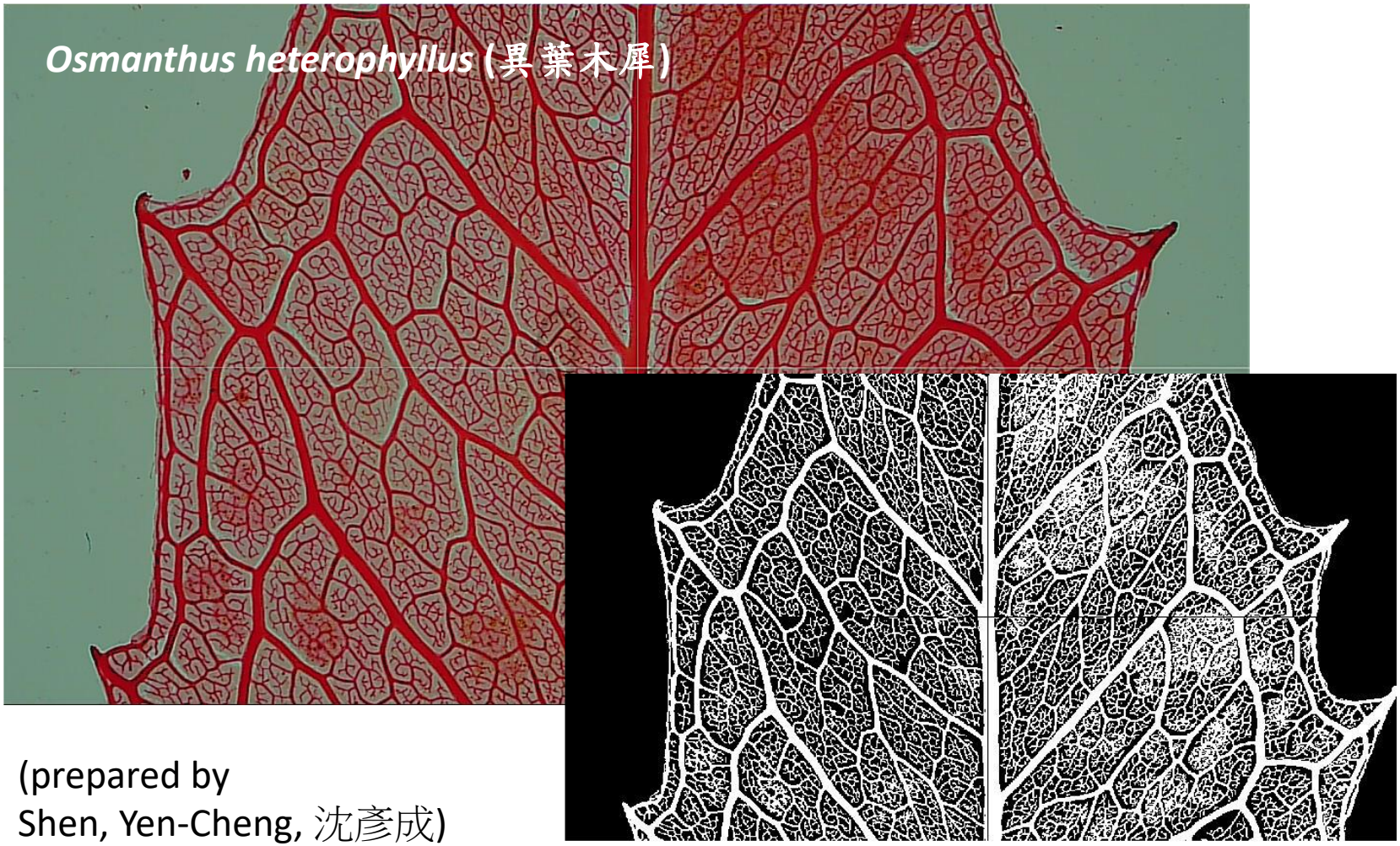
- Additional leaf and wood traits (for woody species only)
  - leaf nitrogen and phosphorus concentration and isotopic ratio
  - stem specific density (SSD, wood density)
  - leaf vein density
  - leaf wettability
  - leaf mechanical resistance (force to tear)

Leaf traits for fern species

Diplazium dilatatum 廣葉鋸齒雙蓋蕨

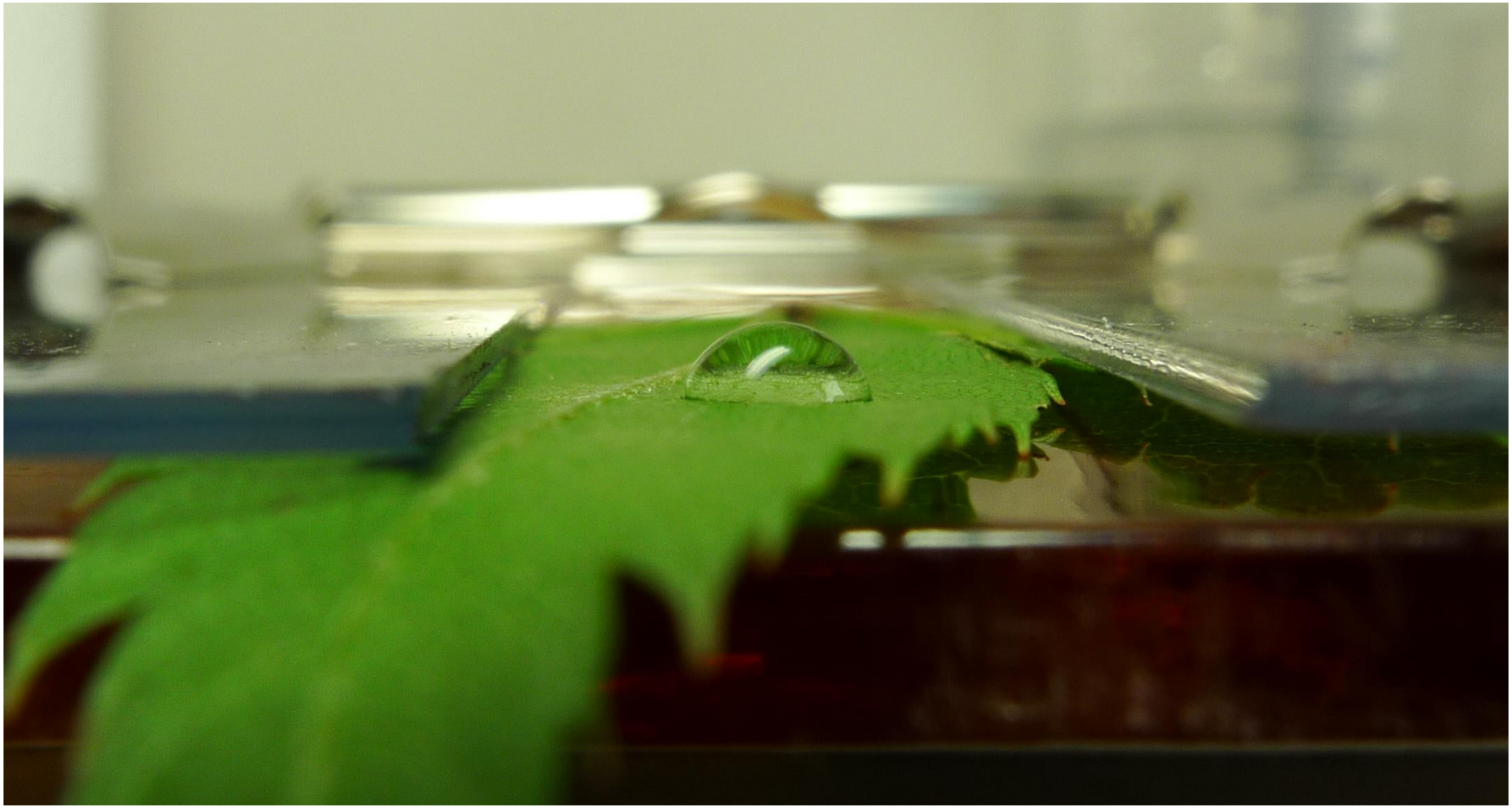
(prepared by Lin, Tsung-Yi, 林宗儀)

Vein density (woody species)



(prepared by
Shen, Yen-Cheng, 沈彥成)

Leaf wettability (droplet analysis)



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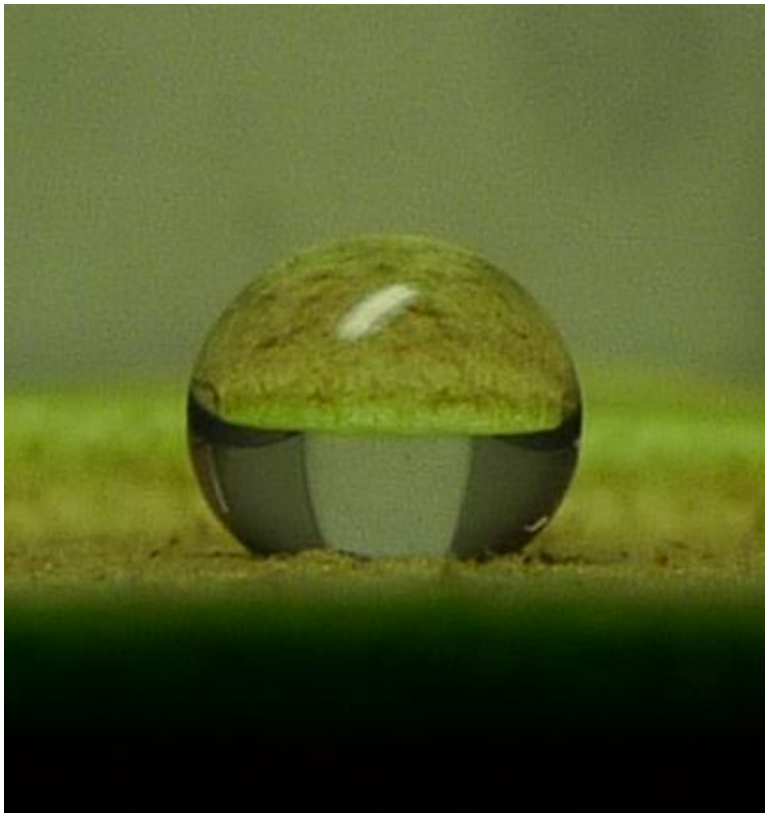


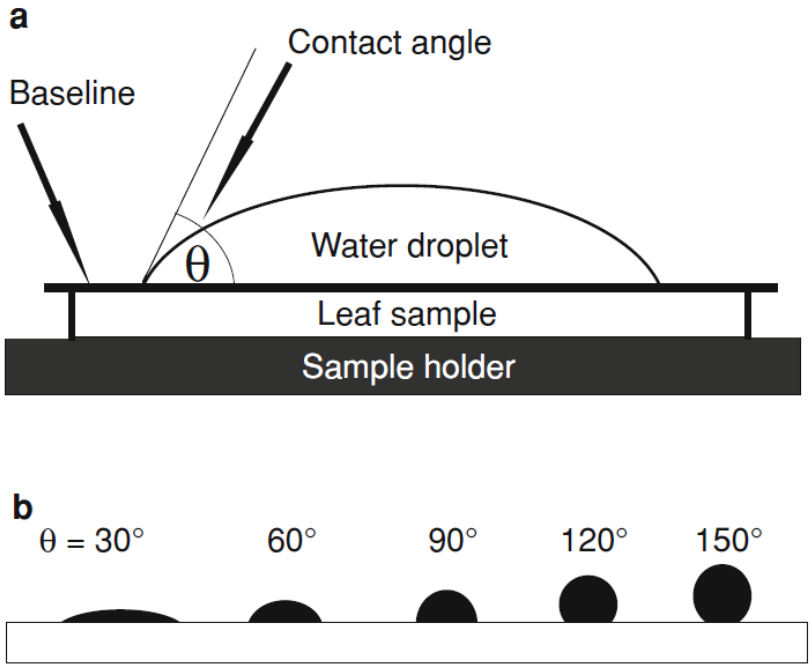
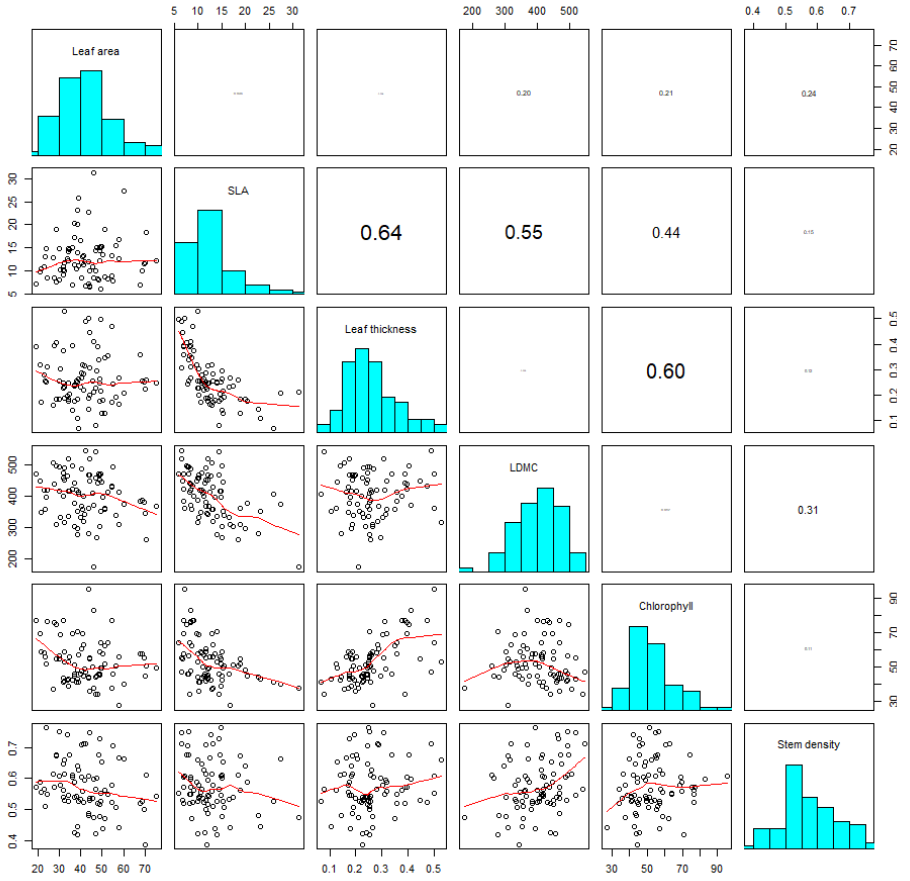


Fig. 2 **a** Determination of the contact angle (θ) between the baseline and the point of contact of a 5-µl water droplet with the surface of a leaf sample. **b** When θ is lower than 110° the leaf surface is termed "wettable", if θ is higher than 110° it is termed "non-wettable"

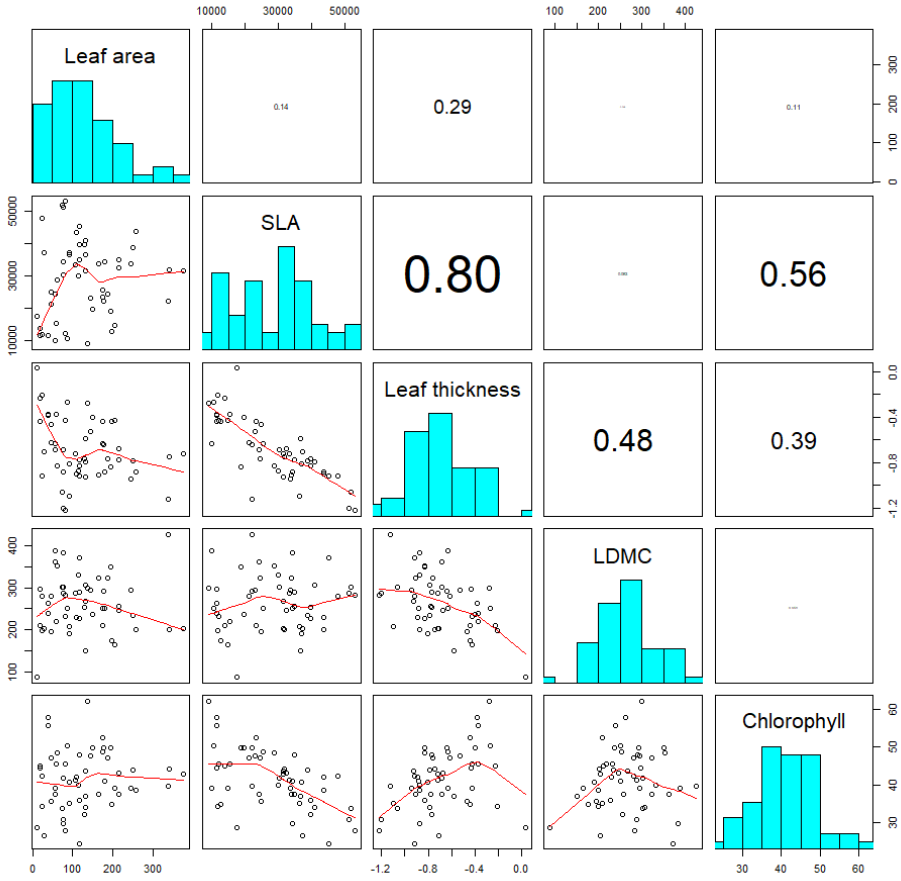
(from Aryal & Neuner 2010)

Relationships between species traits

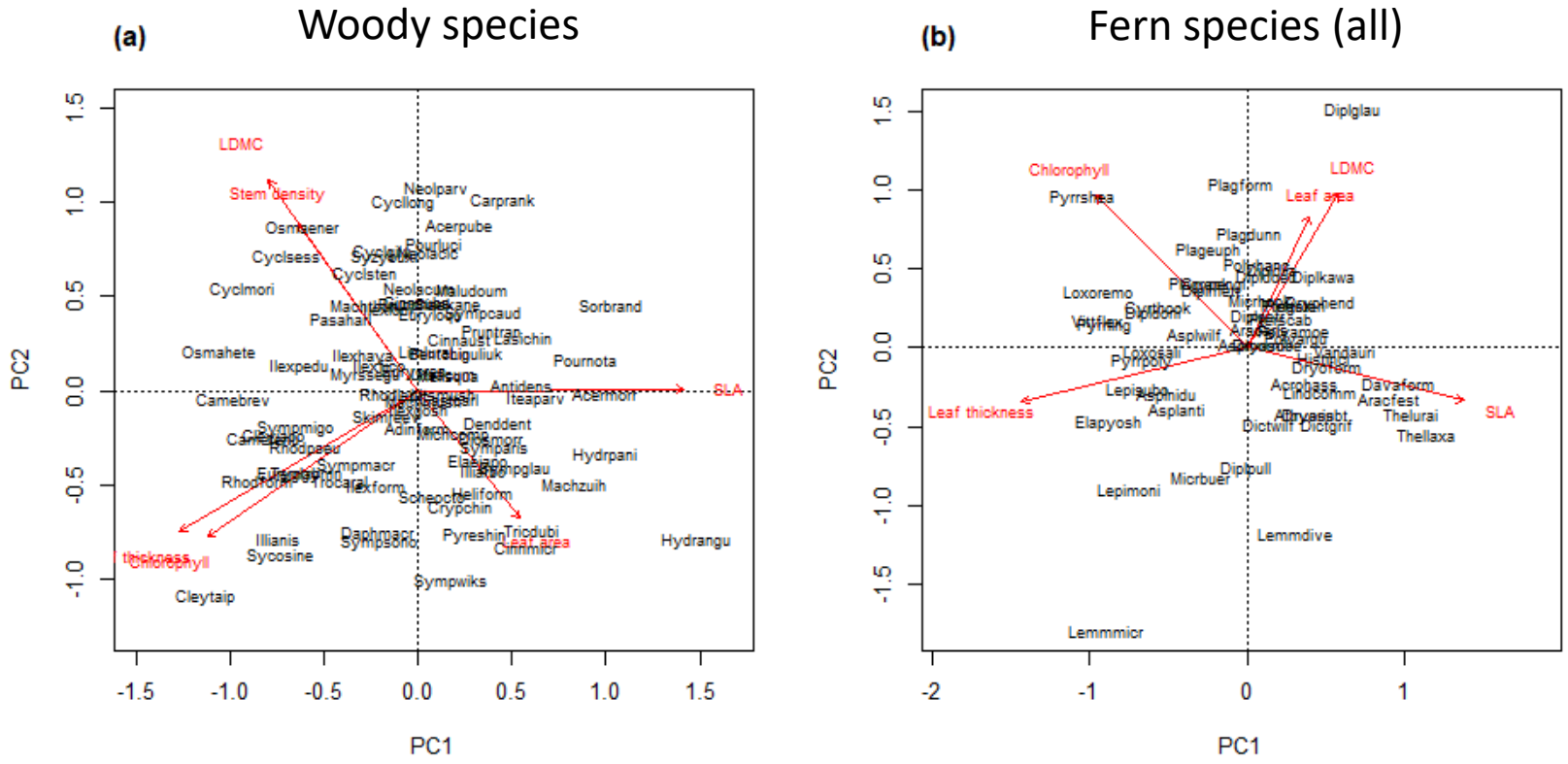
Woody species



Fern species



Relationships between species traits



Method: PCA analysis of species × trait matrix

Thank you for your attention!

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Welcome to Vegetation Ecology Lab!

The lab has been established at the beginning of 2016 by David Zelený and focuses on vegetation ecology studies.

Learn more about the research focus of the lab, and if you are interested to join, take a look at information for prospective students!

Field trip to Tamanshan, December 2016. From left to right: Chien-Fan Chen (陳建帆, PhD student), Yi-Ping Wang (王怡平, Chien-Fan's wife), David Zelený (PI), Tsung-Yi Lin (林宗儀, MSc student), Yen-Cheng Shen (沈彥成, MSc student) and Ching-Feng Li (Woody, 李靜峯, project assistant professor in NTU Forestry)