



CT Geoarchives

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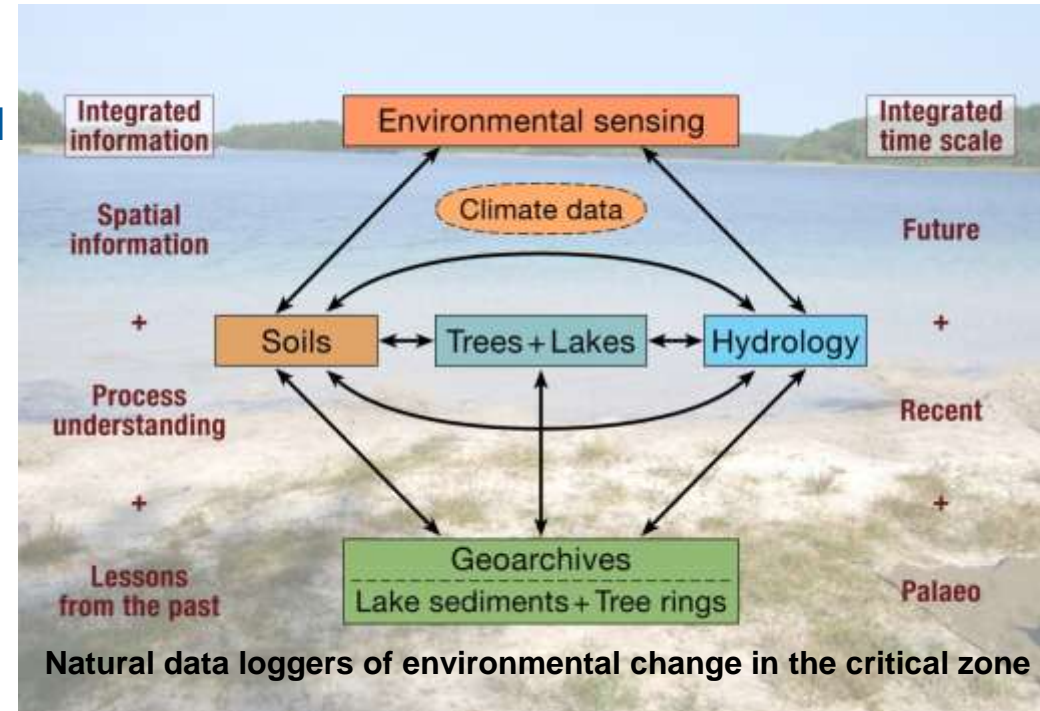




Scientific concept

Tasks

- to combine data from a network of gearchives and environmental sensing
- to study key processes of the critical zone
- to assess climate dynamics and hydrological fluctuations on various time scales



Aims

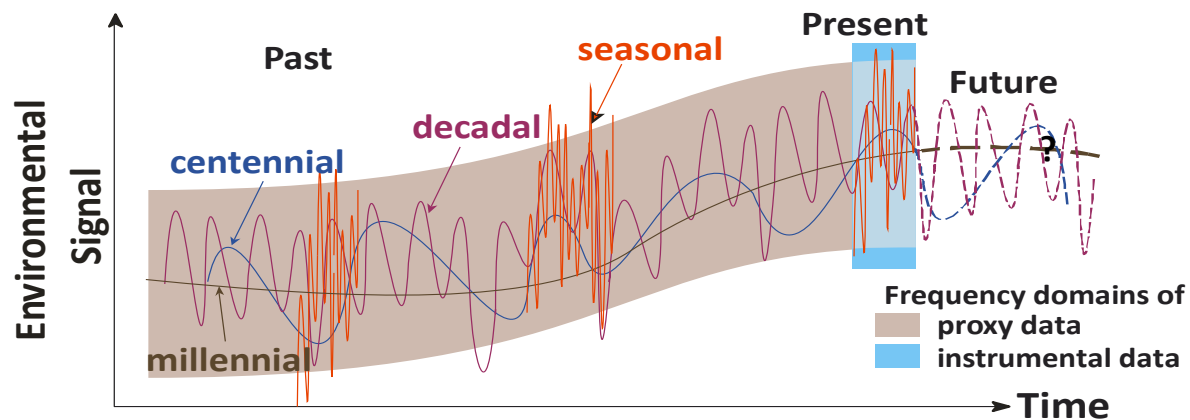
- to improve process understanding of the critical zone
- to distinguish between anthropogenic and natural influences
- to verify models for improved future projections



Tree Rings & Lake Sediments: Natural data loggers of Environmental Change

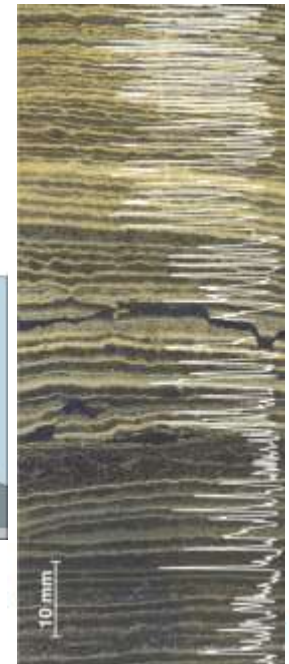
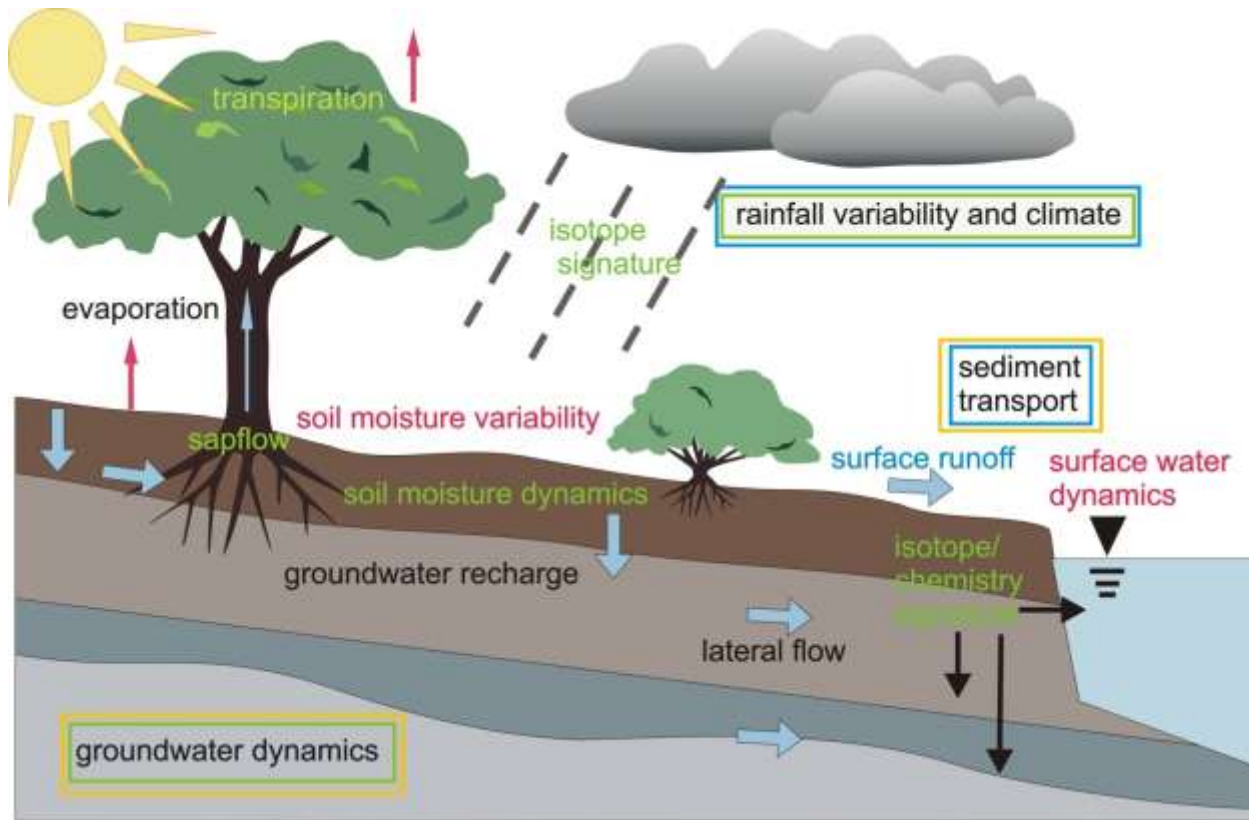


- precisely dated, annually resolved data
- can be calibrated against instrumental observations
- merge instrumental and pre-instrumental time scales
- record high and low frequency dynamics (natural hazards – long-term trends)





Tree Rings & Lake Sediments: Natural data loggers of hydrological changes



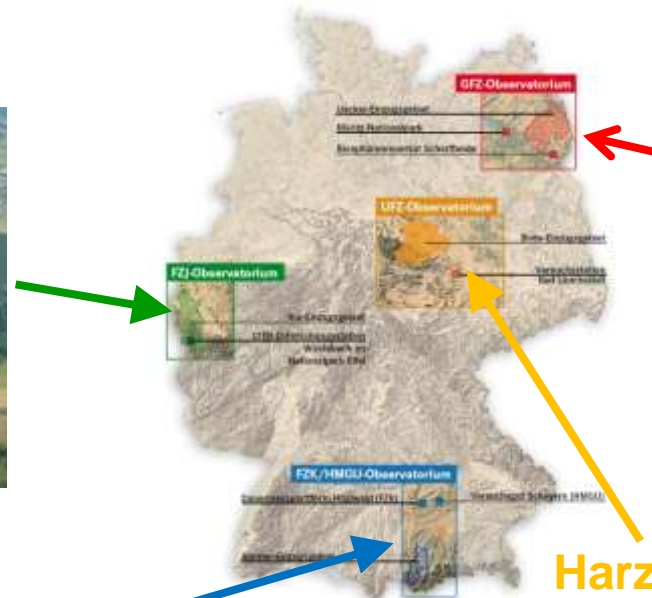
- at the junction between surface and sub-surface run-off



Geoarchive-Stations

NE Germany (trees, lakes, palaeo-soils, mires) *

Eifel (trees, lakes, mires)



Pre-Alpine (trees, Ammersee)

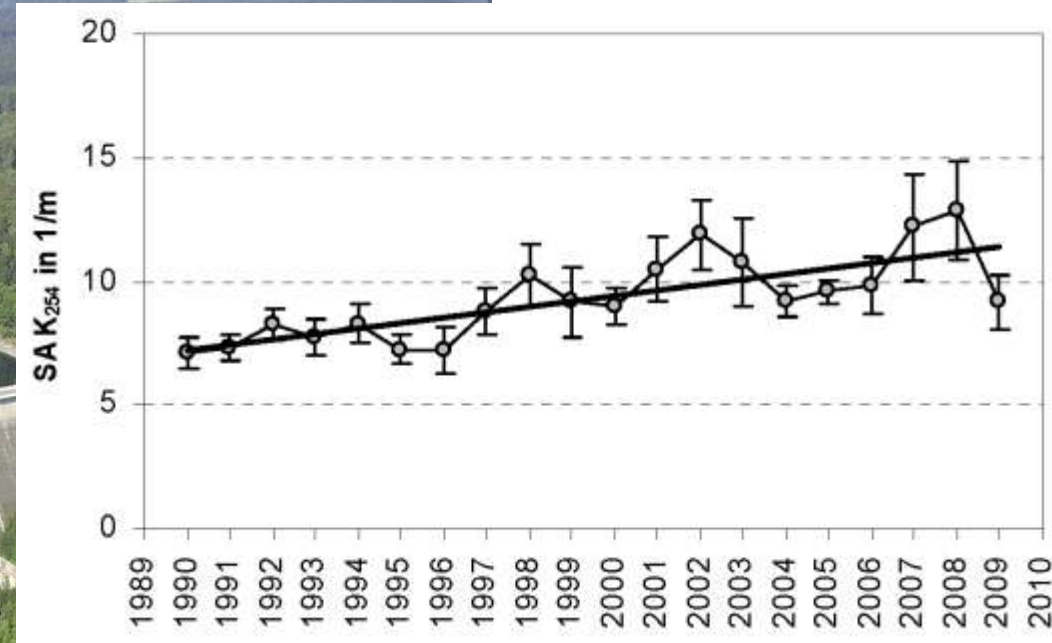
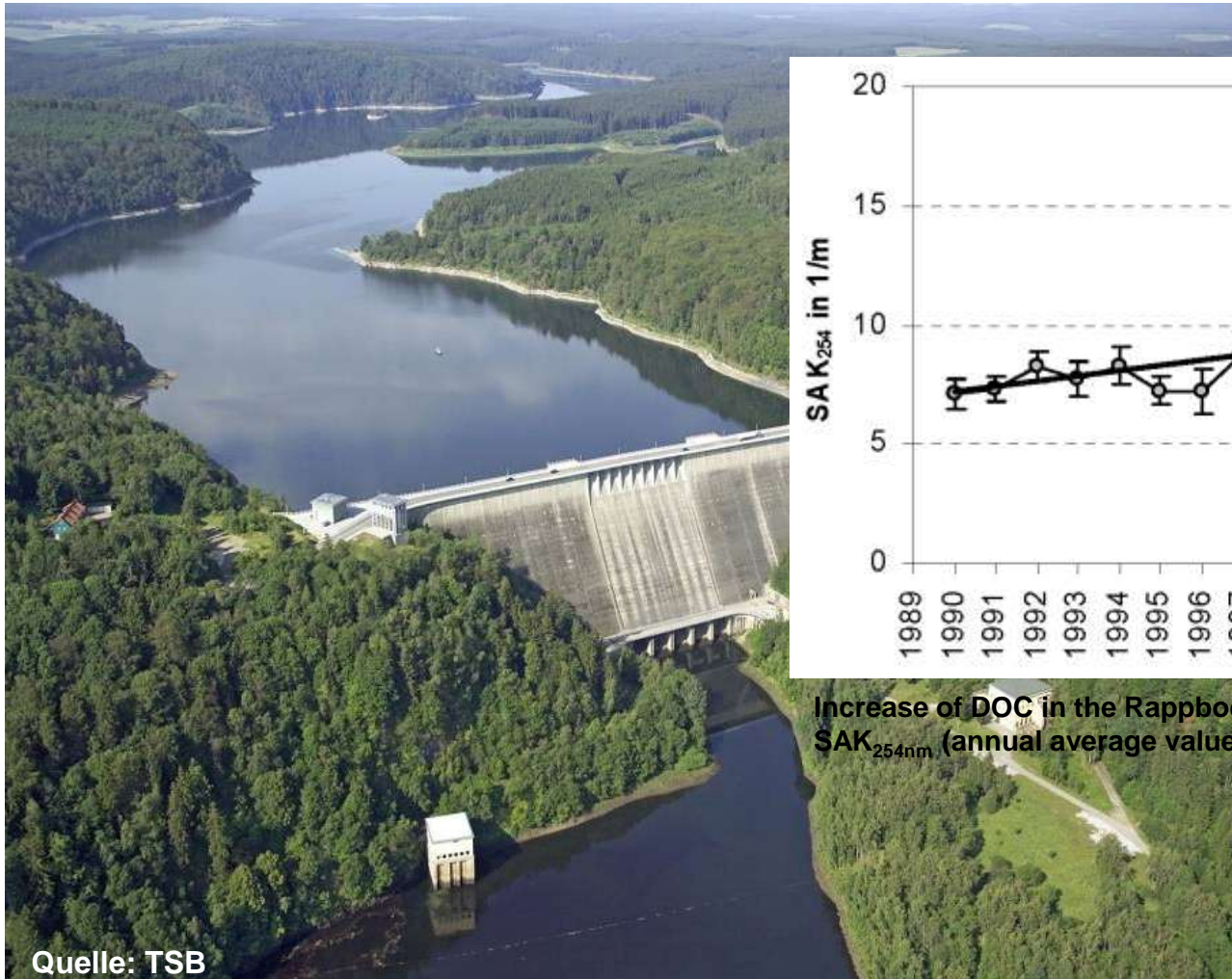
Sonnenberge mire

Rappbode barage *





TERENO Harz: Increasing DOC in the Rappbode reservoir - a challenge for drinking water quality management -



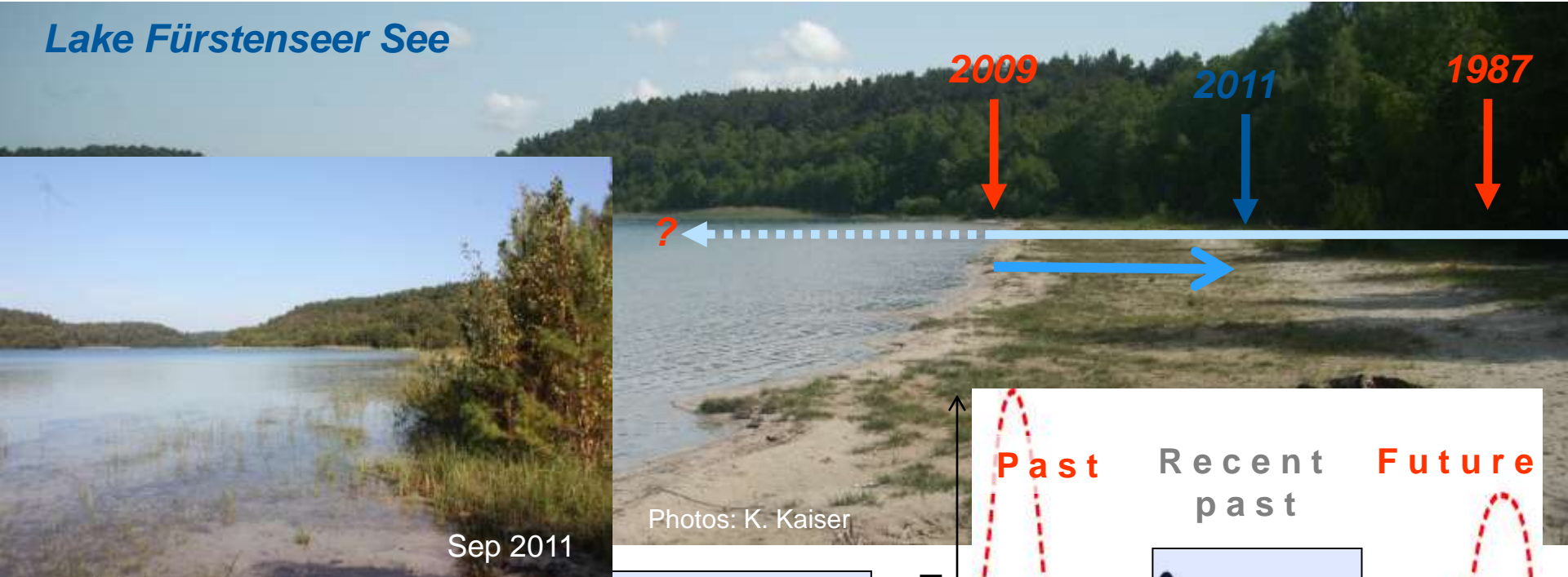
Increase of DOC in the Rappbode reservoir from 1990 to 2009 expressed by SAK_{254nm} (annual average values; data from central lab FWV)

Quelle: TSB

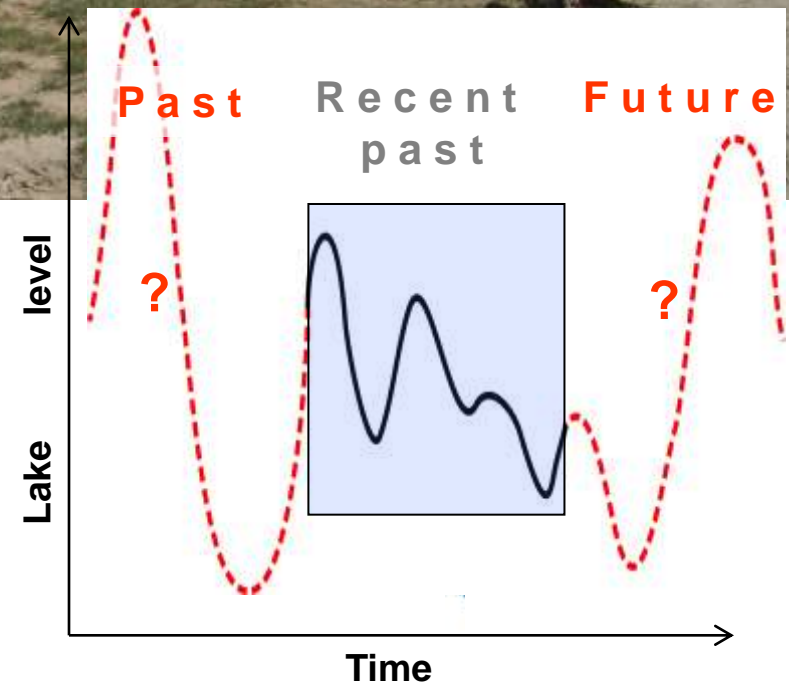
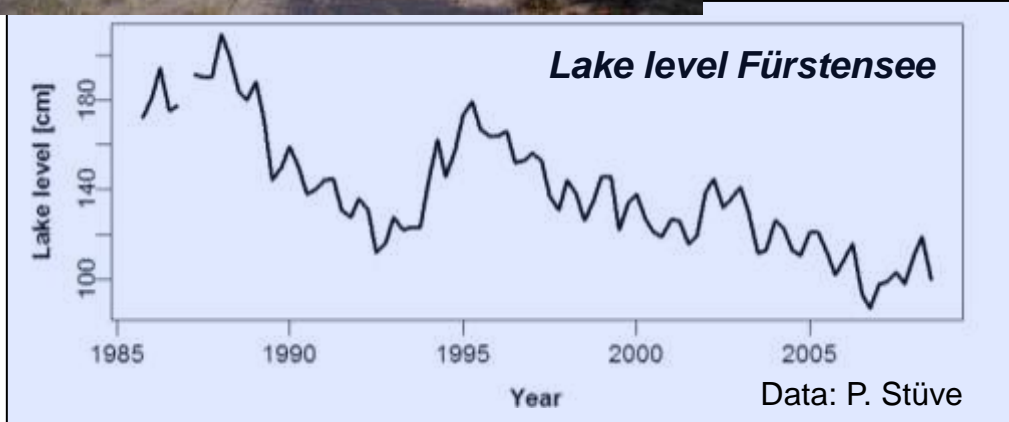


TERENO NE: Lake Level Changes

Lake Fürstenseer See



Photos: K. Kaiser

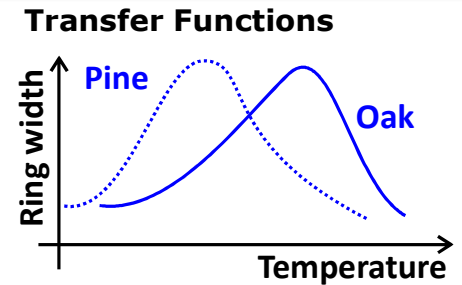
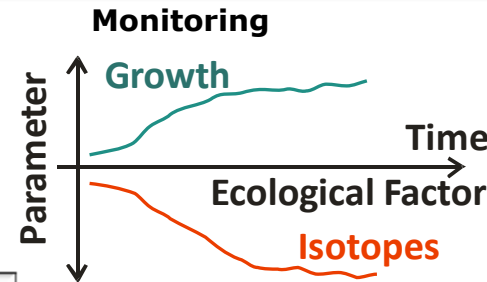




Deciphering Natural Archives, e.g. Tree-rings

Climatic and Environmental Signal Transfer

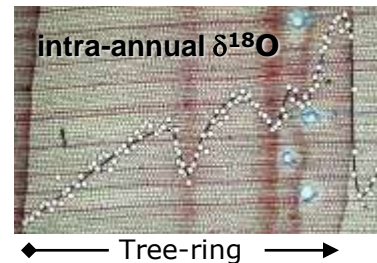
Natural processes and anthropogenic factors
Monitoring of signal transfer
New transfer functions & calibration



Determination of Multiple Parameters

Classical (ring width) and novel methods (e.g. isotopes)
Calibration and verification against instrumental data

Mass Spectrometry

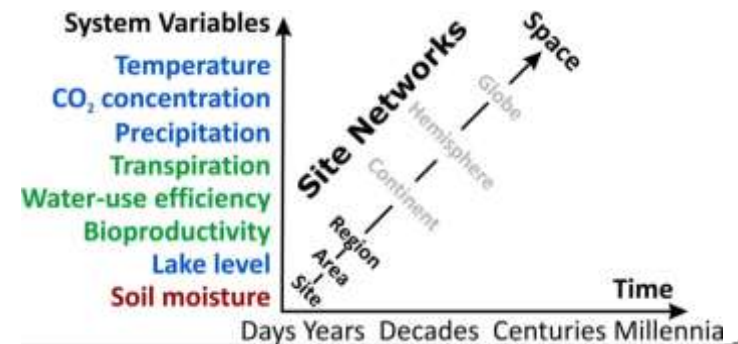


Wood Anatomy & μXRF



Time Series Analyses and Multiple Reconstructions

Spatio-temporal reconstructions
Assessment of natural vs. anthropogenic variability
Evaluation of forest resilience and vulnerability





Dendro-Monitoring on 5 important European tree species (Eifel, Northeast)



Oak, beech, spruce, pine, douglas fir

Xylem-Sapflow
(Transpiration)



Point-Dendrometer
(Wood growth)

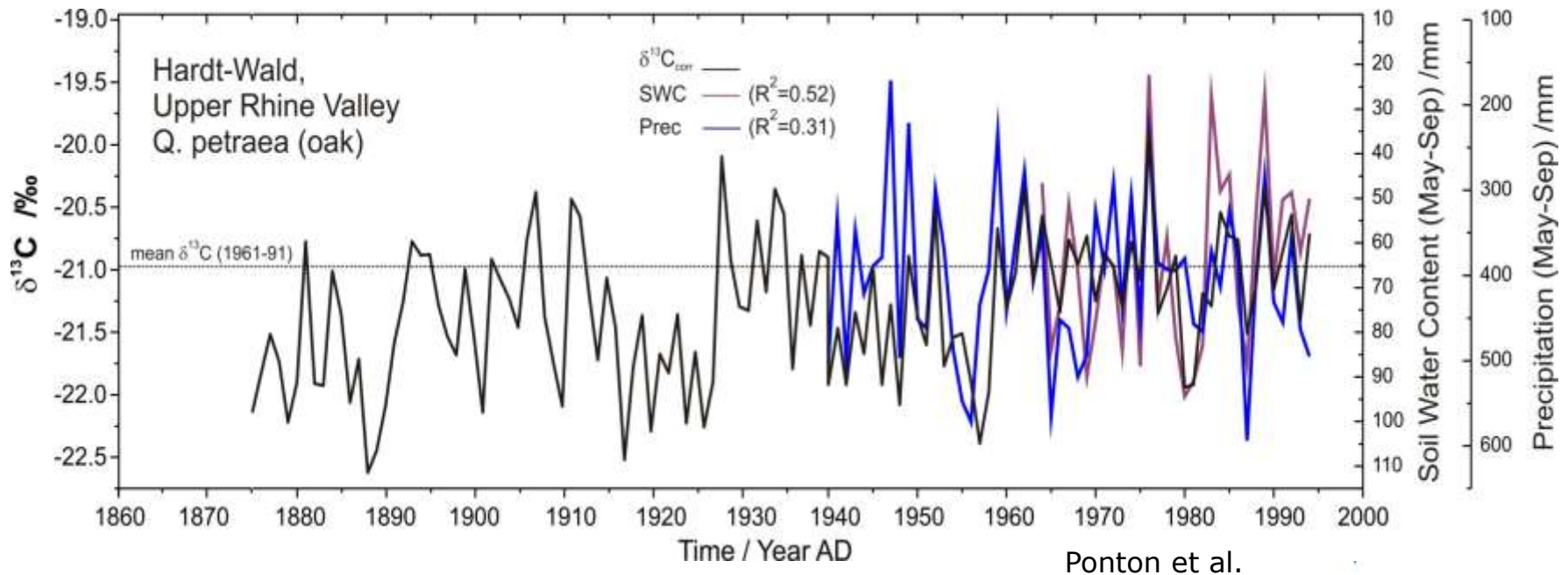
Canopy sampling
($\delta^{18}\text{O}$ leaf water, transpiration)





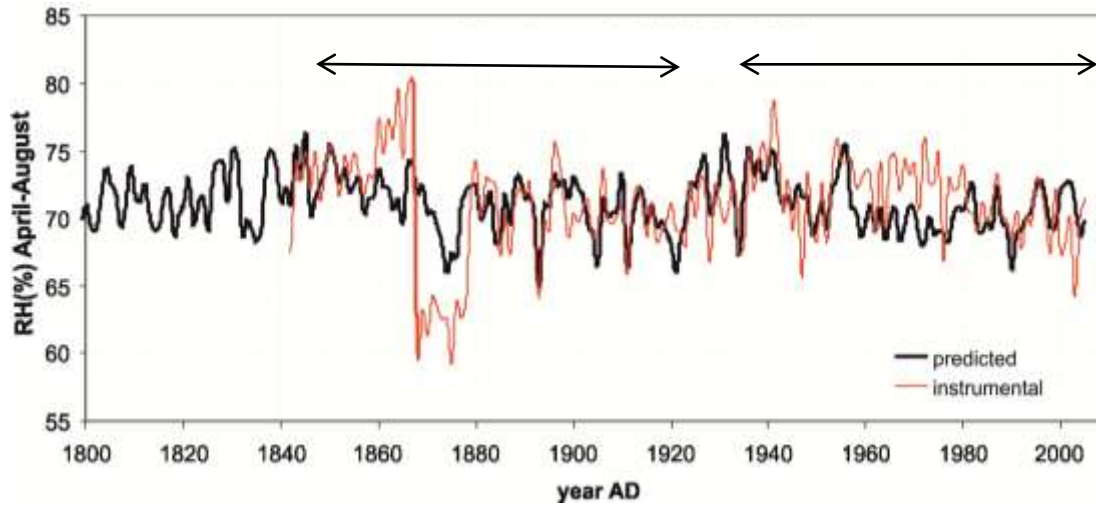
Tree-ring $\delta^{13}\text{C}$ relationships to precipitation and soil water content

- calibration of tree-ring isotope data series against instrumental data
- extension of the instrumental data record for assessing long term changes of soil water content and precipitation

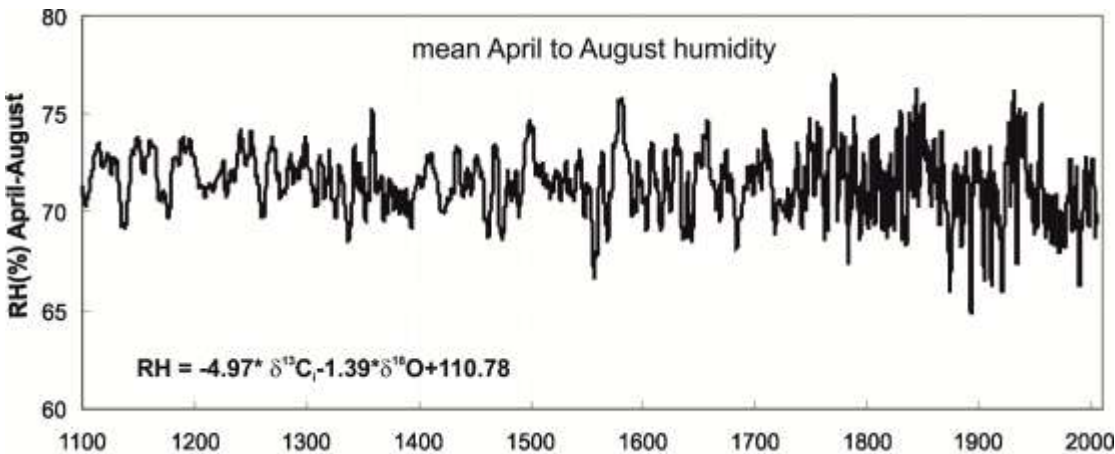




RH% (April-August) derived from tree-ring $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ (Franconia, S-Germany)



➤ calibration & verification against instrumental data



➤ reconstruction of moisture conditions during the vegetation period

Böttger et al. in prep.

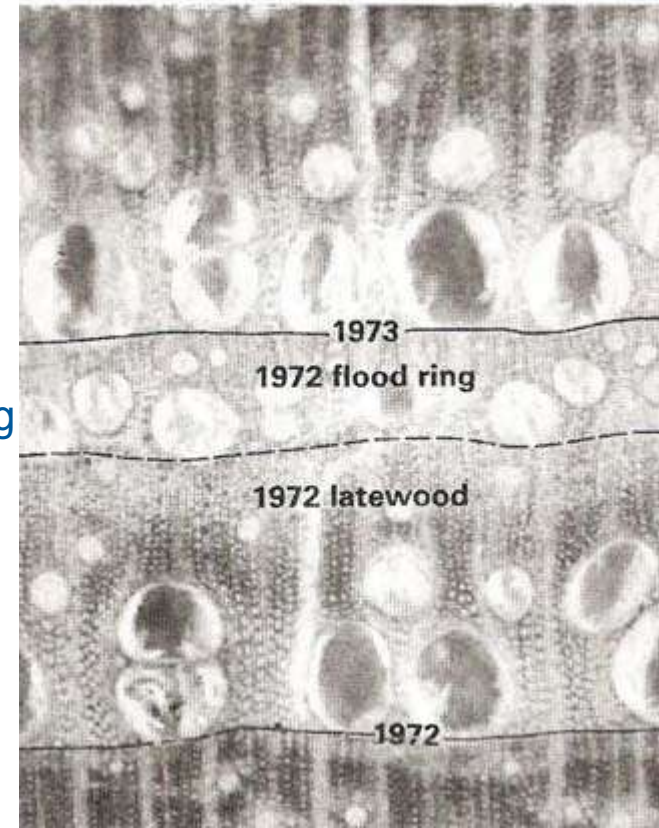


Further dendrohydrological methods

Frequency of flooding events from time series of wood anatomical features



Flood ring





TERENO NE: First results

Reconstructing lake level changes by dating wood stumps

Redernswalder See



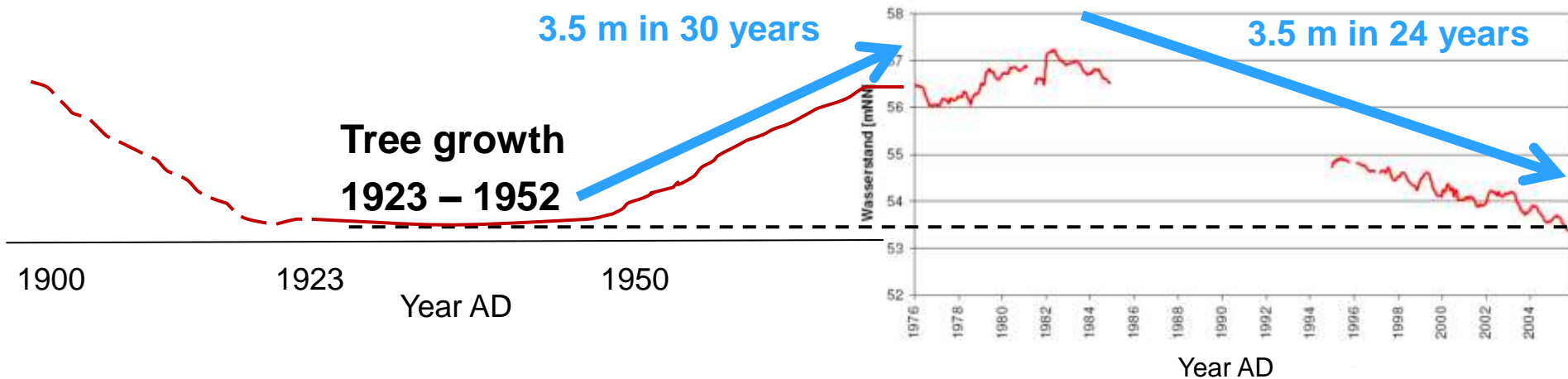
Alder stumps



3.5 m in 30 years

3.5 m in 24 years

Tree growth
1923 – 1952





Thank you for your attention!

Questions, remarks?



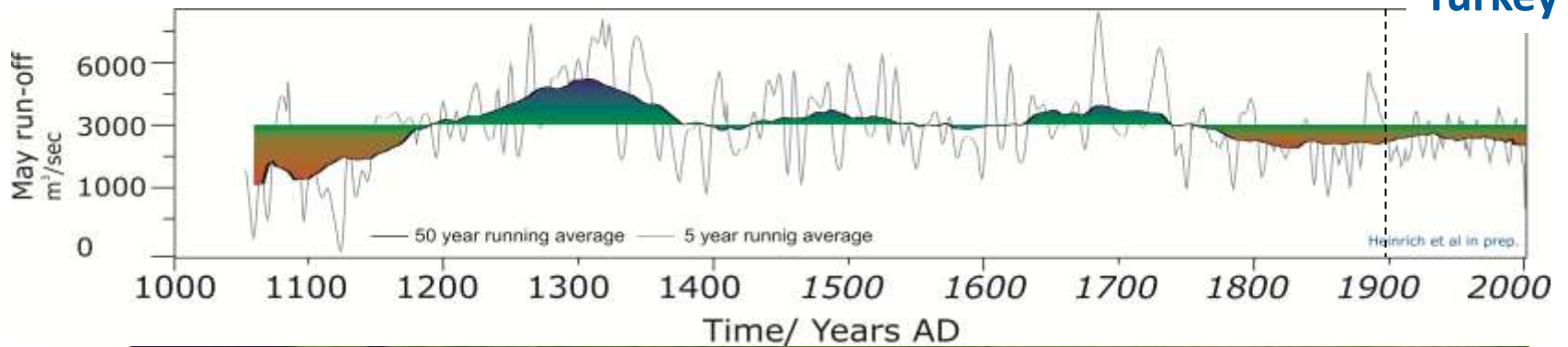
*"The farther backward you can look,
the farther forward you are likely to
see."*

- Winston Churchill

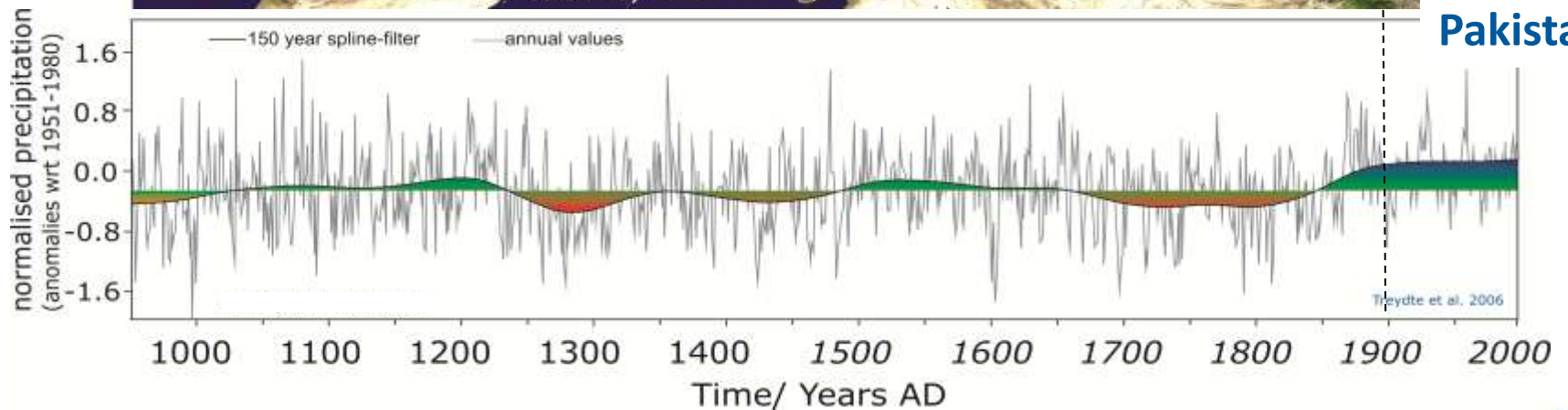


Reconstructions of Moisture Conditions (E-W Transect, 40°N)

Turkey



Pakistan





Reconstructions of Moisture Conditions (E-W Transect, 40°N)

