

CMUG OWP5.2 – Impacts and evaluation of vegetation phenology changes on observed and modelled land-atmosphere processes



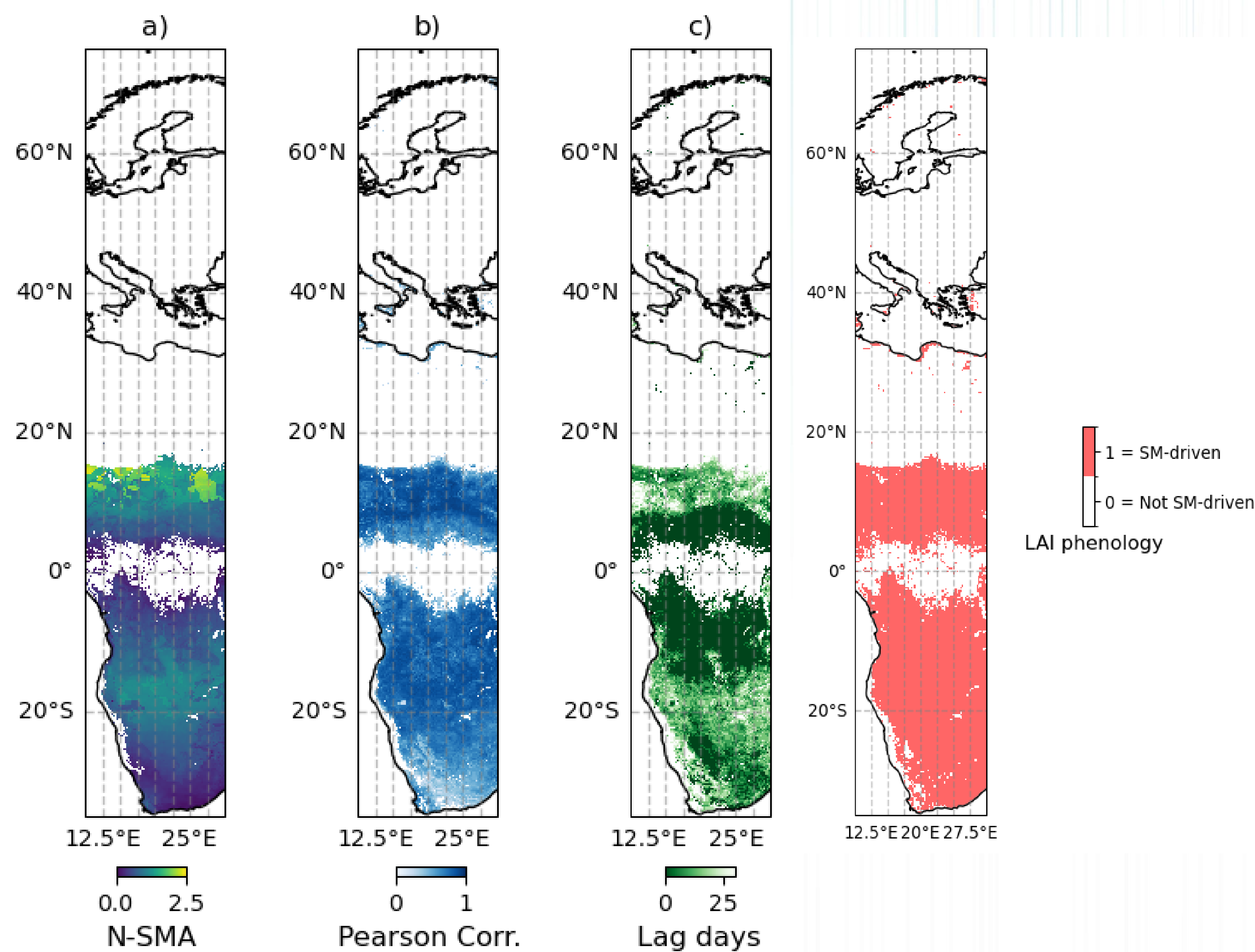
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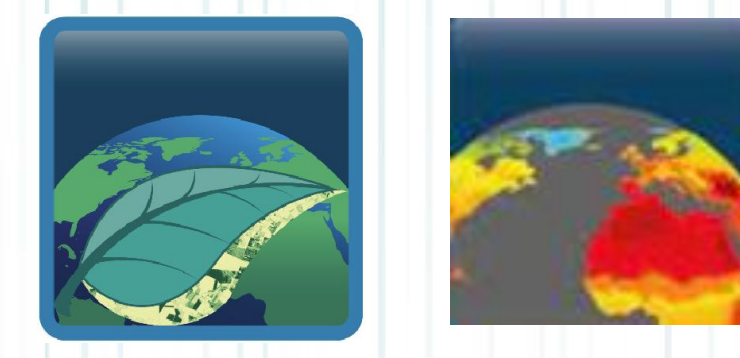
Observed relationship between Vegetation Phenology Onset, Soil moisture and Temperature



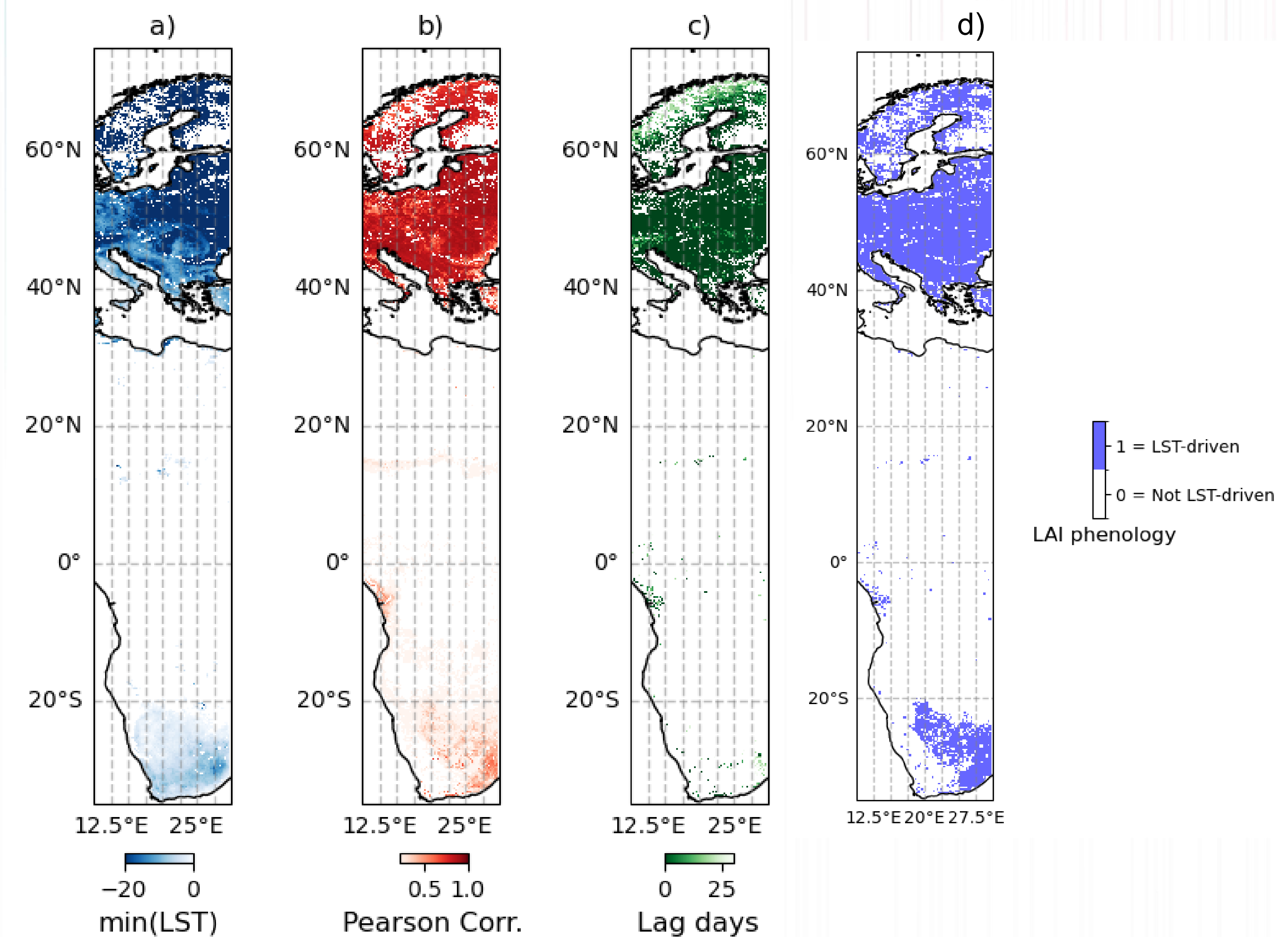
The water-limited regions are identified based on a set of criteria



- Above 70% of normalized soil moisture amplitude;
- Correlation > 0.2 between soil moisture and LAI;
- A positive time-lag correlation between soil moisture and LAI of a maximum of 30 days.

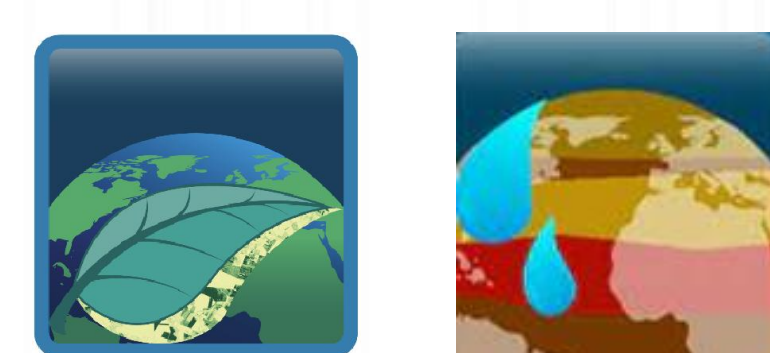


The temperature-limited areas are detected based on these criteria:



- Minimum annual temperature below 0 °C;
- Correlation > 0.2 between between LST and LAI;
- A positive time-lag correlation between LST and LAI of a maximum of 30 days.

Modelled relationship between Vegetation Phenology Onset, Soil moisture and Temperature

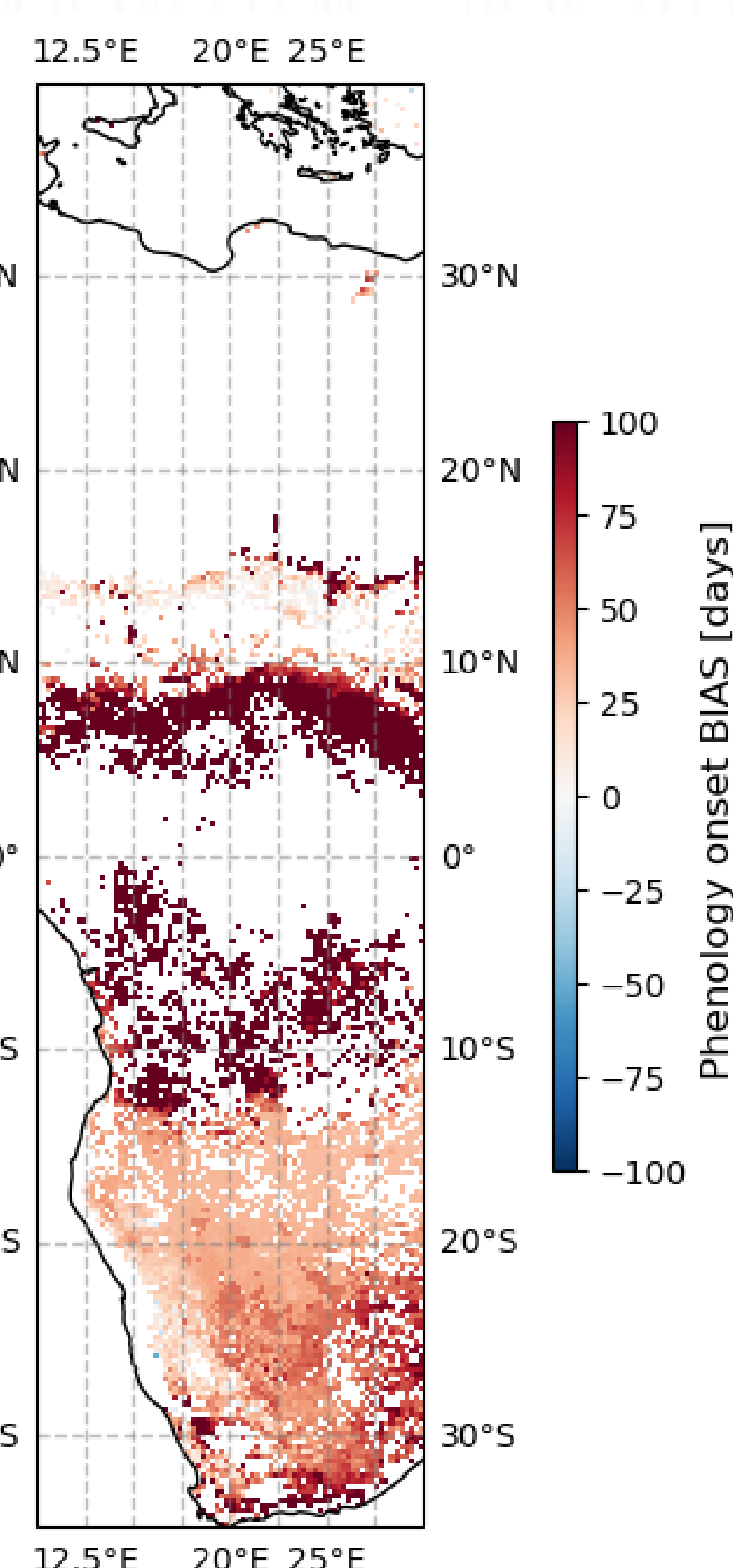
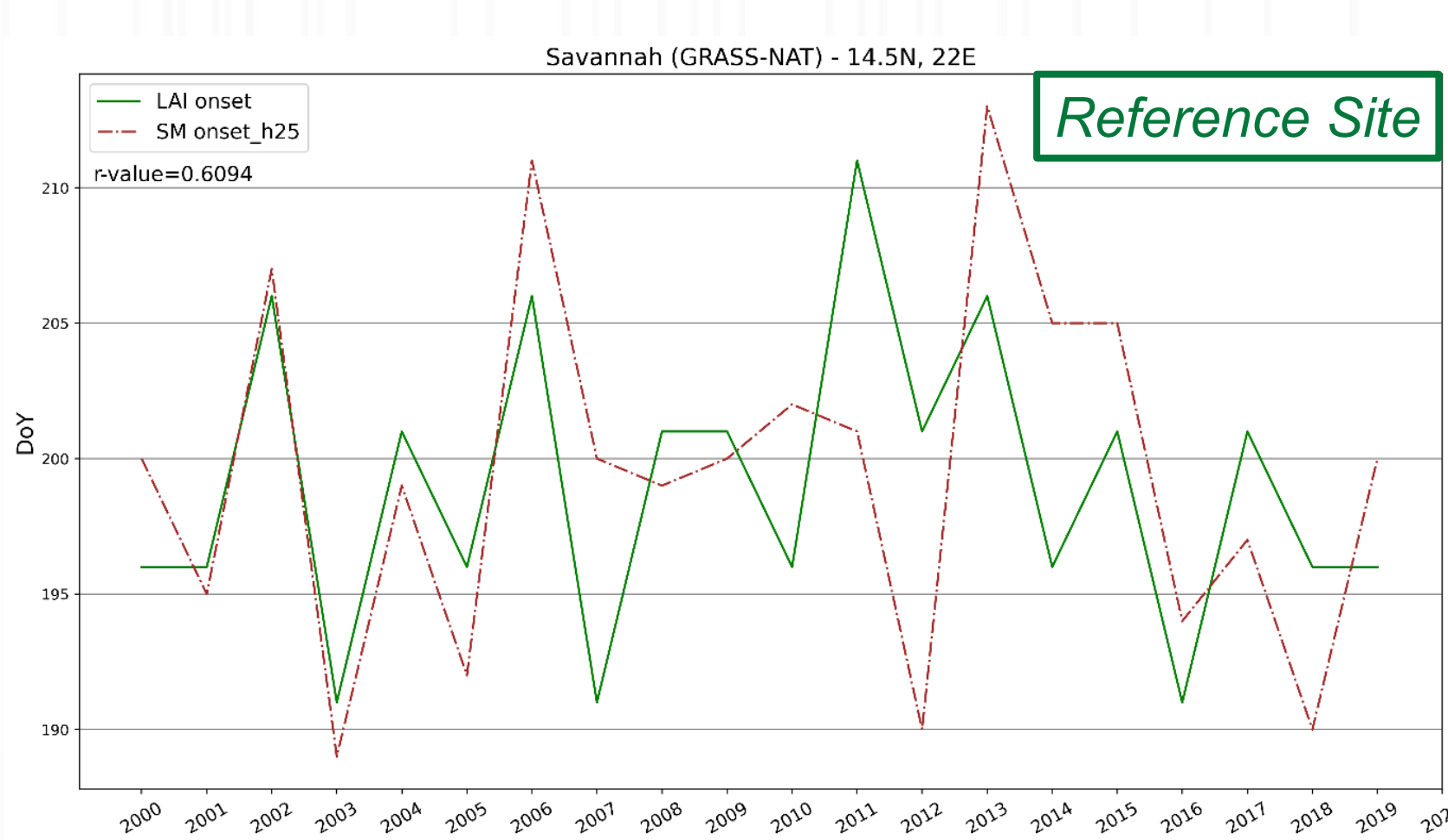


The relationship identified between onset and Soil Moisture is directly applied to the entire SM-driven area

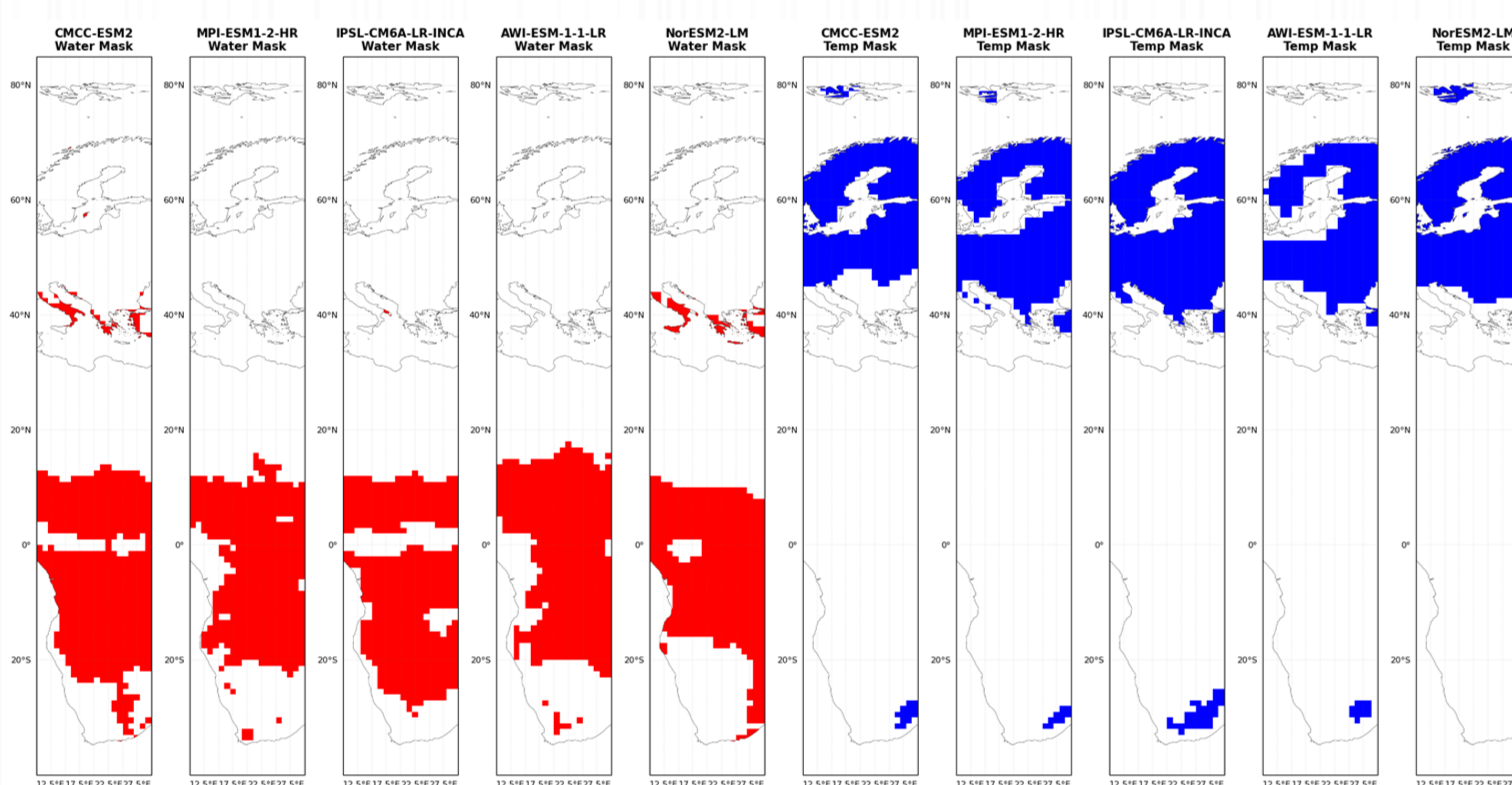
- Extend the onset from Soil Moisture in a grass site to the transect;

$$SM_{onset} = \begin{cases} 1, & \text{if } SM_{30d} > 0.4 \text{ and } SM_{5d} > 1.2 \\ 0, & \text{otherwise} \end{cases}$$

- Good fit (bias < 10 days): for 5.6% of SM-driven area for 10.2% of grass areas
- Possible reconstruction of onset based on ML method.



The extent of SM- and Temperature-driven area is evaluated in a set of CMIP6 Models



- Extent of water- and temperature-driven area are coherent with the observed ones;
- Differences between models based on LAI, variability in soil depth representation, PFT coverage, and reduced soil moisture annual variability.



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