Root **A**symmetry growth in response to hydromechanical **F**orcing **T**empers soil **ER**osion

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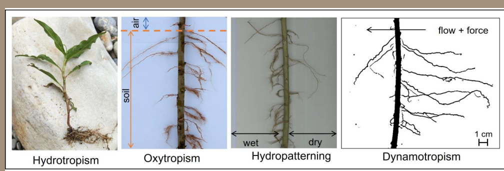
How does azimuthal root asymmetry develop in response to hydromechanical forcing?

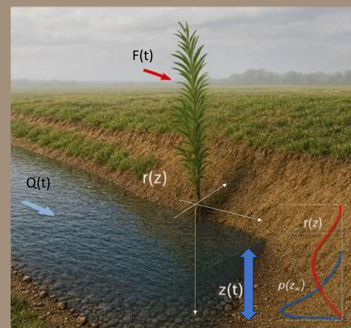
PLATEFORME DE CONSTRUCTIONS HYDRAULIQUES

Tropism



- New form of root response namely *dynamotropism*

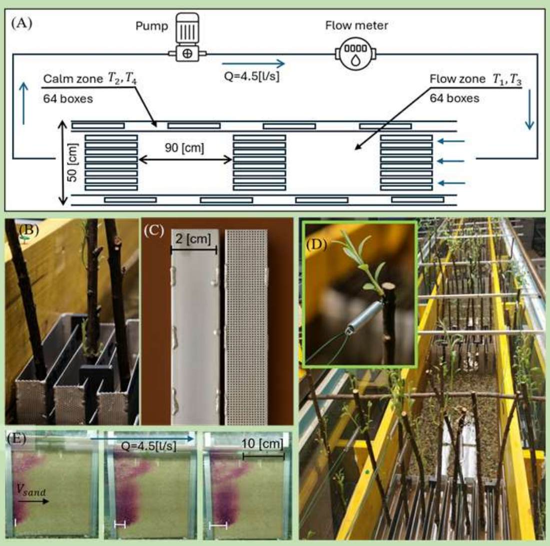
Hydromechanical forces



Motivation

- Improve river restoration techniques

Experimental Set-up



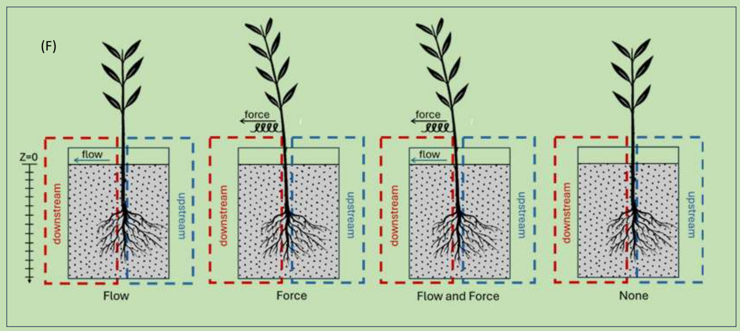


Fig.1: (A, D) Experimental setup illustrating the configuration of the 128 aluminum rhi-zoboxes (21 × 30 × 2 cm³), each containing a single Salix cutting (diameter D ≈ 0.9–1.2 cm, length= 65 cm). The rhizoboxes were evenly distributed between a calm zone (T2, T4) and a flow zone(T1, T3), corresponding to different hydrodynamic treatments. (B, C) Two rhizobox designs wereused to either allow or restrict hyporheic flow through the sediment: boxes placed in the flow zonewere equipped with lateral mesh walls to permit flow, while boxes without mesh walls were used tolimit flow near the root zone. (D) Horizontal mechanical force was applied by extending a spring toΔ = 4.5 cm, corresponding to a force of F = 1.5 N. Flow conditions were maintained at 4.5 L/s, asshown in (A). (E) Dye tracer tests confirmed flow penetration into the sediment, with an estimatedpore water velocity of Vsand = 0.01 cm/s. (F) Schematic illustration of the definitions of upstream and downstream regions underdifferent experimental conditions: (A) Force, (B) Flow, (C) Combined Flow and Force, and (D)none.

Results

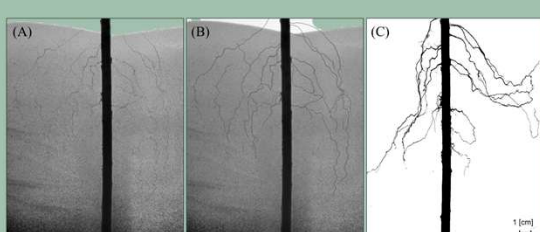


Fig. 2: A) Raw cutting image scanned by Neutron scanner (B)Extracted roots from the neutron scanner image in (A), (C) Raw cuttingimage of the same cutting in A scanned by light scanner after removing it from the sediment

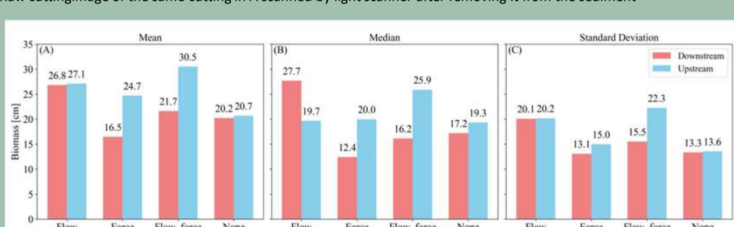


Fig 3: Upstream–Downstream analysis of the (A) mean, (B) median, and (C) standarddeviation of root biomass for each treatment Ti.

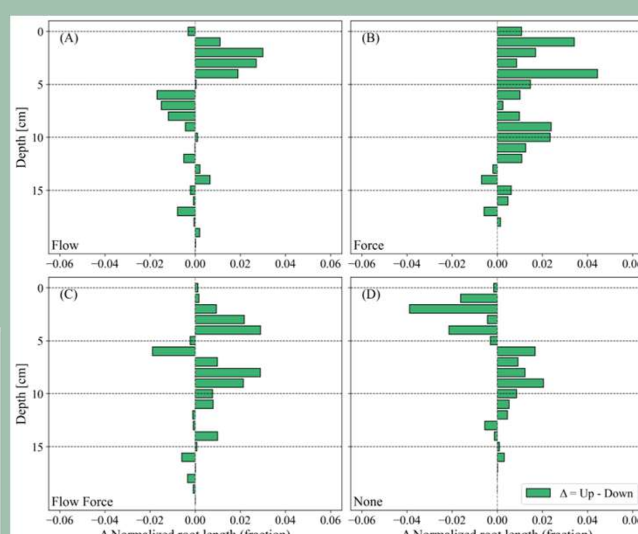


Fig 4: The normalized differences between the upstream396and downstream normalized biomass at each 1 cm depth intervals

This work is supported by the Swiss National Science Foundation Projects "Root Asymmetry response to hydromechanical Forcing Tempers soil ERosion (RAFTER)", grant N. 200021_212179. The authors also thank PSI and Anders Kaestner for use of the Neutron Imaging Instrument NEUTRA of the Swiss spallation neutron source SINQ at PSI, project grant N. 20222609