

WHERE DO CROPS TAKE THEIR WATER FROM?

USING ISOTOPIC TRACERS IN AGRICULTURAL AND AGROFORESTRY SYSTEMS

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Rational

- 70 % of water resources is used for irrigation
- The pressure on water resources will increase due to the
 - growing population
 - increasing urbanization and industrialization
 - climate change

Goal

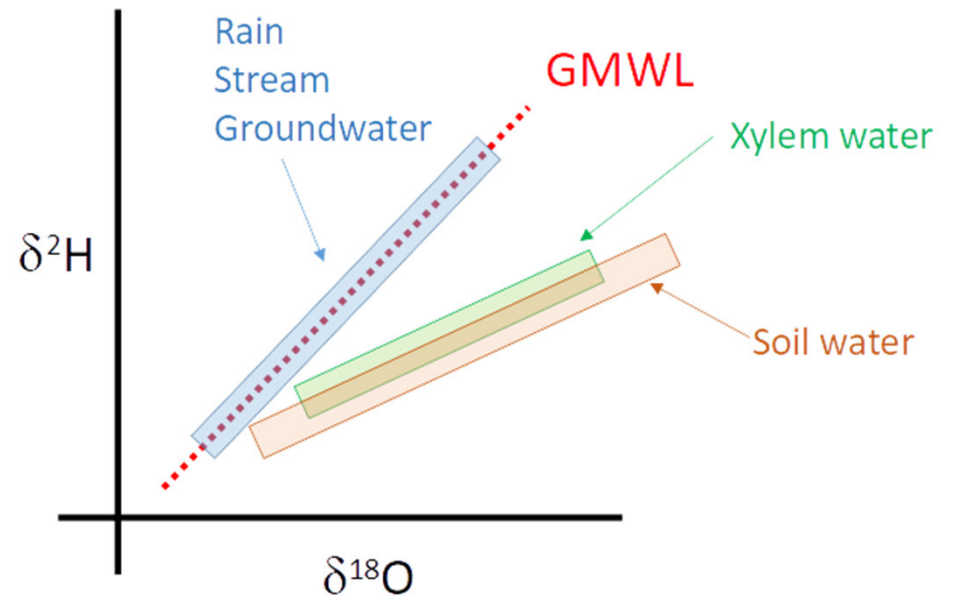
- To achieve an accurate quantification of the proportions of different water sources taken up by plants.
- This goal has important ecological and economic implications for water saving and utilization.

Practical implications

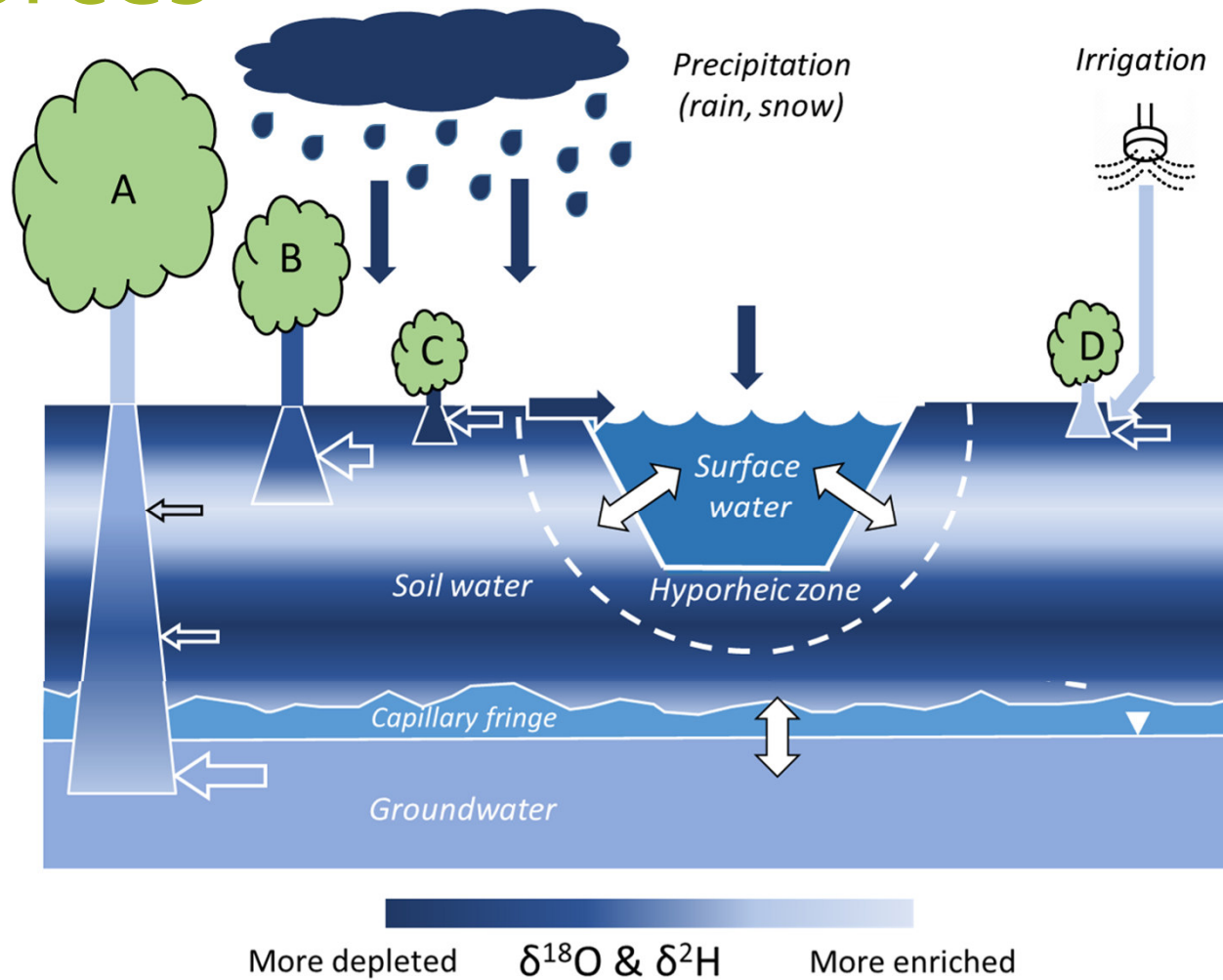
- Improving local to regional farming practices such as irrigation or fertilization treatment schemes
- Strategic planning at longer timescales in relation to changing hydroclimatological conditions (e.g. extreme weather events, droughts or altered flow regimes)
- Competitive or complementary water use strategies of co-existent species
- Understanding the implications of climate or management change
- Evaluating the need for irrigation especially for agricultural and agroforestry regions which are sustained at the natural limits of water availability.

Stable isotopes as a tool

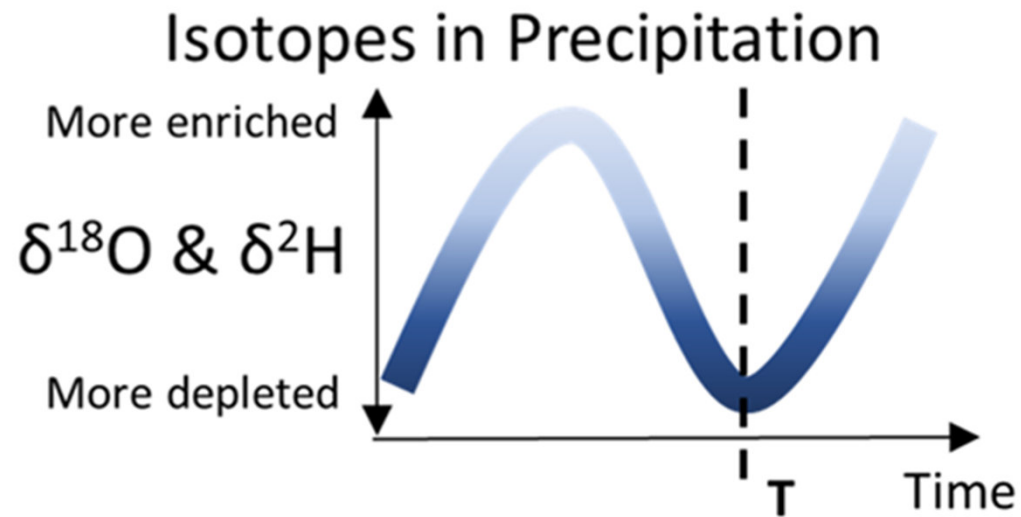
- Stable isotopes of water ($^2\text{H}/^1\text{H}$, $^{18}\text{O}/^{16}\text{O}$)
- Understand temporal and spatial patterns of root water uptake (RWU)
- Tackle water management-related questions



Crop roots access different water sources



Precipitation isotopic signatures change with time



Main points to clarify

- Water sources for plant uptake
- Effect of irrigation and fertilization on uptake
- Effect of co-existing plants

Opportunities and challenges

- Methodological issues
 - Interaction water-soil and water-organic matter
 - Effect of root exudates
 - ...
- Mixing models
- Quantification of uncertainty



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Water sources for root water uptake: Using stable isotopes of hydrogen and oxygen as a research tool in agricultural and agroforestry systems



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