Intrinsic vegetation memory as a proxy of engineering resilience may be an oversimplification.

PRESENTER: Erik Kusch

Identifying ecological-memory patterns in drylands using remote sensing and state-of-the-art climate-reanalysis products

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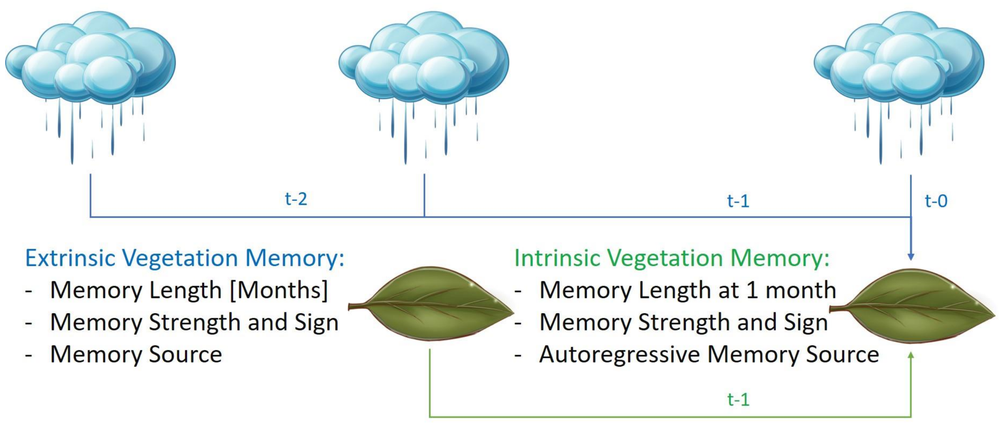
BACKGROUND

- **Vegetation memory** determines how **plants** react to **environmental changes**
- Especially **strong** across **dryland regions** (e.g. due to water limitations)
- **Compartmentalized:**
  - **Intrinsic (***"How vegetation influences itself over time"***)**
    → *Usually treated as an inverse proxy of recovery rates*
  - **Extrinsic (***"How the environment influences vegetation over time"***)**
    → *Usually understood as an inverse proxy of ecosystem resistance*
- **Characterized through:**
  - **Strength (***"How strong does the system react to an anomaly?"***)**
  - **Sign (**"*Does a positive anomaly benefit the system?"***)**
  - **Length (**"*How long does the system react to an anomaly?"***)**
  - **Source (**"*Which kind of anomaly does the system react to?"***)**

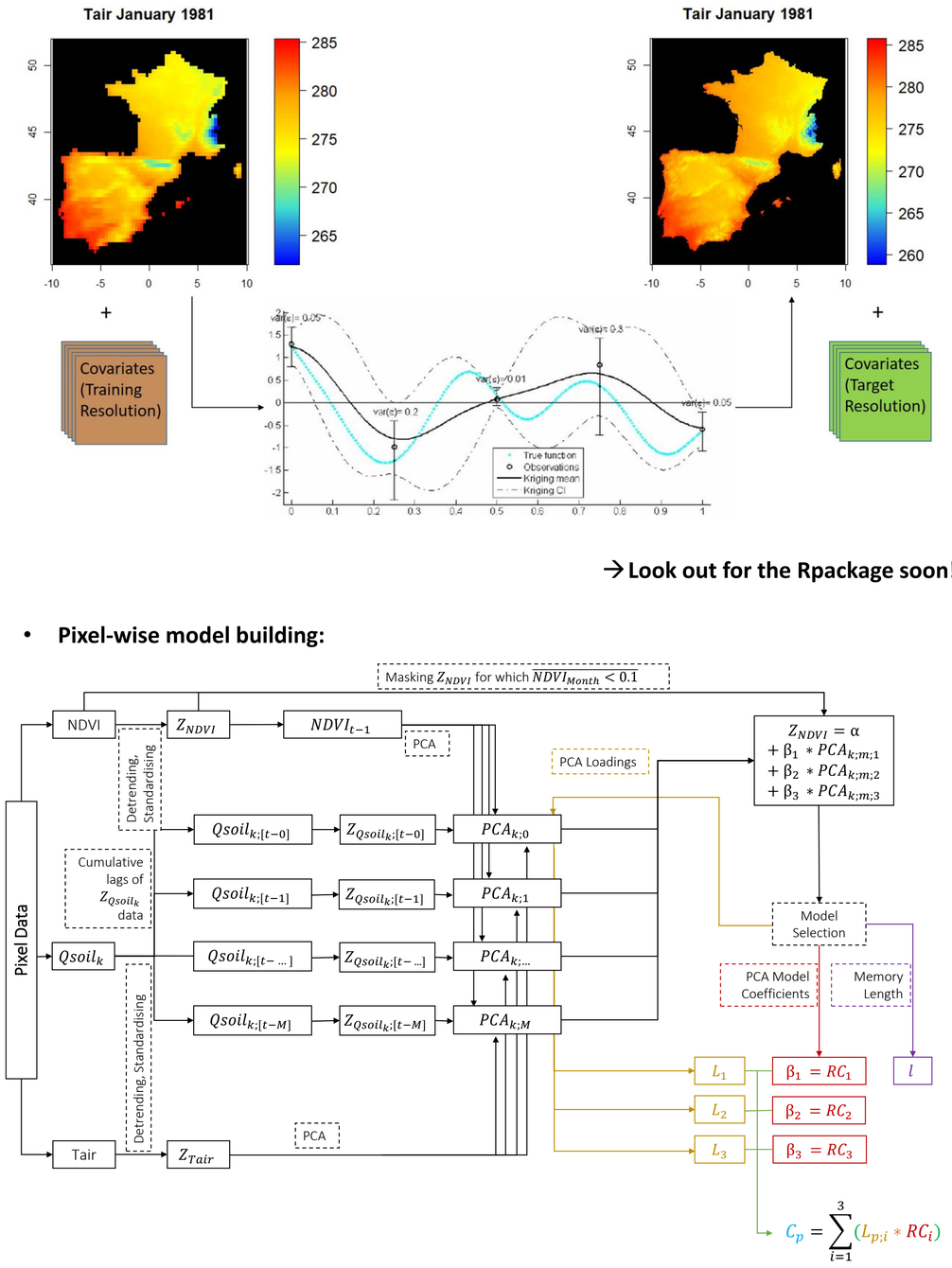


RESEARCH QUESTIONS

1. How can we distinguish intrinsic and extrinsic vegetation memory?
2. Can the use of novel climate products enhance our understanding of vegetation memory when compared to legacy products?
3. How well can we establish causal links between measures of plant function or vegetation life history traits and vegetation memory?

METHODS

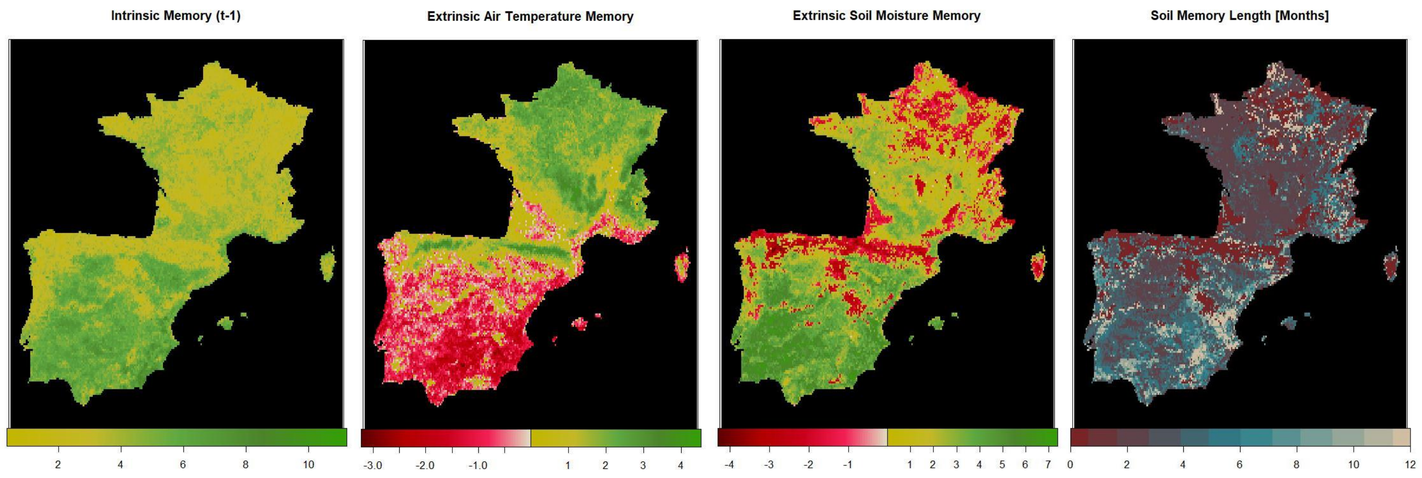
- **Data sets:**
  - **AVHRR GIMMS NDVI (**9x9km, 1982 – 2015, Monthly**)**
  - **ERA5 (**30x30km, 1950 – TODAY, Hourly**)**
    - Air Temperature (implemented as instantaneous effect)
    - Soil Moisture (in four depth layers, on lags from 0 to 12 months)
- **Spatial resolution mismatch r**esolved via **Kriging**



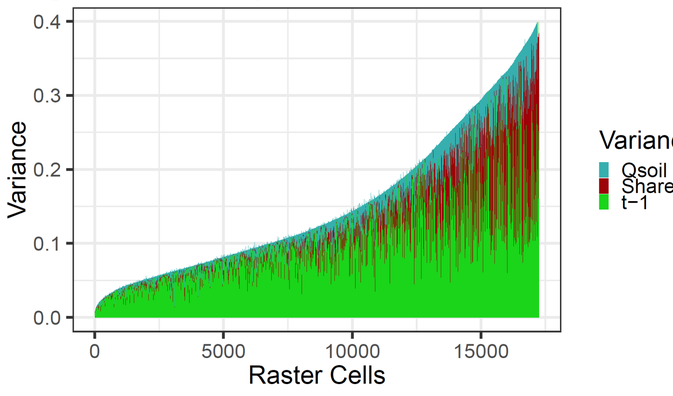
→ **Look out for the Rpackage soon!**

- **Pixel-wise model building:**

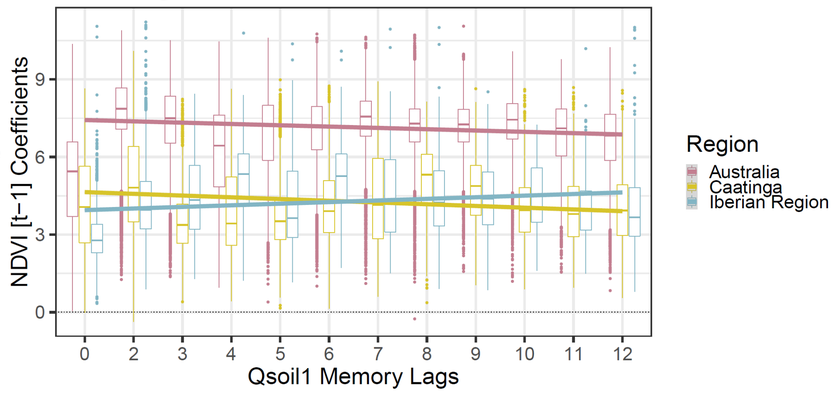
RESULTS



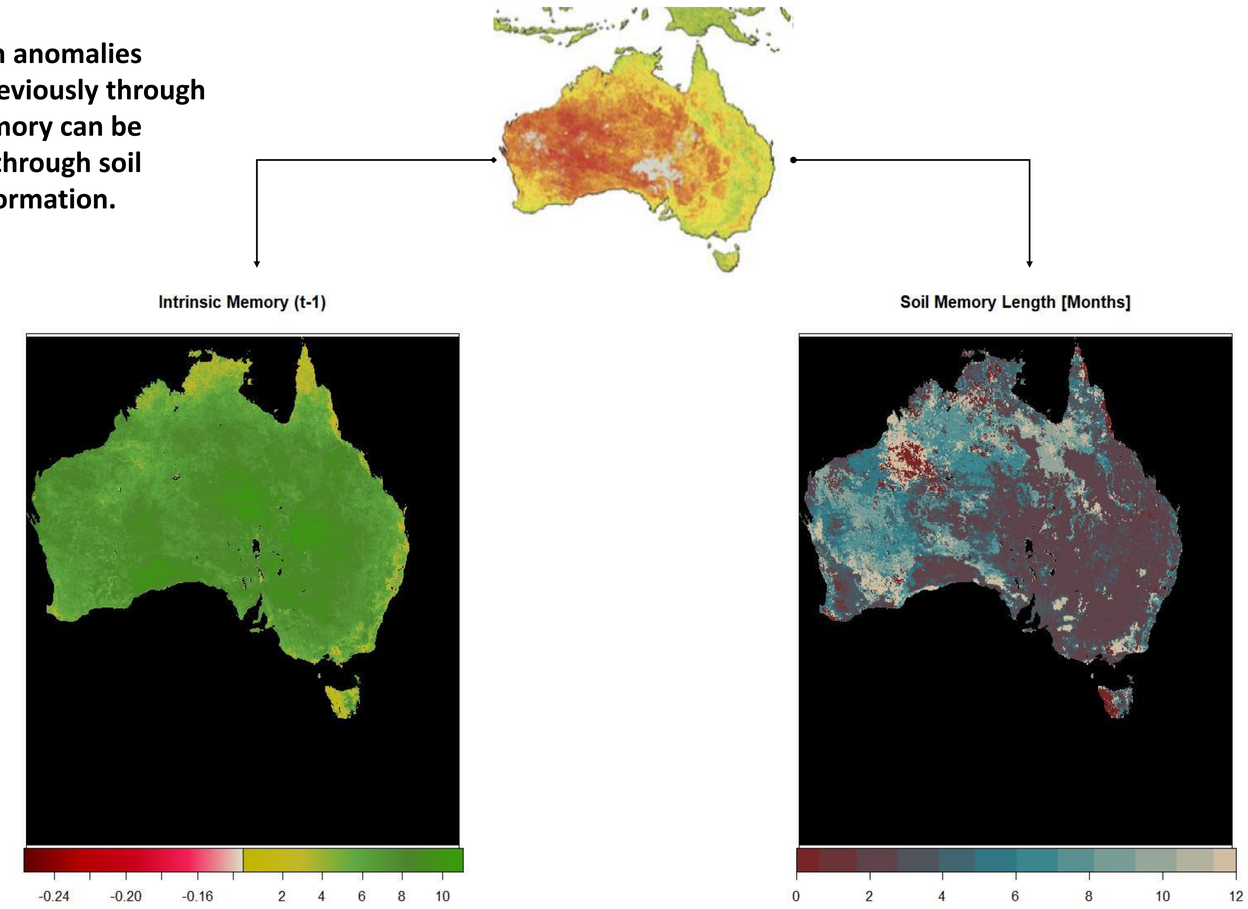
1. It is difficult to distinguish intrinsic and extrinsic vegetation memory.



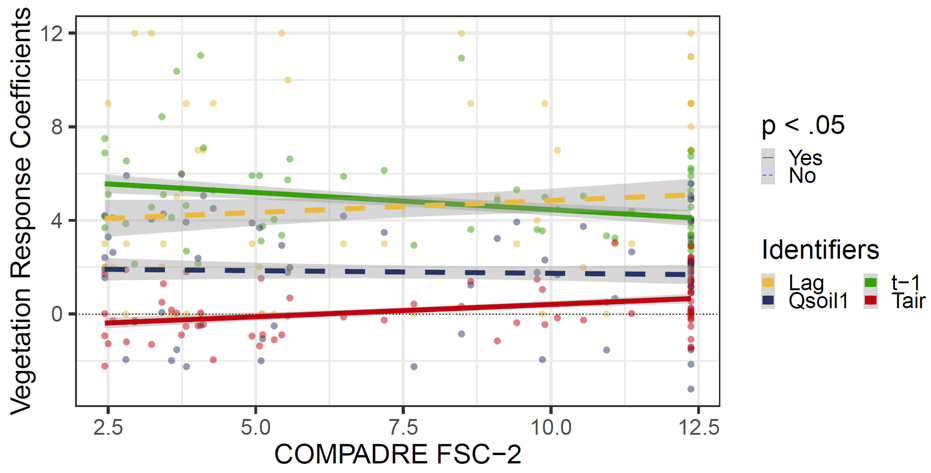
2. Vegetation memory processes differ greatly between regions.



3. Vegetation anomalies explained previously through intrinsic memory can be understood through soil moisture information.



4. No clear patterns of plant function or life history traits and vegetation memory characteristics were found.



TAKE-HOME MESSAGES

1. Management decisions based on **intrinsic vegetation memory as a** direct **proxy of recovery rates may be flawed.**
2. **Novel climate reanalysis products** may offer **more informative climate parameters than** the ones **previously used.**
3. **Global generalisations** of **vegetation response to soil moisture aspects** are **not possible** (at this point in time)**.**
4. **Linking vegetation memory to** expressions of **plant function** or **life history traits** remains **inconclusive.**

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