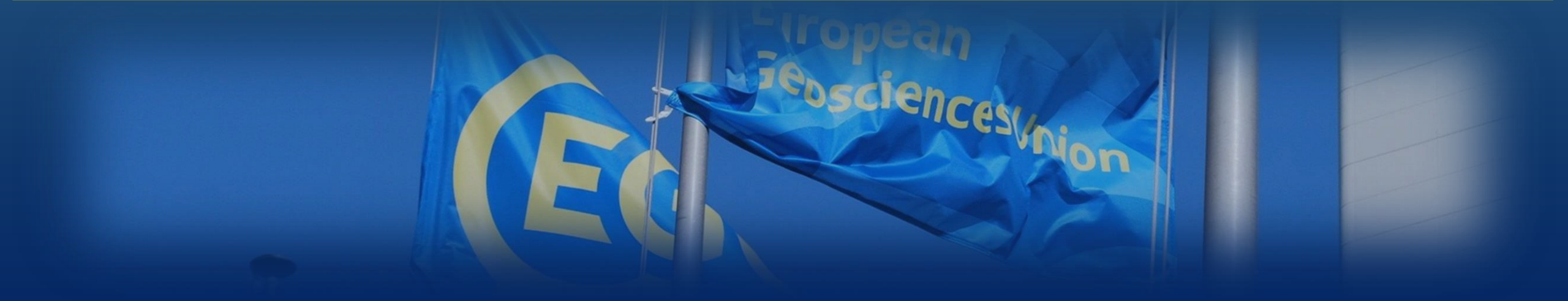

Trends of crop daily water requirements driven by 50-years global hydro-climatic data

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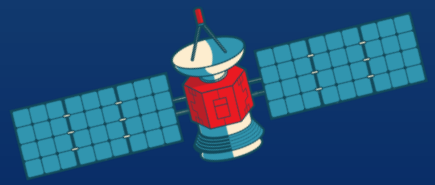
INTRODUCTION



- New space-time high-resolution data, combining **satellite** and **ground** information.
- New **high-resolution** climate datasets to compute **daily** assessments on a global scale.

MOTIVATIONS

- Understanding the spatio temporal changes of large-scale agricultural water needs
- Need for future scenarios of water management due to Climate Change, to adopt proper adaptation strategies.

OUR GOALS

- Impact of climate variability on crop water stress and irrigation requirements, from 1970 to 2019.
- Analysis of water requirement daily statistics on a global scale.

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DATA & METHODS

CLIMATE DATA
- Daily Precipitation and Temperature from ERA5
- Estimation of daily ET_0 : Hargreaves-Samani method, calibrated with annual Penman-Monteith rates.
- 0.25° x 0.25° resolution (global)

CROP DATA
- **Rainfed** & **Irrigated**
- 26 main crops
- Multi-seasonal practices

SOIL PROPERTIES
Available Water Capacity (AWC) of cropland surfaces

Rainfall water input

Rainfed Scenario

$$\Delta S = ETa - P_{eff}$$

Irrigated Scenario

$$\Delta S = ET_a - I - P_{eff}$$

Rainfall + Irrigation water inputs

Daily soil water balance

- Actual evapotranspiration (ET_a) → $ET_a = ET_0 \cdot k_c \cdot k_s$

k_s=1 → well-watered soil (no stress).
k_s=0 → wilting point.

- Irrigation requirement (I) → water needed to fulfill lacks of precipitation on areas equipped for irrigation, avoiding water stress.

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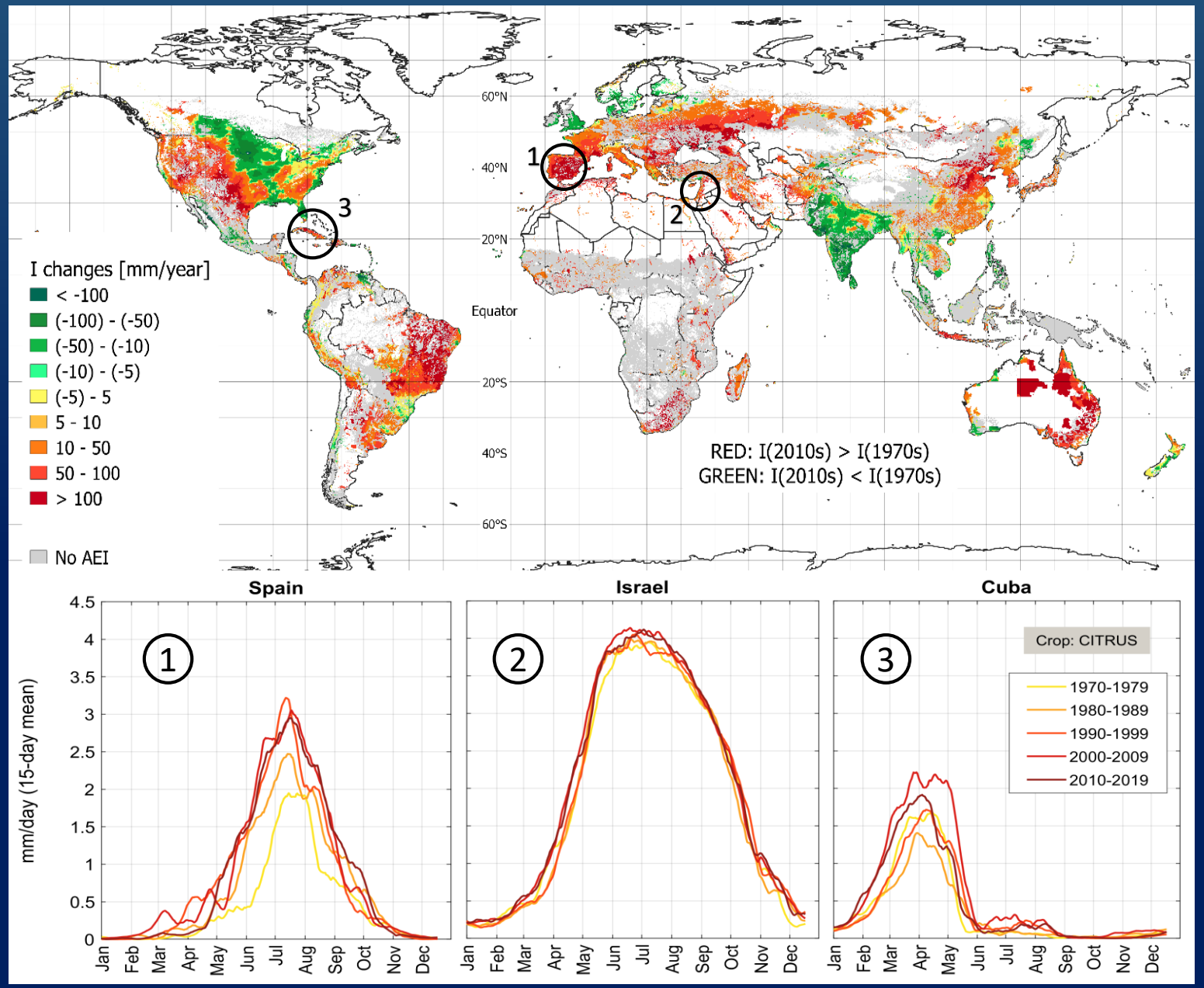
Spatio- temporal variability of irrigation requirements (I)

Changes of mean annual irrigation requirements (mm yr^{-1}), comparing the AEI-weighted rates of 26 crops during 1970s and 2010s.

N.B. AEI: Area Equipped for Irrigation

Focus: CITRUS

Temporal variability of daily irrigation requirement: daily series in Spain, Cuba and Israel.



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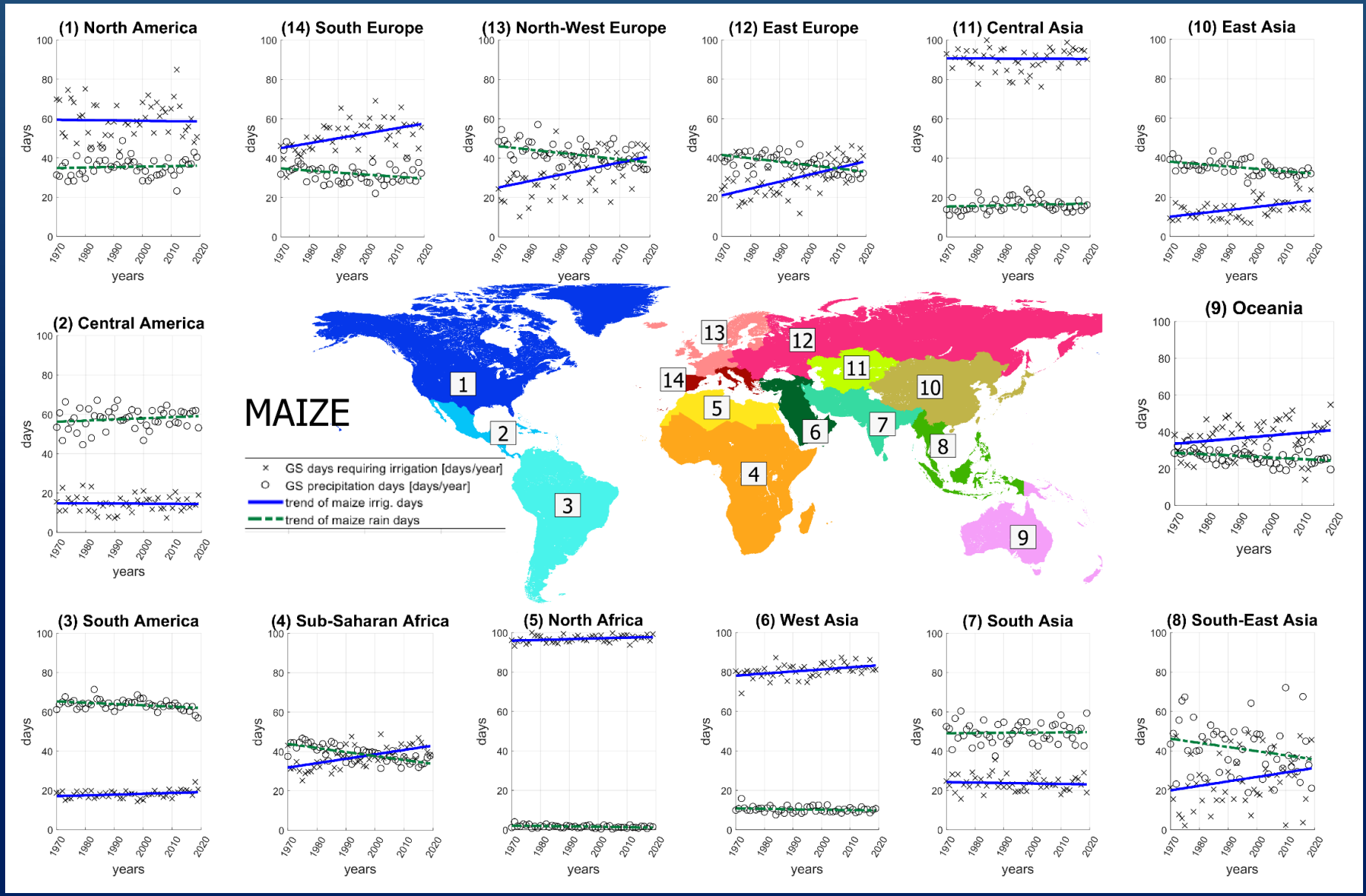
Days requiring irrigation

Temporal variability of precipitation days (circles) and days requiring irrigation (crosses) per growing season.

Period: 1970 - 2019

Crop: MAIZE



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Trends of crop water stress

Map of significant trends of water-stress days per year, considering 26 main rainfed crops.

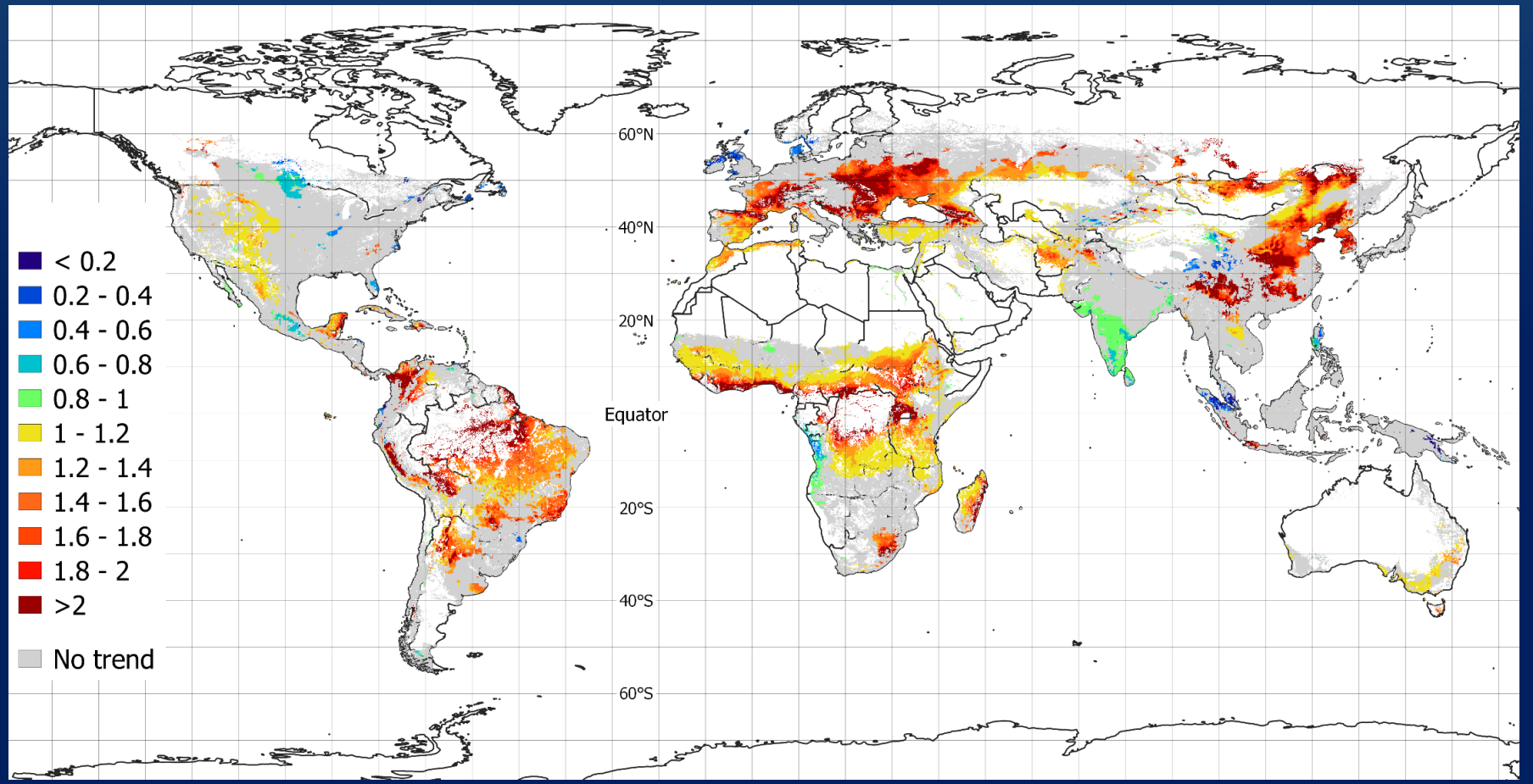
$$wSD_y = \frac{\sum_{c=1}^{26} SD_{y,c}}{\sum_{c=1}^{26} LGP_c}$$

- ***wSD***: stress days (***SD***) normalized by the total number of growing days per pixel [days].
- ***LGP***: length of growing period per crop (***c***) [days].
- **y**: year (1970 to 2019).

Coloured pixels → statistically significant trend of water stress.

LEGEND COLOURS

$$\frac{wSD_{(mean\ 2010-2019)}}{wSD_{(mean\ 1970-1979)}}$$



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Thank you for the attention

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