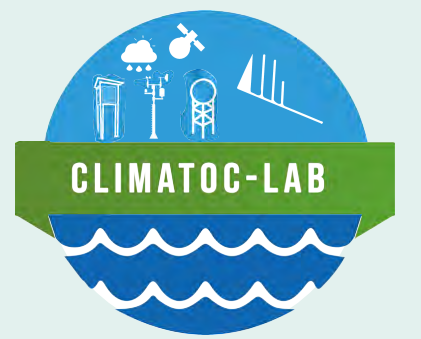




# Trends of sea breezes over the Western Mediterranean basin, 1981-2021: Are they affected by large-scale atmospheric circulation changes?

Shalenys Bedoya-Valestt<sup>1</sup>, Cesar Azorin-Molina<sup>1</sup>, Lorenzo Minola<sup>1,2,3</sup>, Luis Gimeno<sup>4</sup>, Miguel Andres-Martin<sup>1</sup> and Deliang Chen<sup>2</sup>

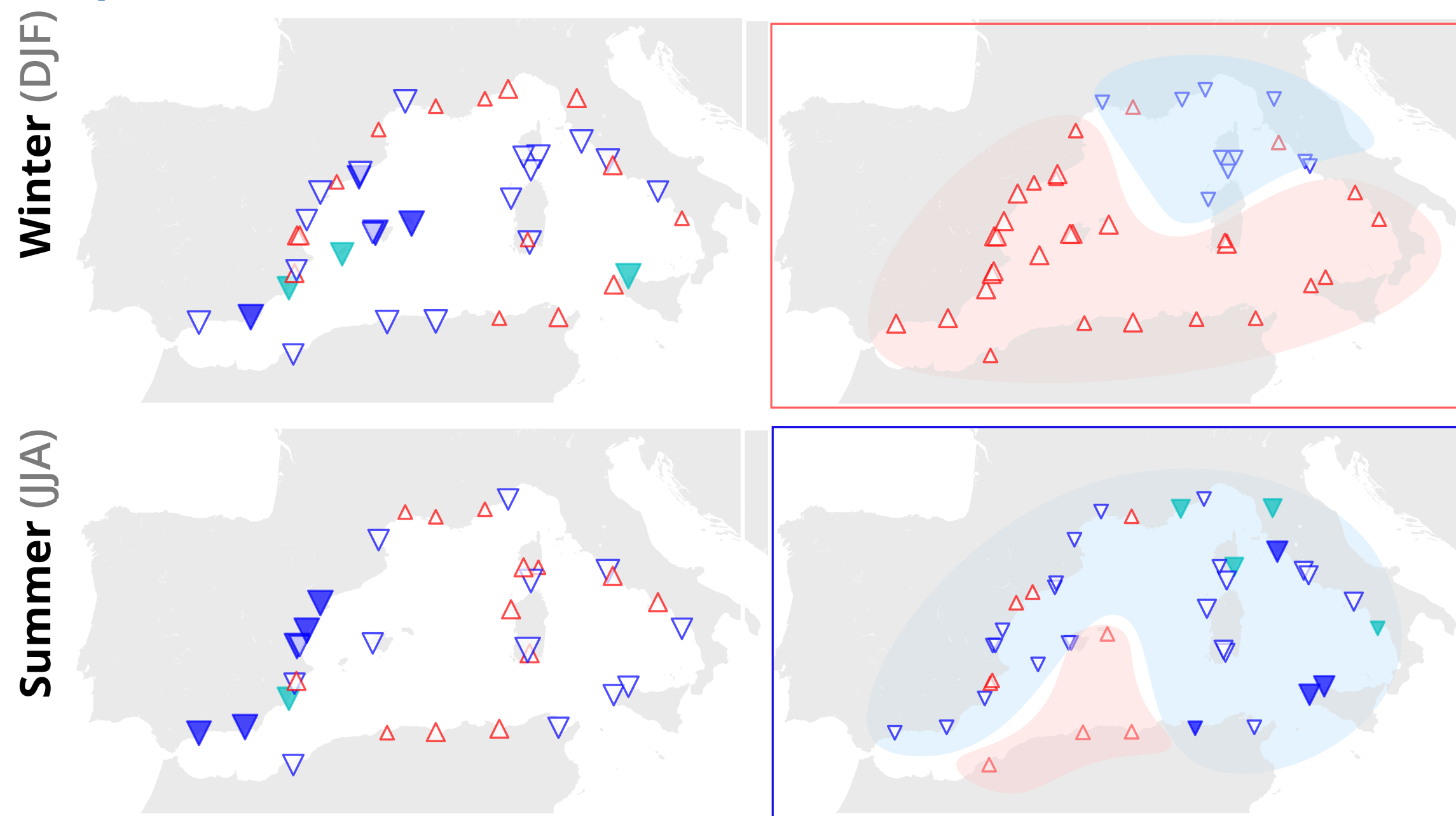
<sup>1</sup> CIDE (CSIC-UV-Generalitat Valenciana), <sup>2</sup> RCG (UGOT), <sup>3</sup> DIST, <sup>4</sup> EPhysLab (CIM-UVIGO)



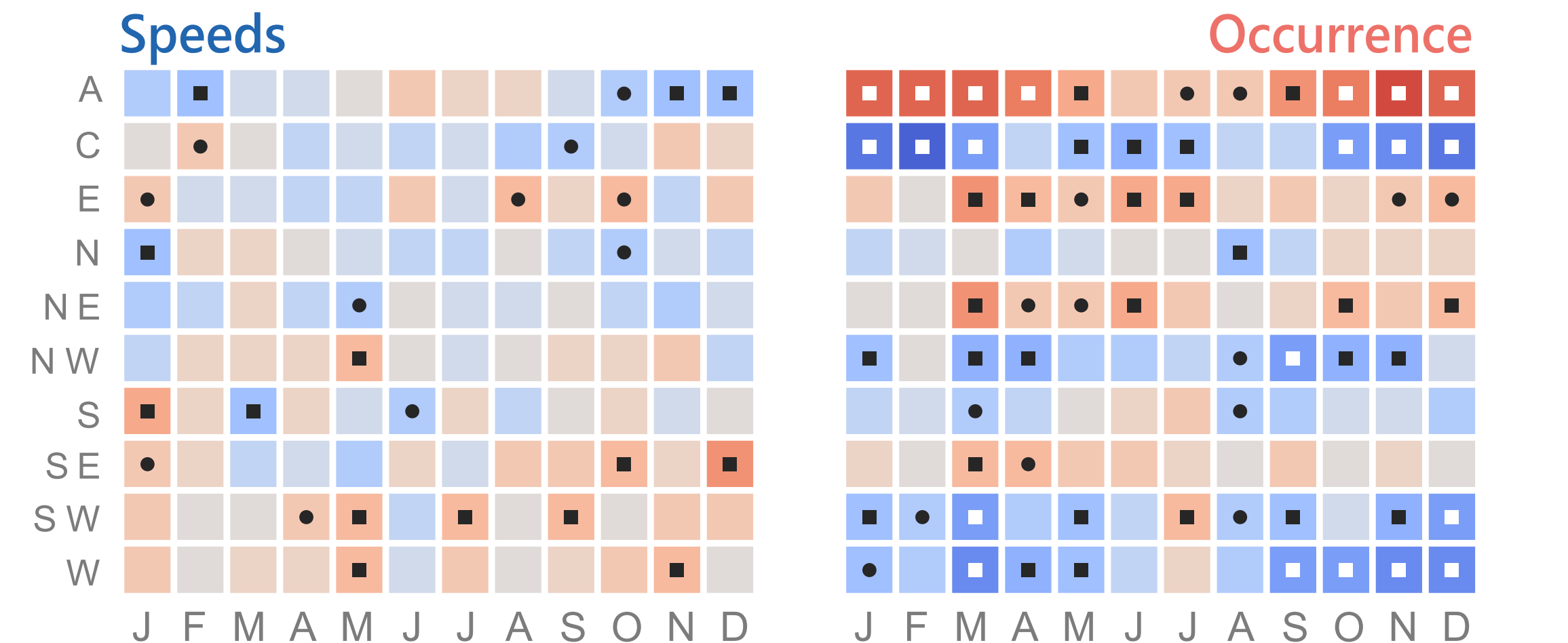
## Sea-breeze station-based trends (1981-2021)

### Speeds

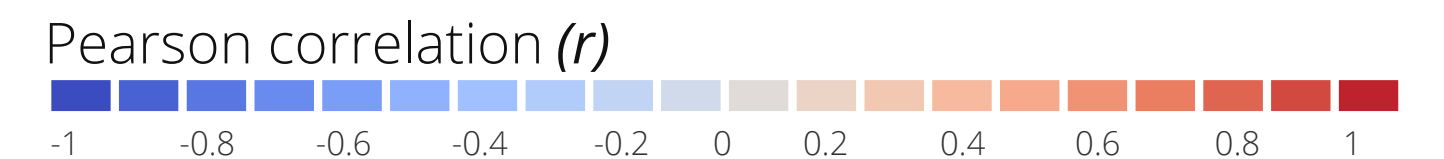
### Occurrence



## Relationship with frequencies of the JC weather types



■ Significant at  $p < 0.05$   
 ● Significant at  $p < 0.10$



**FUNDING:** We acknowledge support from the IBER-STILLING project RTI2018-095749-A-100 (MCIU/AEI/FEDER,UE), the VENTS project AICO/2021/023 (GVA), the Santiago Grisolia grant (CIGRIS/2021/131), the CSIC Interdisciplinary Thematic Platform PTI-CLIMA, the LINGLOBAL-CSIC (RED-CLIMA, ref. INCGLO0023), and the "Unidad Asociada CSIC-Universidad de Vigo: Grupo de Física de la Atmósfera y del Océano"



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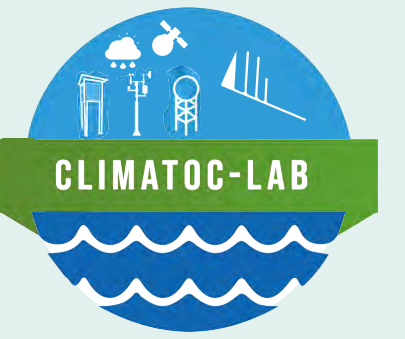
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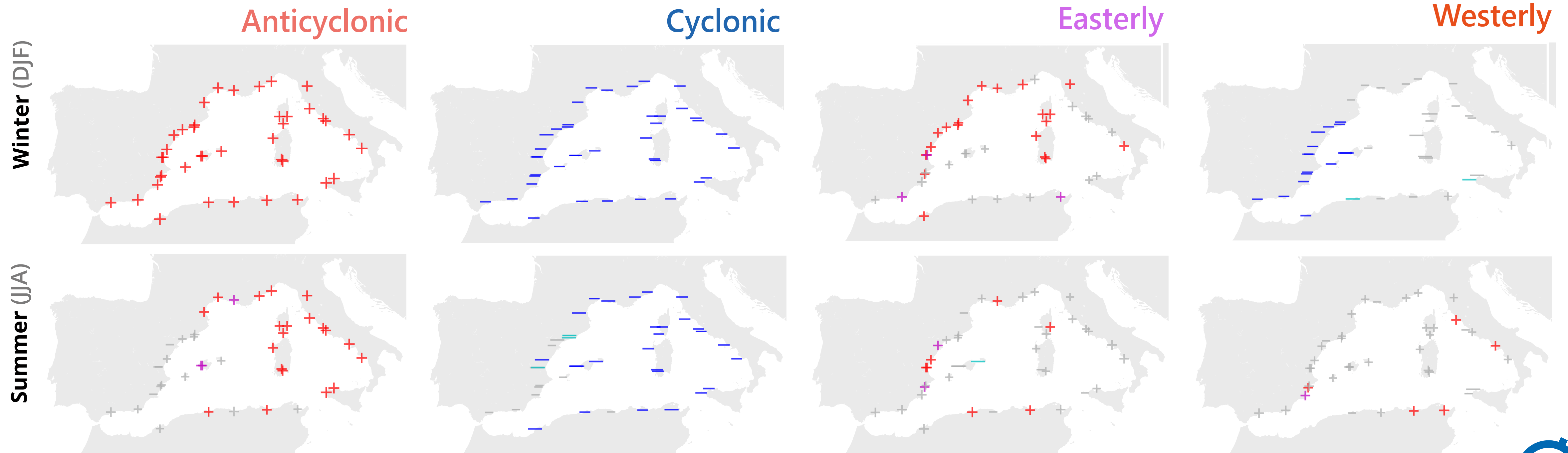
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## JC Station-based correlations with sea-breeze occurrence (1981-2021)



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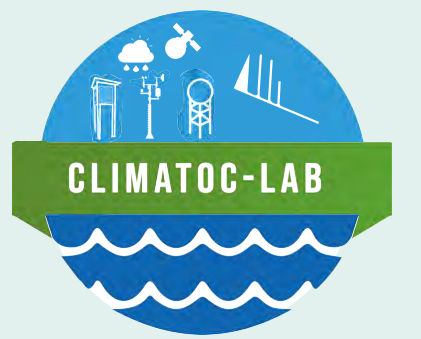
MINISTERIO DE CIENCIA E INNOVACIÓN



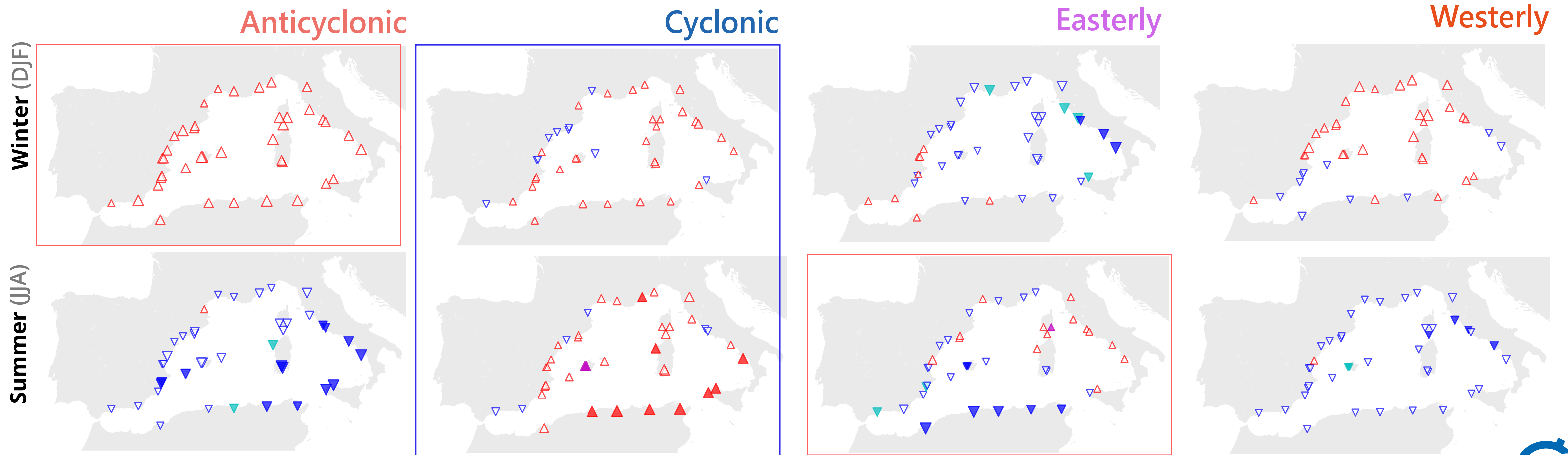
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## JC Station-based trends (1981-2021)



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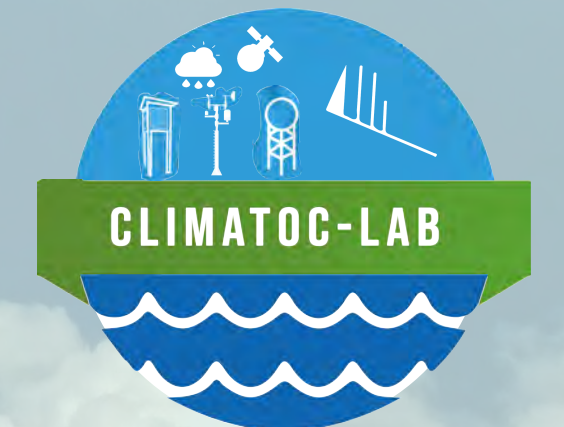


# Thanks!

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## Data

- 40 weather stations from HadISD
- Hourly homogenization of wind speed data
- SLP data from ERA5 (to compute gridded JC scheme)
- Precipitation, cloudiness, wind components and geopotential data from ERA5-Land and ERA5

## Identification algorithm

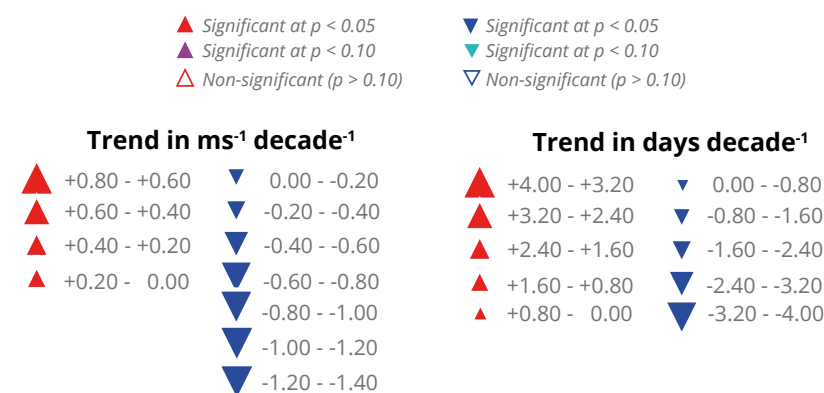
### Large-scale conditions

- Filter 1. Non-cyclonic weather types\*
- Filter 2. Weak geostrophic wind  $\leq 12 \text{ ms}^{-1}$

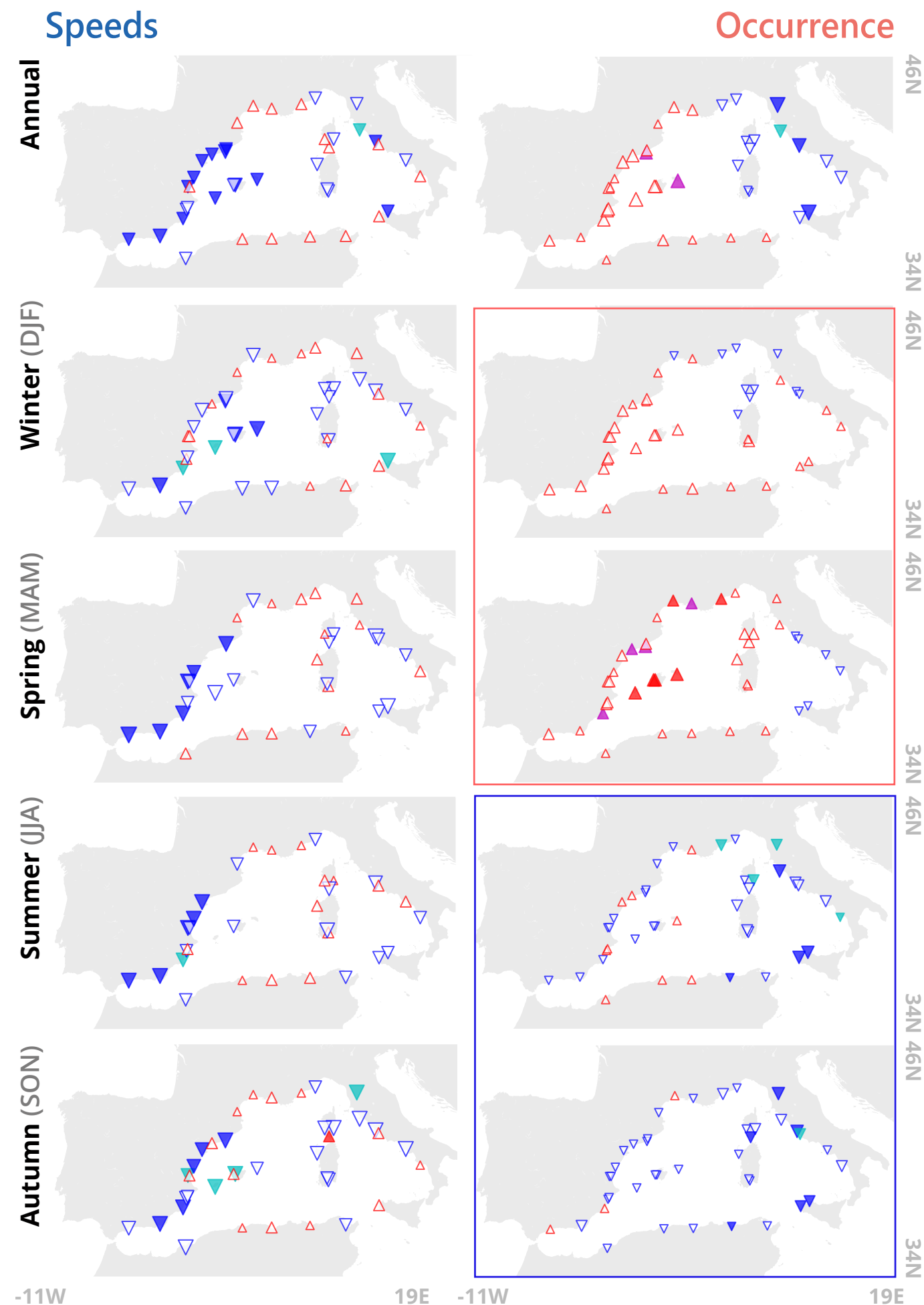
### Local-scale conditions

- Filter 3. Onshore winds
- Filter 4. Aerial tide  $\geq -0.5$
- Filter 5. Total cloud cover  $< 4/8$
- Filter 6. Precipitation  $< 0.1 \text{ mm}^{-1}$

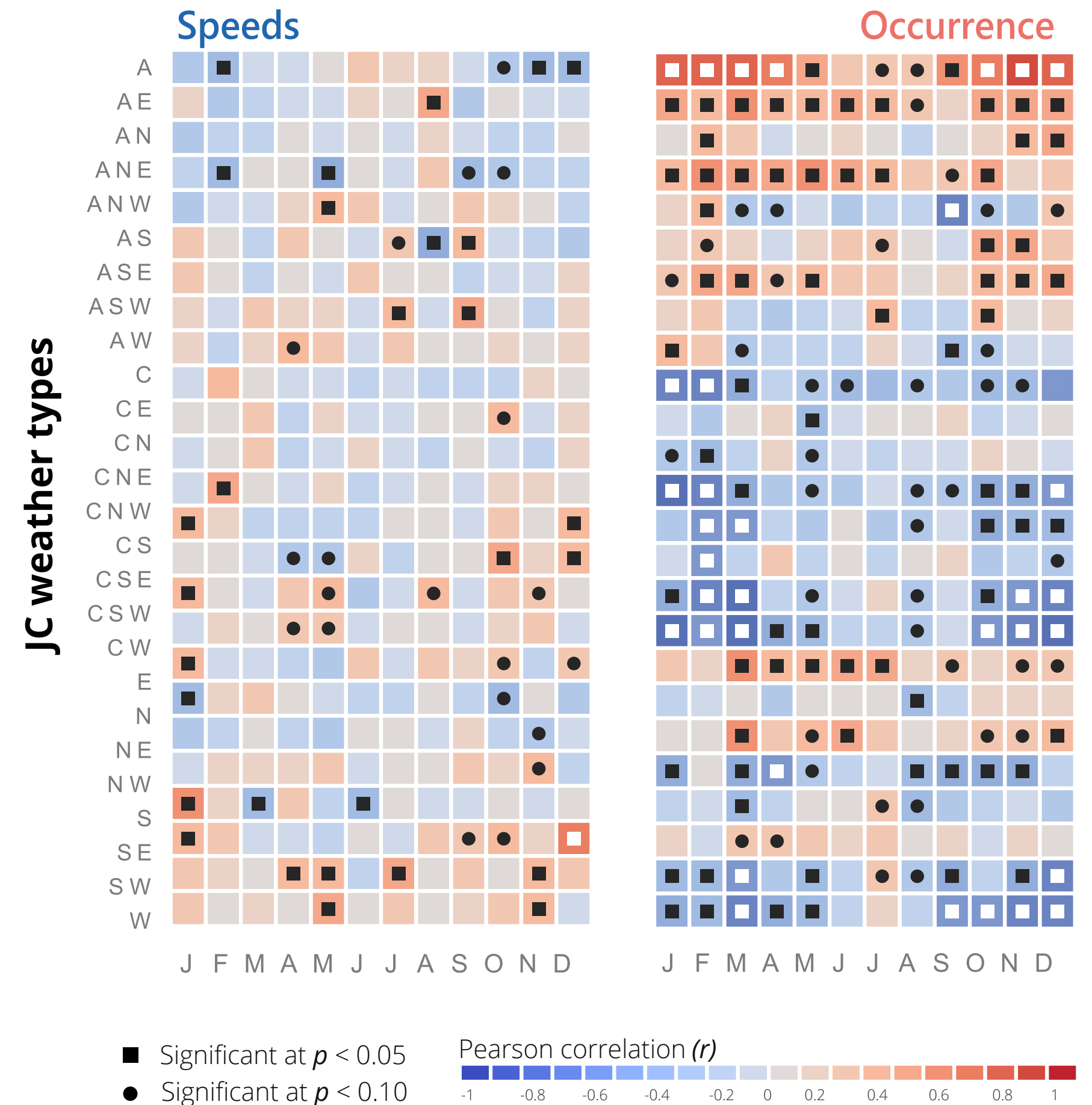
We found 9,888 sea-breeze episodes across the Western Mediterranean basin for the 40 years period



## 1 Station-based trends (1981-2021)



## 2 Relationship with frequencies of the Jenkinson and Collison weather types



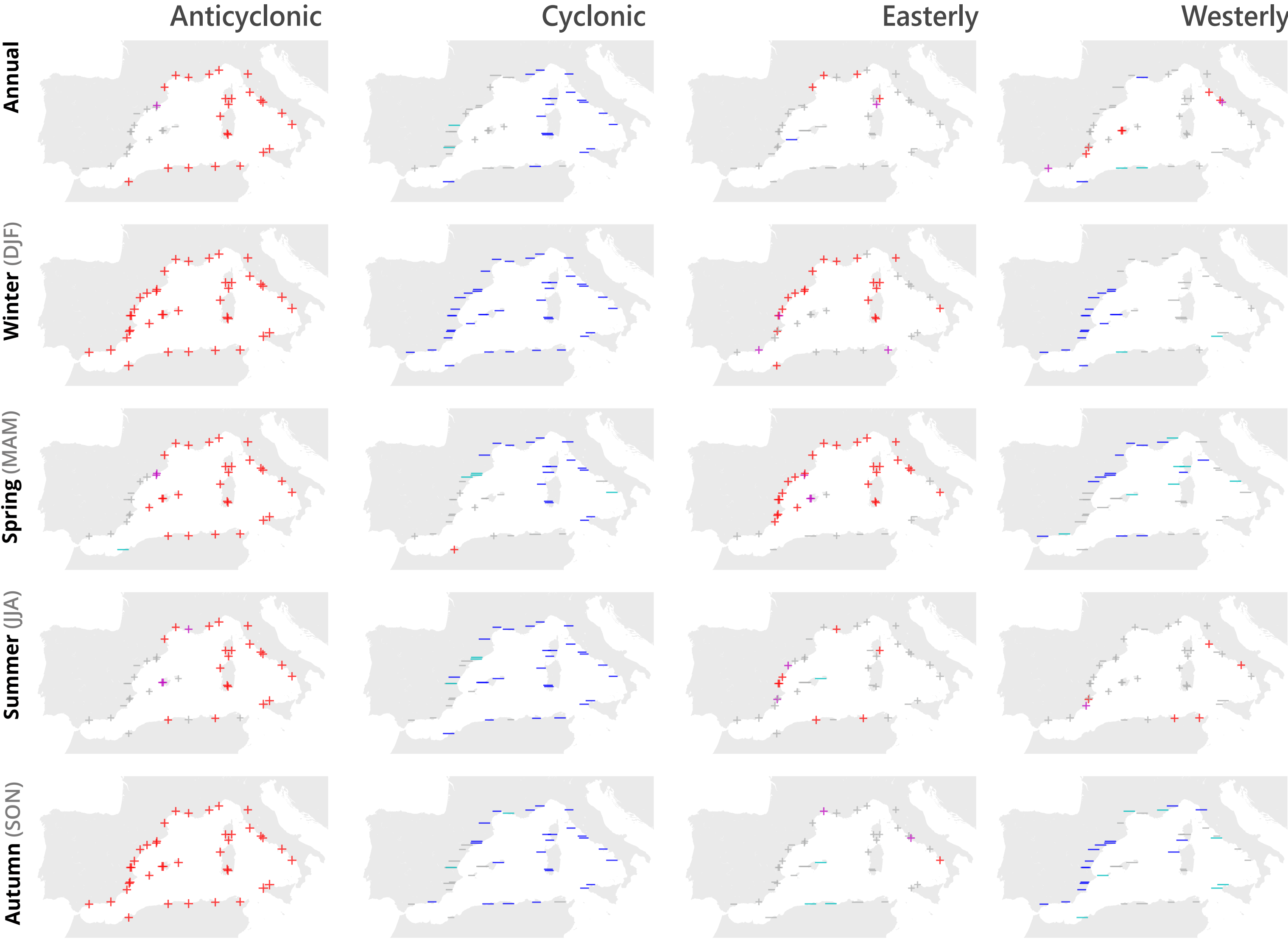
\*Correlations for all sea-breeze episodes on the Western Mediterranean basin

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# Trends of sea breezes over the Western Mediterranean basin, 1981-2021: Are they affected by large-scale atmospheric circulation changes?

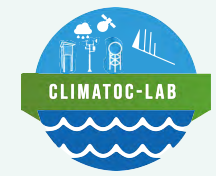


## 3 JC Station-based correlations with sea-breeze days (1981-2021)

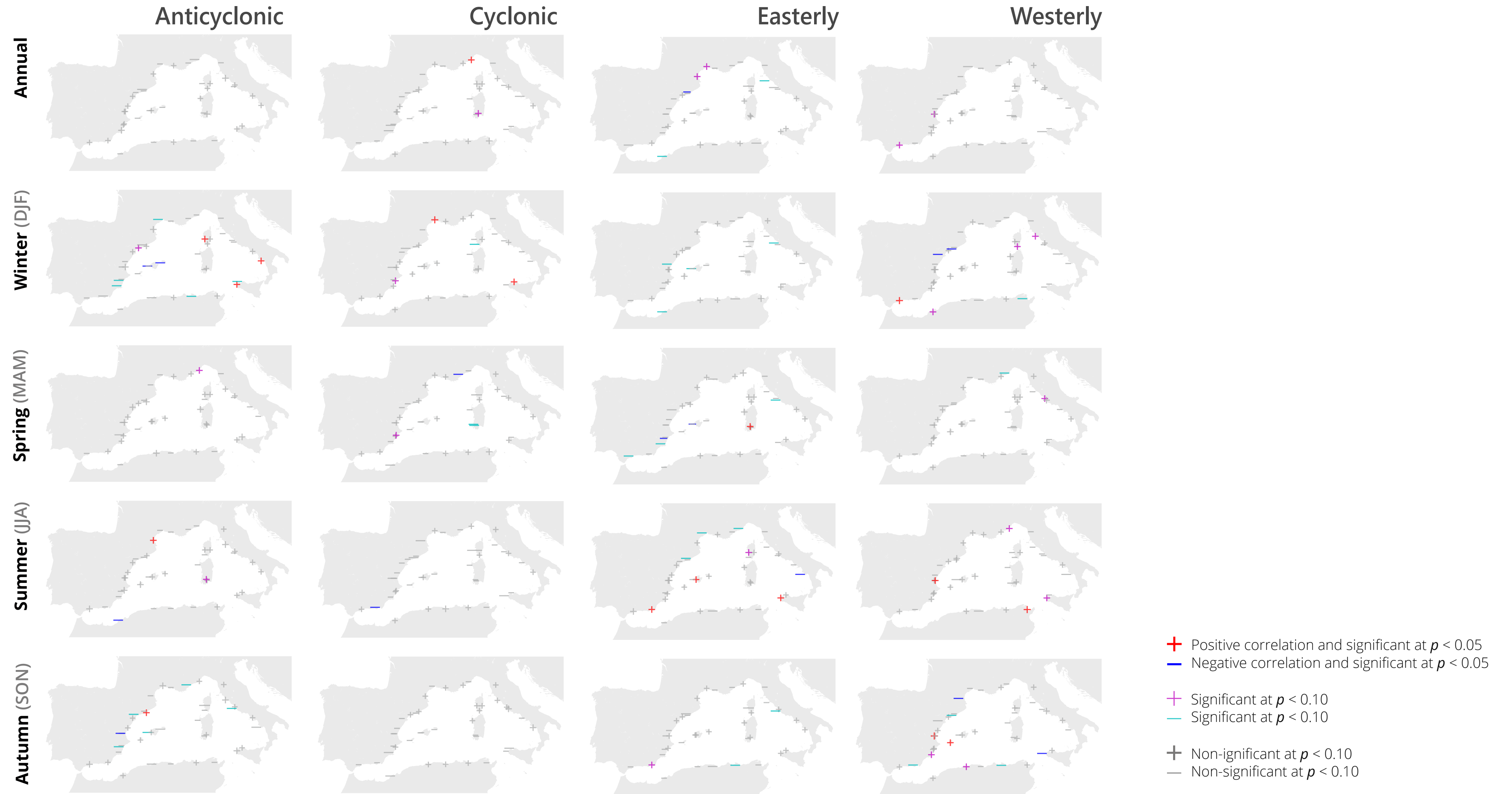


+ Positive correlation and significant at  $p < 0.05$   
 - Negative correlation and significant at  $p < 0.05$   
 + Significant at  $p < 0.10$   
 - Significant at  $p < 0.10$   
 + Non-significant at  $p < 0.10$   
 - Non-significant at  $p < 0.10$

# Trends of sea breezes over the Western Mediterranean basin, 1981-2021: Are they affected by large-scale atmospheric circulation changes?

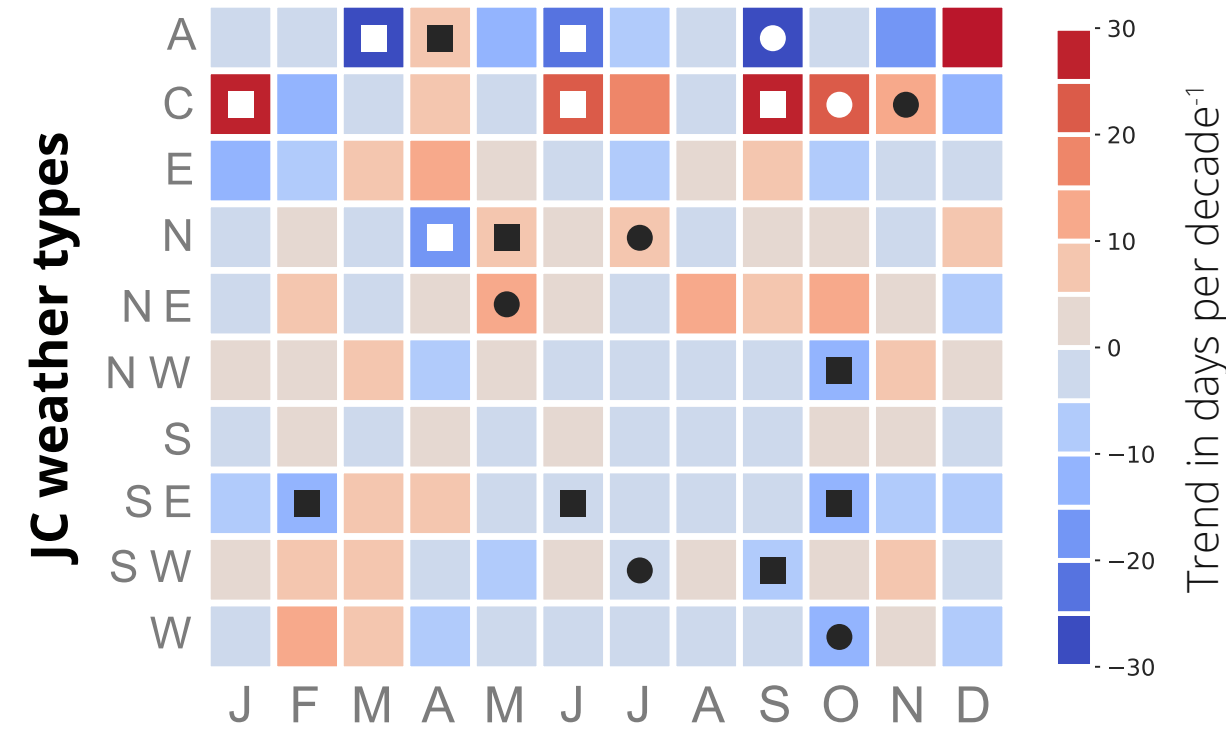


## 4 JC Station-based correlations with sea-breeze speeds (1981-2021)



# Trends of sea breezes over the Western Mediterranean basin, 1981-2021: Are they affected by large-scale atmospheric circulation changes?

## 4 Jenkinson and Collison trends (1981-2021)



## 5 JC Station-based trends (1981-2021)

Trend in days per decade<sup>-1</sup>

- ▲ Significant at  $p < 0.05$
- ▲ Significant at  $p < 0.10$
- △ Non-significant ( $p > 0.10$ )
- ▼ Significant at  $p < 0.05$
- ▼ Significant at  $p < 0.10$
- ▽ Non-significant ( $p > 0.10$ )

