EGU Presentation

Stable water isotopes reveal the effects of land use on ecohydrological partitioning in a drought-sensitive mixed land-use catchment

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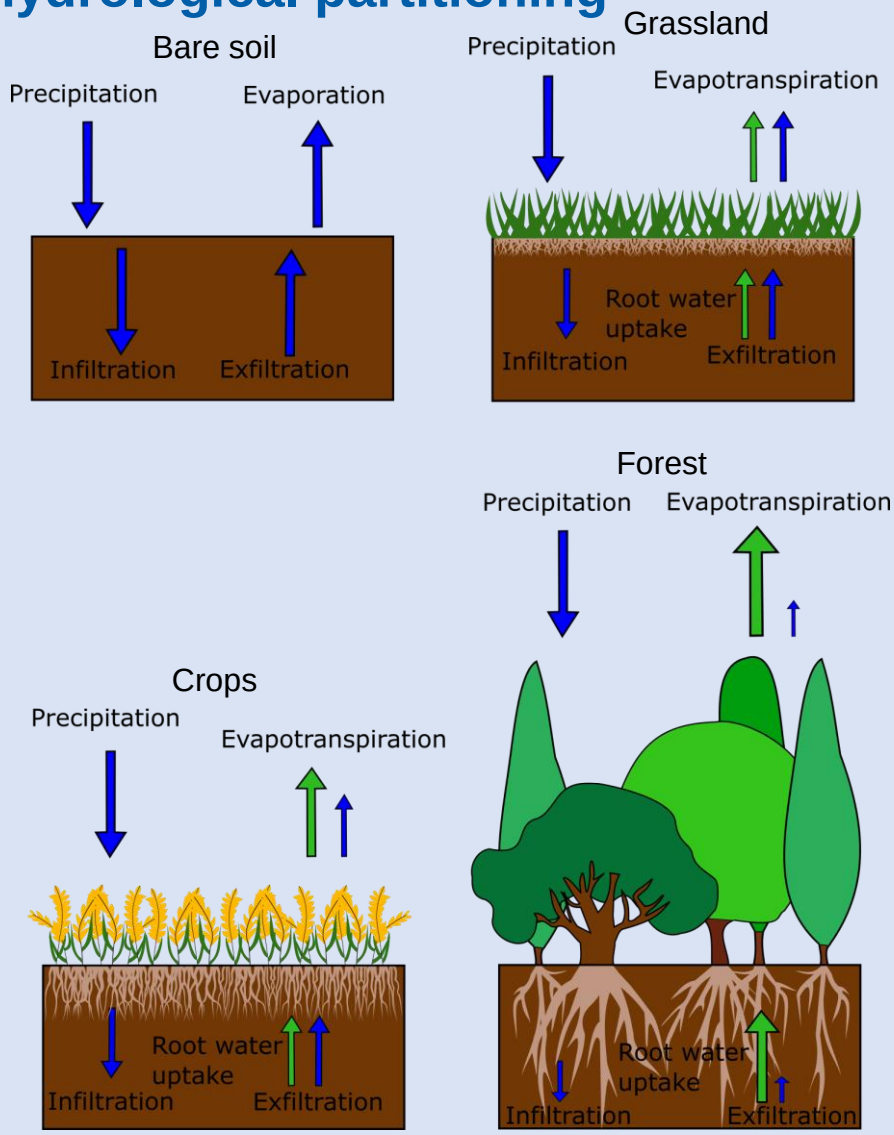
Effects of different land use on ecohydrological partitioning

- Transpiration >> runoff from world's rivers (*Good et al, 2015*)
- Trade offs between blue and green water fluxes
- Evapotranspiration (ET) sensitive to land use (Douinot et al. 2019)
- Land use changes shift patterns of ET, infiltration, water retention (*Balist et al., 2022*)
- Important considering climate change shift in precipitation amount and pattern,
  increasing atmospheric demand for ET, prolonged drought years

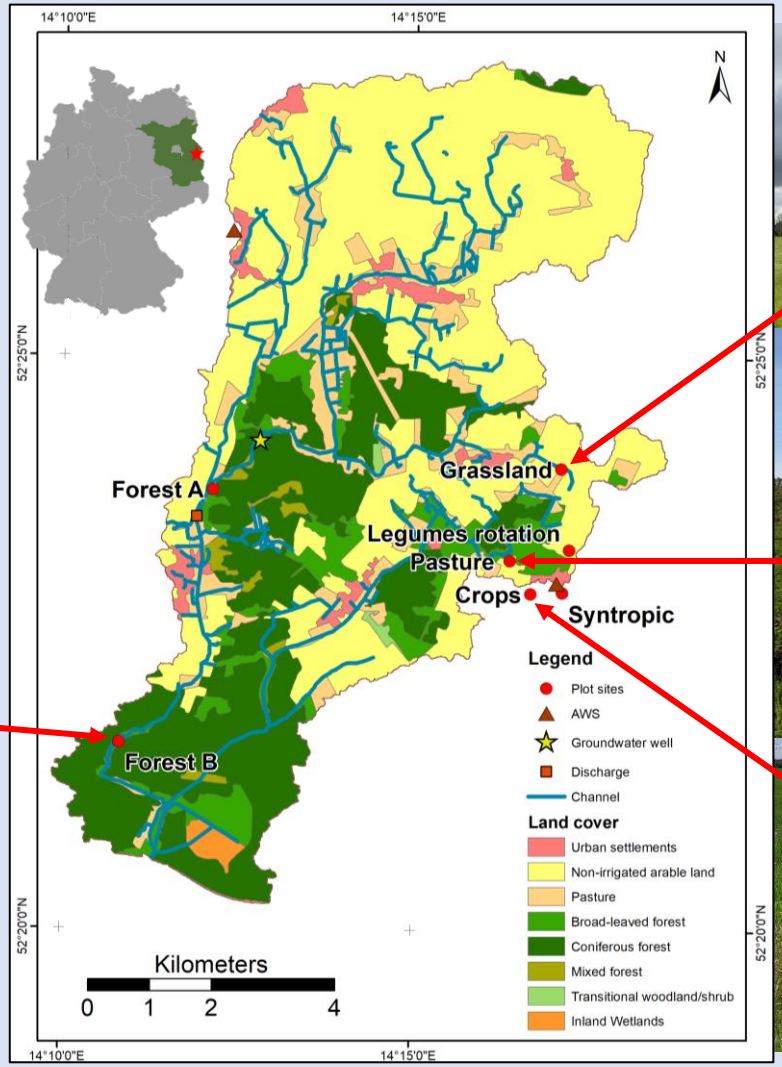


Demnitzer Millcreek Catchment

Precipitation **~548 mm**
Temperature **~9.7°C**
(1990 – 2020, DWD 2021)
PET **650 – 700 mm a^{-1}**
(Smith et al. 2020)

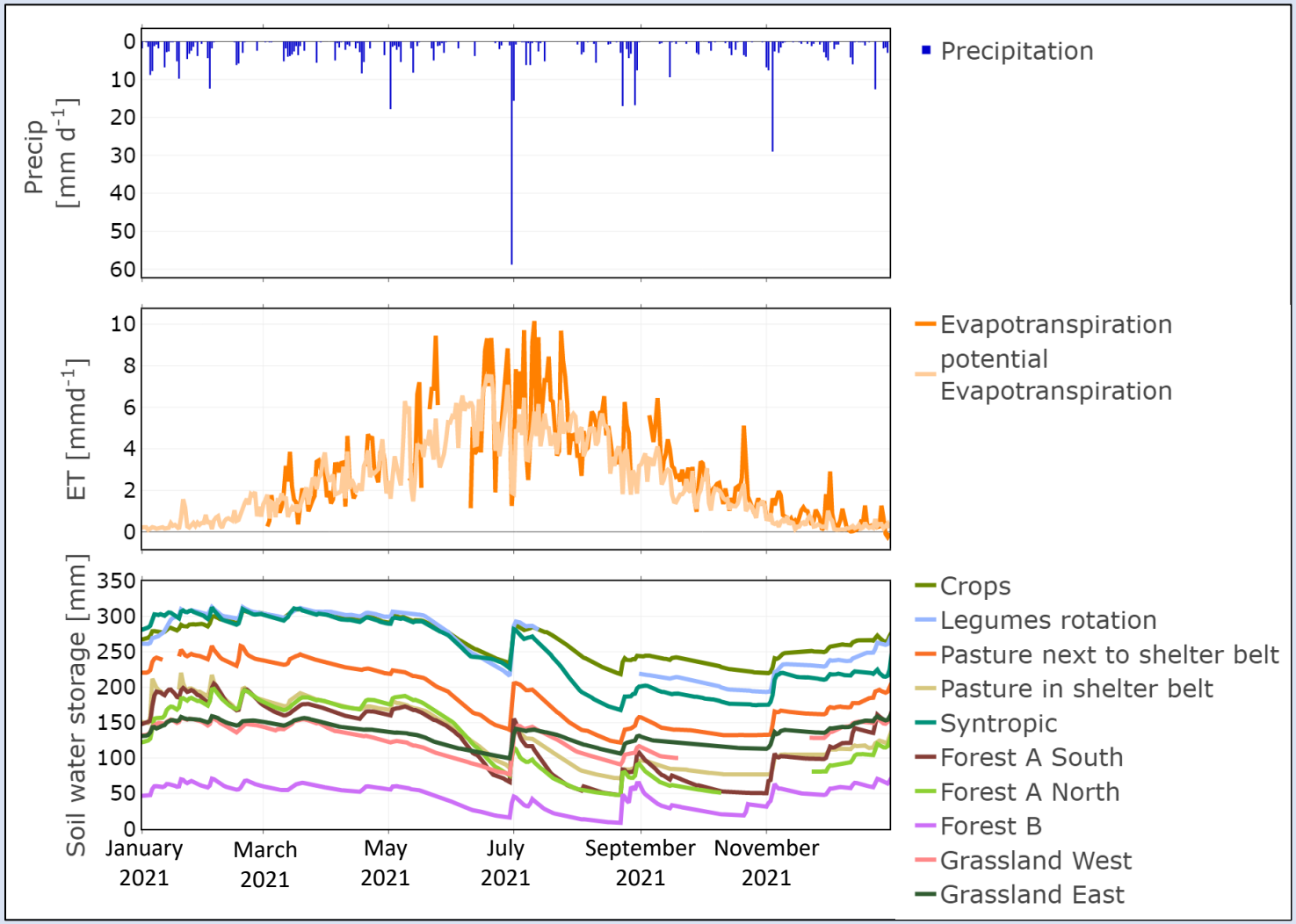
8 sites - 4 different land use / soil units

- Forest,
- Grassland,
- Arable (e.g. Crops)
- Alternative arable (e.g. Syntropic)



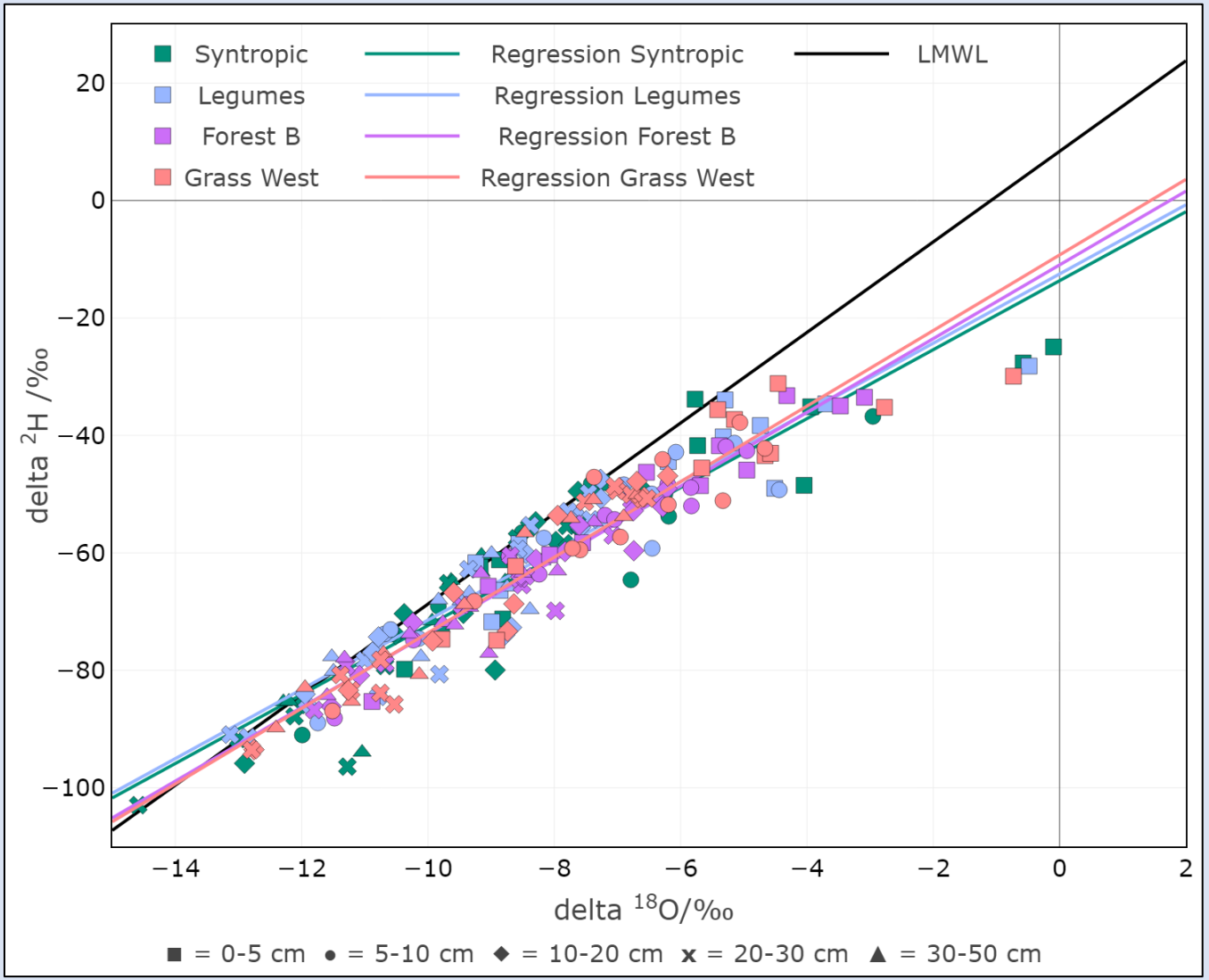
Hydroclimatic conditions

- Precipitation ~545 mm
- PET ~874 mm
- Volumetric water content (VWC) lowest at forests; wetter in humus-rich surface horizons
- Arable land uses highest total VWC; higher wetness in subsoil

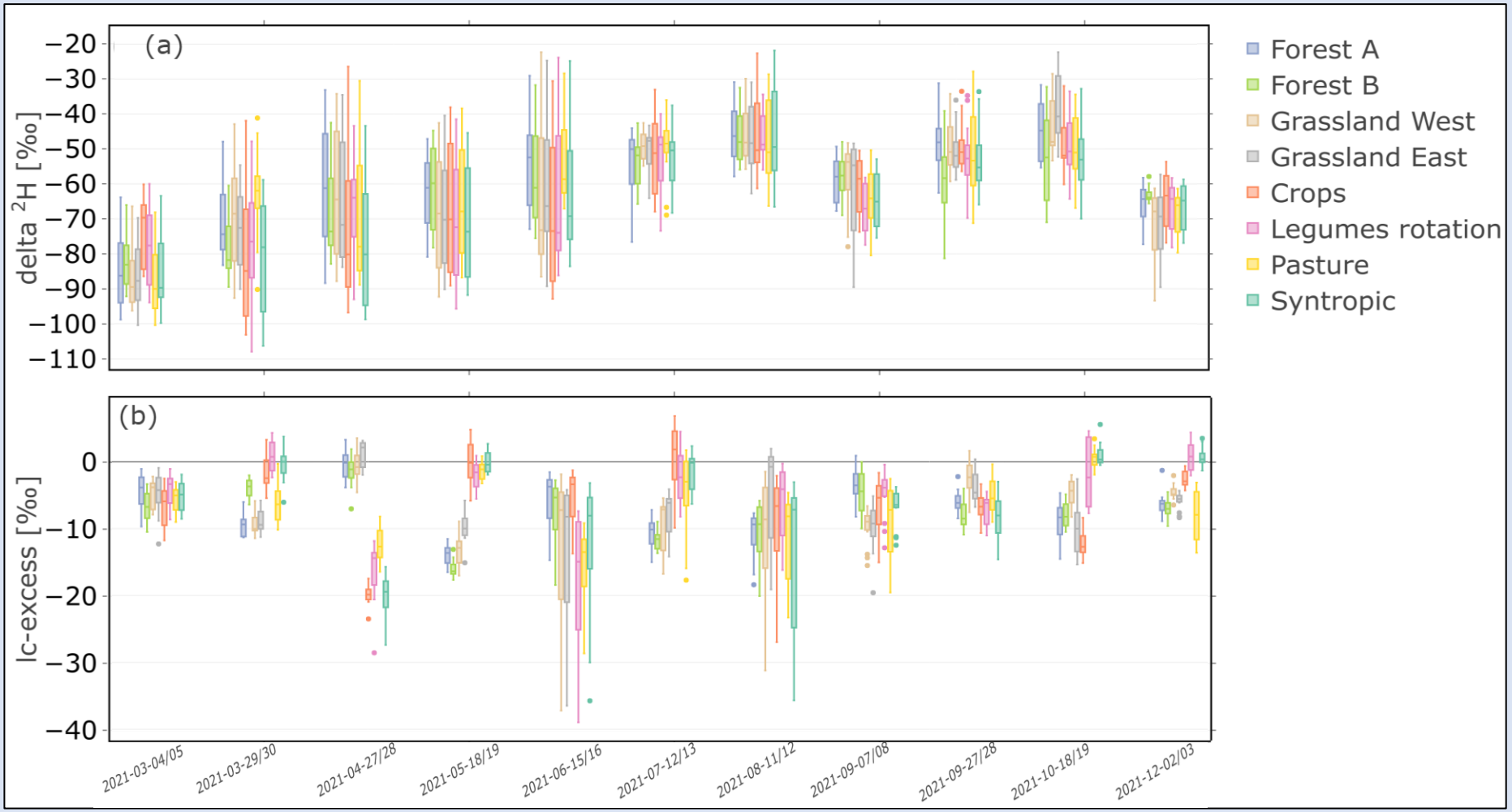


Dual isotope plot with LMWL & 4 land use types with regression lines

- Most data points scatter in close proximity to the local meteoric water line (LMWL)
  - Syntropic site regression widest deviation from the LMWL
- Regressions do not deviate much from LMWL → Low evaporative signal



Variability of soil δ^2H (a) and lc-excess (b) over the season



(a) δ^2H enriched until August, then depleted and strongly depleted in December

(b) Lc-excess highly depleted in June and August → strongest evaporative singal

Conclusions

- Stable water isotopes useful tool to investigate spatial-temporal differences in water partitioning
- Slight variability

- Alternative arable sites did not differ substantially from conventional sites
  - ➢ early stages since management started (2019/2021)
  - ➢ Long-term observations needed to assess land use change influences

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Thank you very much for your attention!