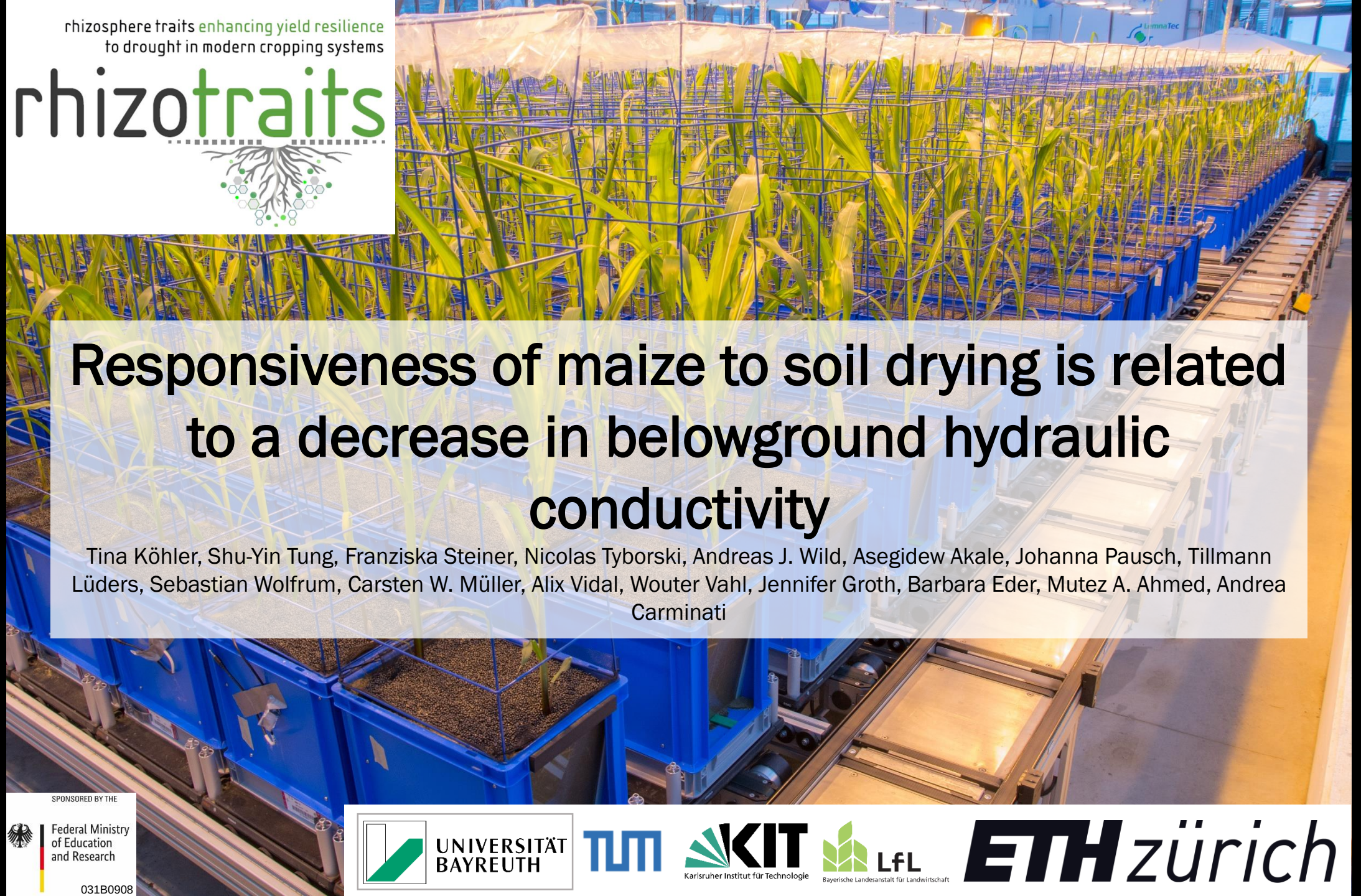
rhizosphere traits enhancing yield resilience to drought in modern cropping systems

rhizotraits



Responsiveness of maize to soil drying is related to a decrease in belowground hydraulic conductivity

Tina Köhler, Shu-Yin Tung, Franziska Steiner, Nicolas Tyborski, Andreas J. Wild, Asegidew Akale, Johanna Pausch, Tillmann Lüders, Sebastian Wolfrum, Carsten W. Müller, Alix Vidal, Wouter Vahl, Jennifer Groth, Barbara Eder, Mutez A. Ahmed, Andrea Carminati

SPONSORED BY THE
Federal Ministry of Education and Research
031B0908

UNIVERSITÄT BAYREUTH

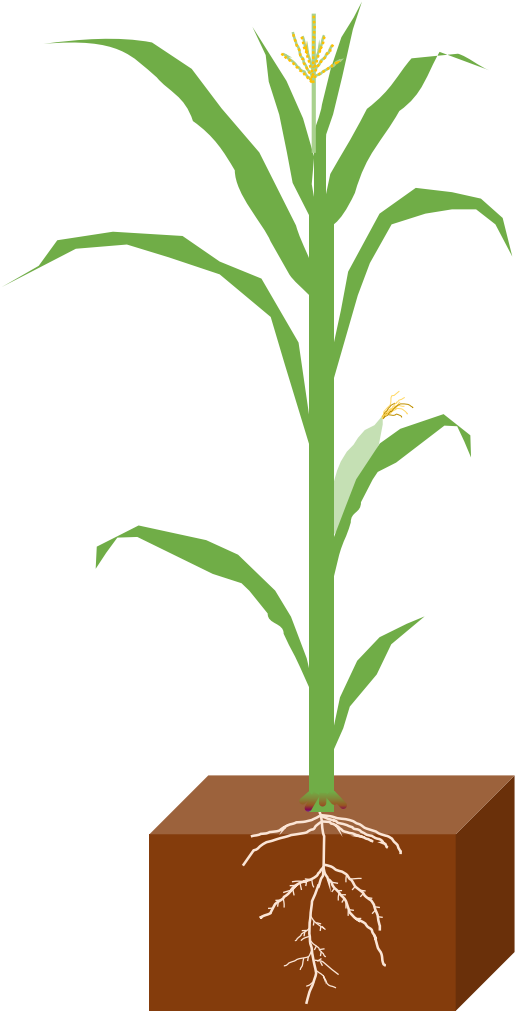
TUM

KIT Karlsruher Institut für Technologie

LfL Bayerische Landesanstalt für Landwirtschaft

ETH zürich

1. Water flow in soil and plants



Air Ψ=-50 MPa

K_{leaf}

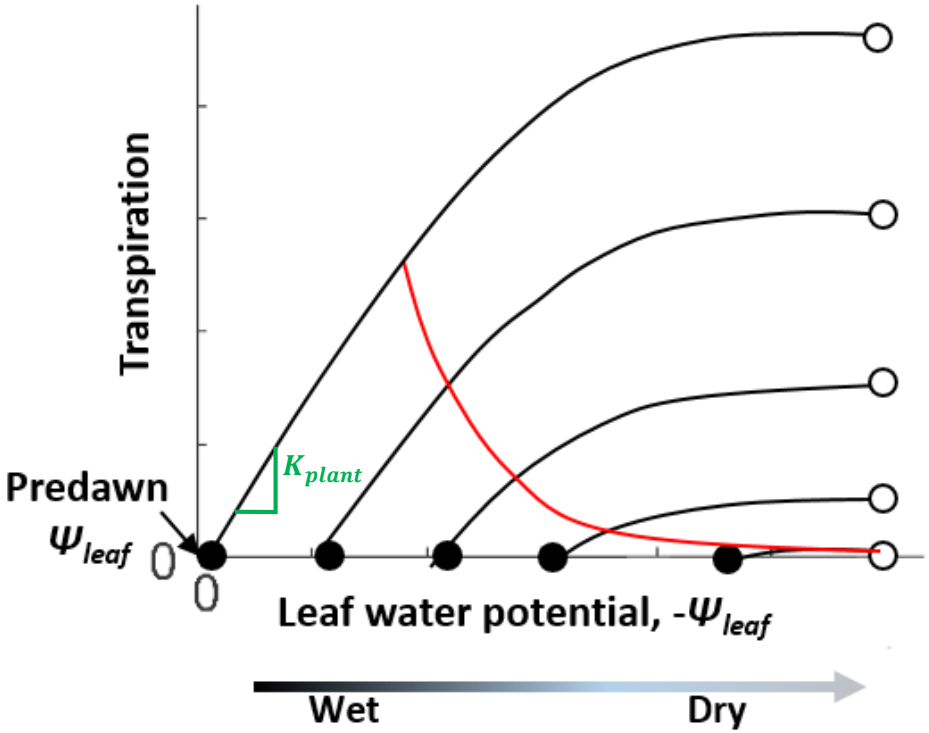
Leaf Ψ=-1.5 MPa

K_{plant}

Root-soil-interface Ψ=-0.3 MPa

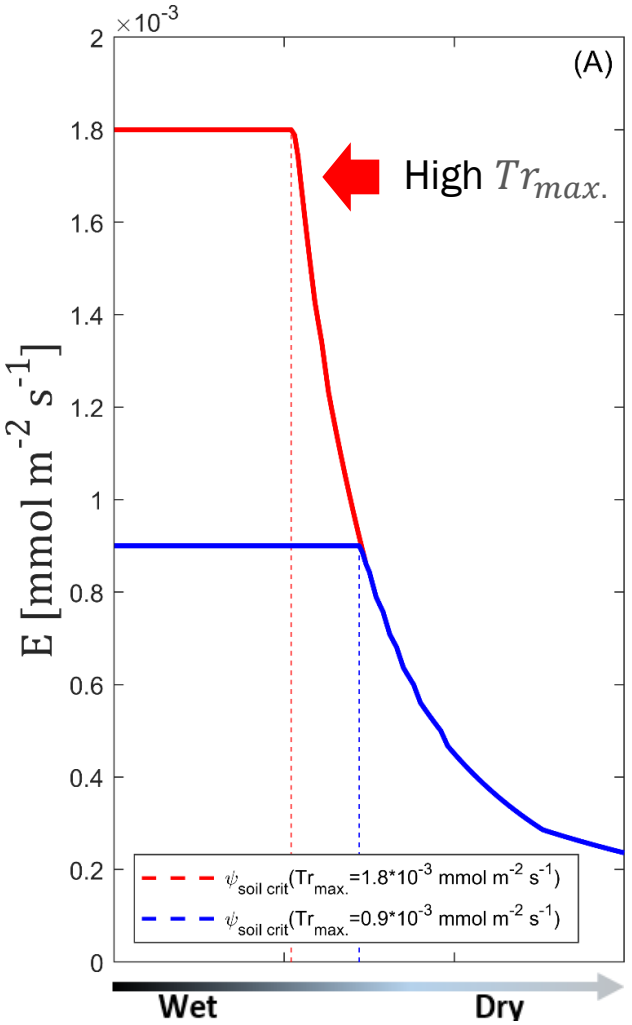
K_{rhizo}

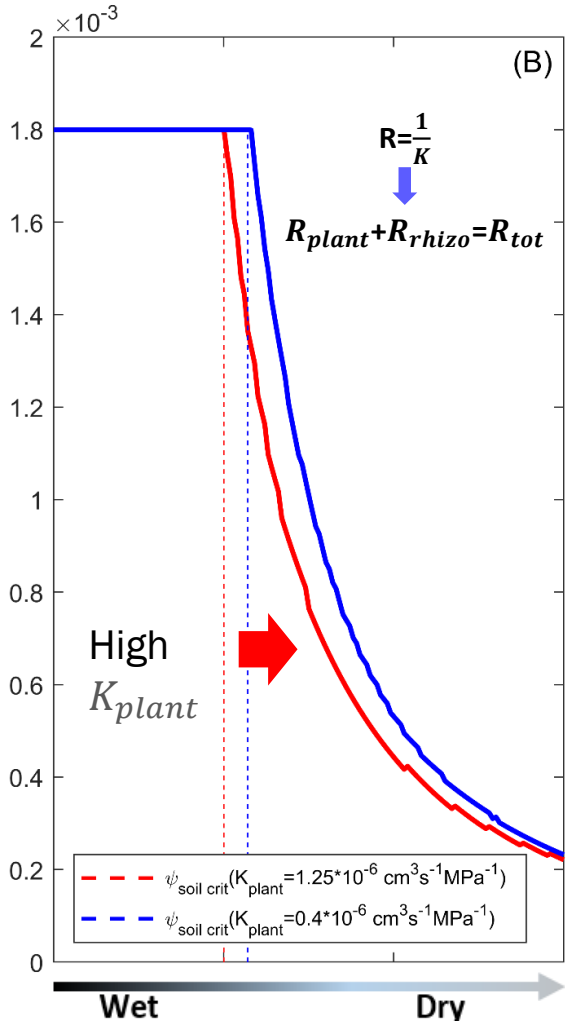
Soil Ψ=-0.03 MPa

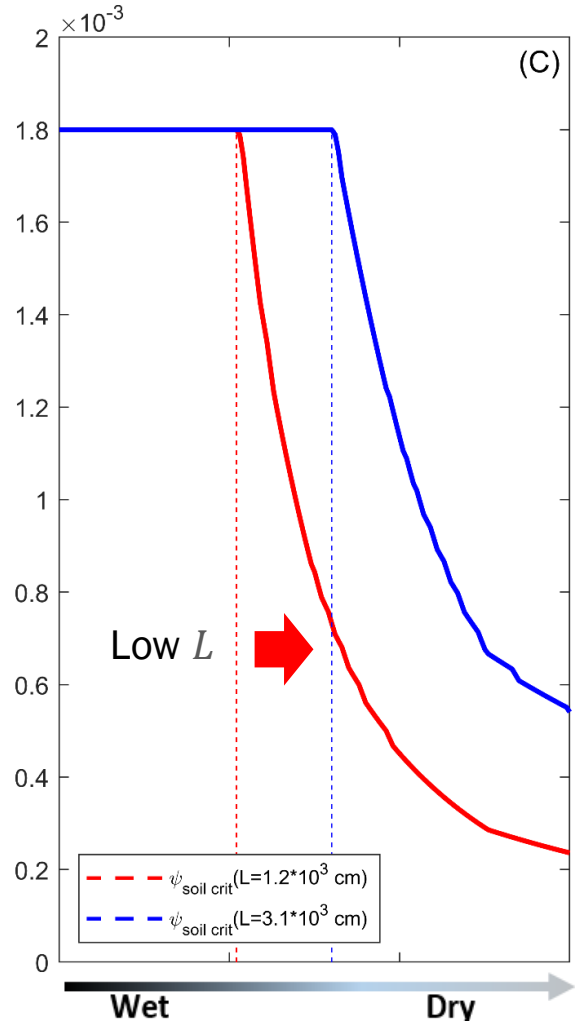


Sperry and Love 2015; Sperry et al. 2016, Carminati & Javaux 2020

2. Hypotheses: $\Psi_{soil\ crit.} \sim Tr_{max.} * K_{plant} \,/\, L$

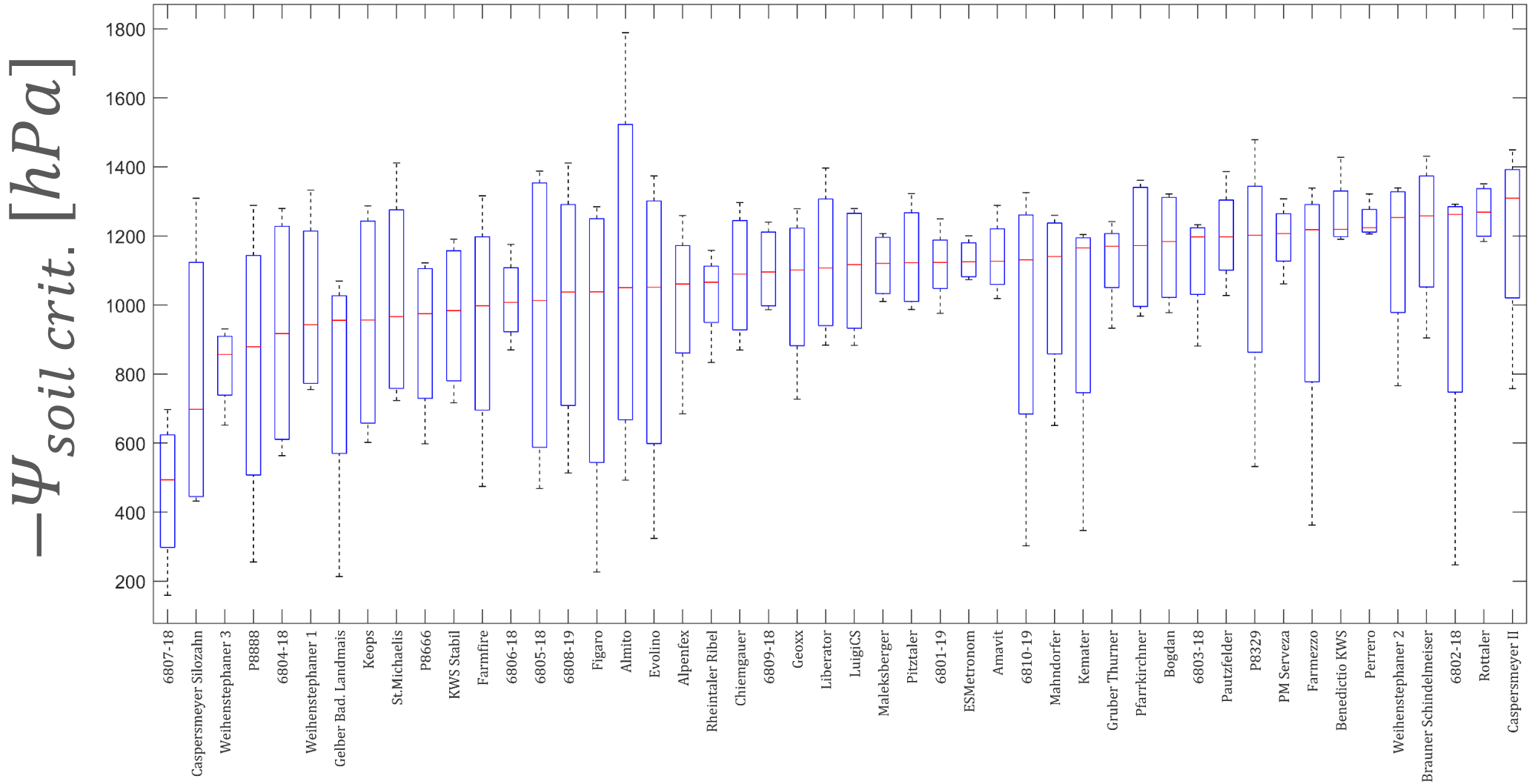




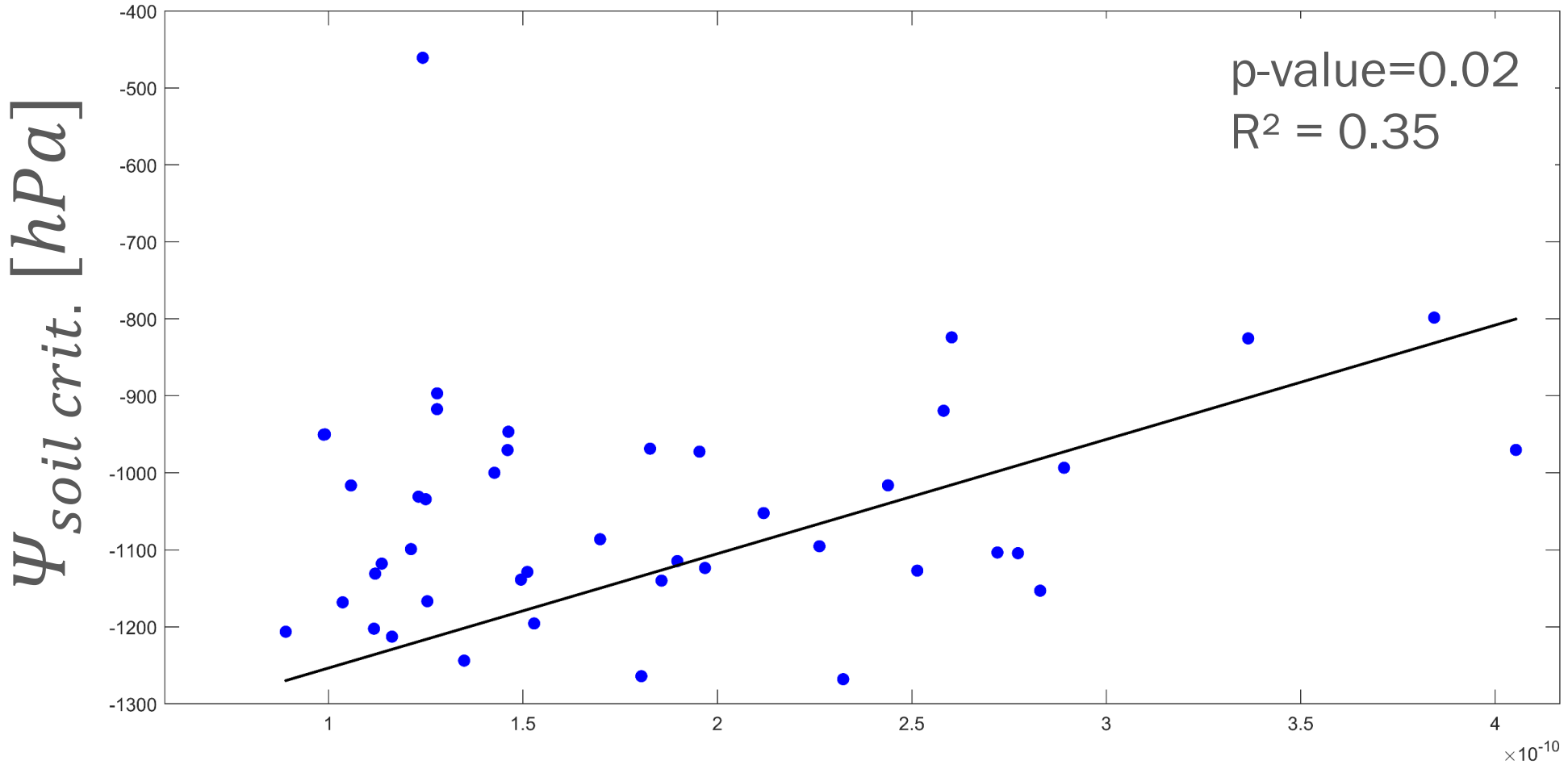


3. Soil-plant hydraulic measurements and belowground phenotyping

4. Results



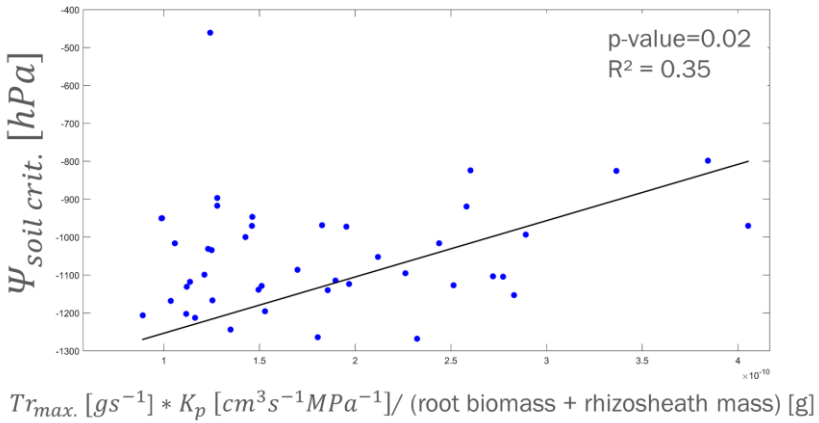
4. Results



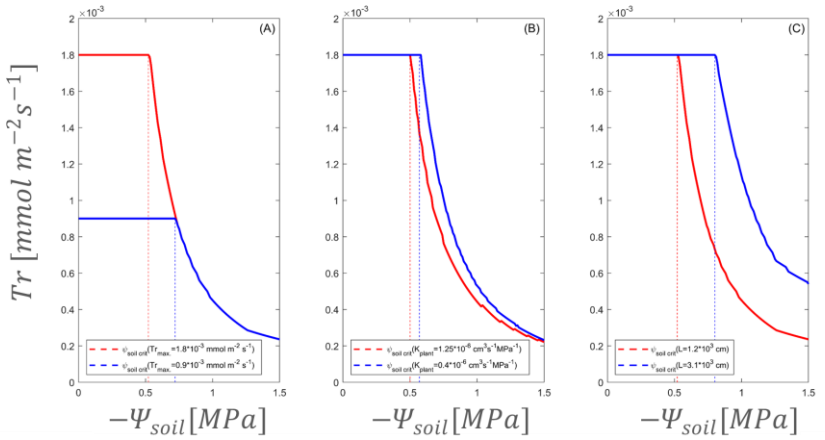
$Tr_{max.}\ [gs^{-1}] * K_p\ [cm^3 s^{-1} MPa^{-1}]$/ (root biomass + rhizosheath mass) [g]

5. Conclusion

- $\Psi_{soil\ crit.}$ is positively associated with traits that shape belowground hydraulic conductivity: $Tr_{max.}$, $K_{plant.}$, root biomass, rhizosheath mass



- **Stomatal regulation is related to the drop in belowground hydraulic conductivity under soil drying!**



tina.koehler@usys.ethz.ch