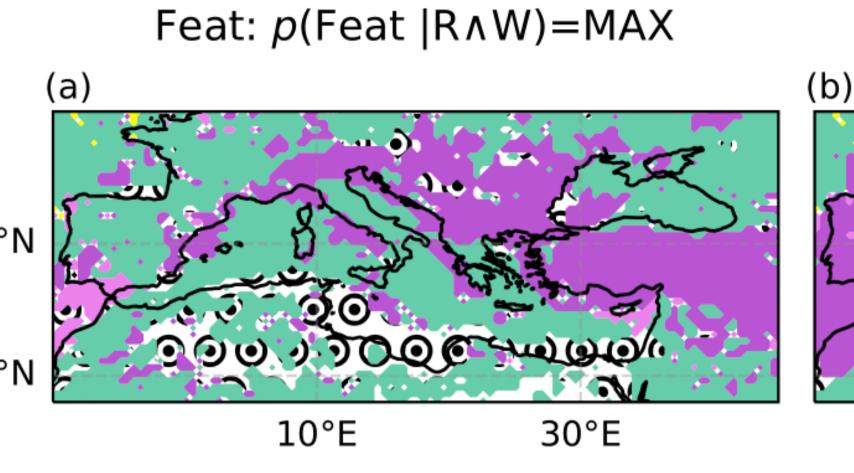
A climatology of Mediterranean cyclones and compound weather extremes A. Portal (alice.portal@unibe.ch)¹, O. Martius¹, S. Raveh-Rubin², J. Catto³ ¹ Institute of Geography, Oeschger Centre for Climate Change Research, University of Bern, Bern 2 Department of Earth and Planetary Sciences, Weizmann Institute of Science, Rehovot, Israel ³ Department of Mathematics and Statistics, University of Exeter, Exeter, UK Data and Methods

Will.

Results 2

- IA-noDF
- DI-IA
- WCBas-IA
- WCBin-IA
- CF-IA



(b)

Feat: $p(R \wedge W | Feat) = MAX$

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Feat: $p(Feat | W \wedge W) = MAX$

Feat: $p(W \wedge W | Feat) = MAX$ (b)

(a) N N

10°E 30°E

Which **Dynamical Feature** is **most common** during compound extremes? (a)

Which Dynamical Feature has highest compound frequency? (b)

MEDcyclone tracks from [1] using confidence-level 5

MEDcyclone *Impact Area* (IA01) definition: $[other defs in [2-5] a example \rightarrow]$

circle of 1000 km radius* + Dry Intrusions (if \cap 1000 km radius*) + Cold Fronts, Warm Conveyor Belts (if \cap 500 km radius*) * around the cyclone center

Dynamical Features (DF): Dry Intrusions (DI), Cold Fronts (CF), Warm Conveyor Belts (WCB) [from ERA5, 6-8]

R∩**W** compound: extreme 6h cumulative Precipitation & extreme 6h maximum 10m Windgust **W**∩**W** compound: extreme 6h maximum Swell-Wave height & extreme 6h maximum 10m Windgust [from ERA5, extreme = above max(98th pct, 2 mm / 10 m s-1 / 2 m)]

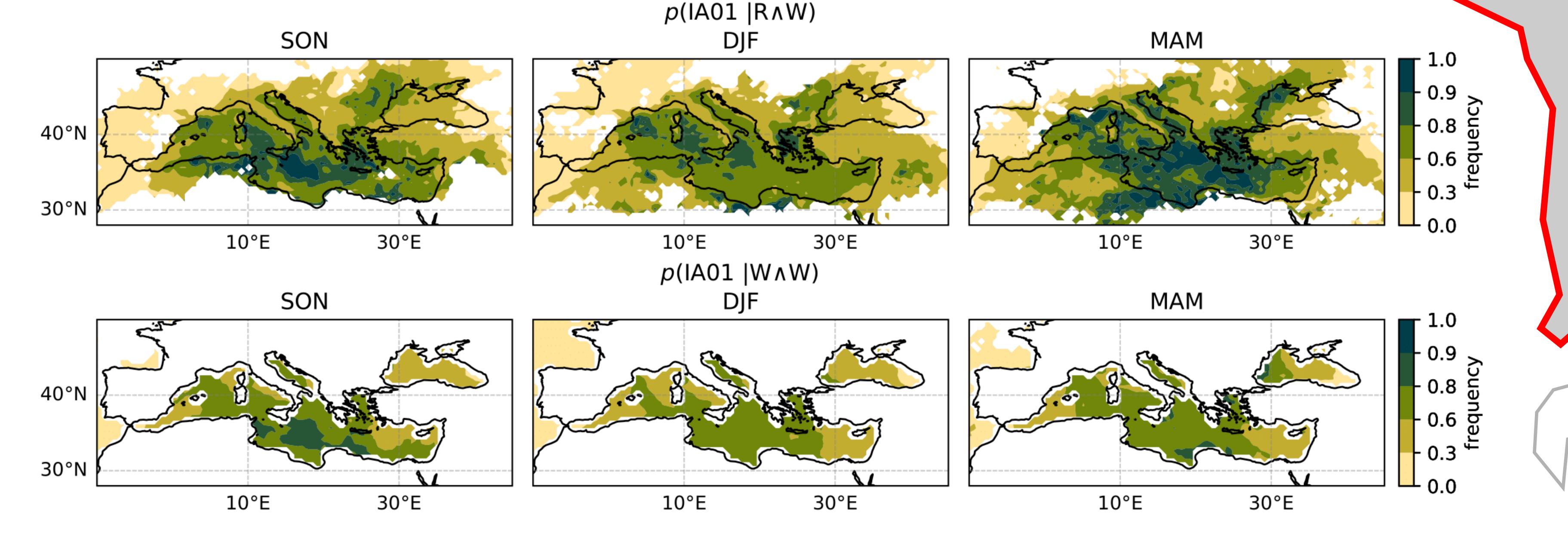
Notation: p(e) : frequency of event e

 $\mathbf{p}(\mathbf{e} \cap \mathbf{f})$: frequency of the spatial and temporal superposition of events \mathbf{e} and \mathbf{f}

p(e |f): conditional frequency of event e, given the occurrence of event f

What fraction of compound extremes occurs within a cyclone's Impact Area (per season)?

Results 1



Conclusions

Motivation

Study the statistical relations between

Mediterranean cyclones (MEDcyclones),

characterised by dynamical features, and regional

compound extremes of Rain&Wind (RAW) and

Wave&Wind (W\aggree) in the climatological period

1980-2019. Details in [9,10].

- i. **Seasonality**: during the transition seasons (SON, MAM) compound extremes happen mostly with cyclones.
- ii. **Type of compound**: R∩W extremes show a stronger association with cyclones than W∩W extremes.
- iii. Dynamical features:
- R\triangle W and W\triangle W extremes in the Central and Northern MED occur frequently around cyclones' *CFs*.
- RoW extremes are most likely below cyclones' WCB ascent, WoW extremes below cyclones' DI outflow and WCB ascent.

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