

Causal Drivers and Mechanisms of Monsoon Rainfall Over the Northern Indian Subcontinent

EGU – 24.05.2022

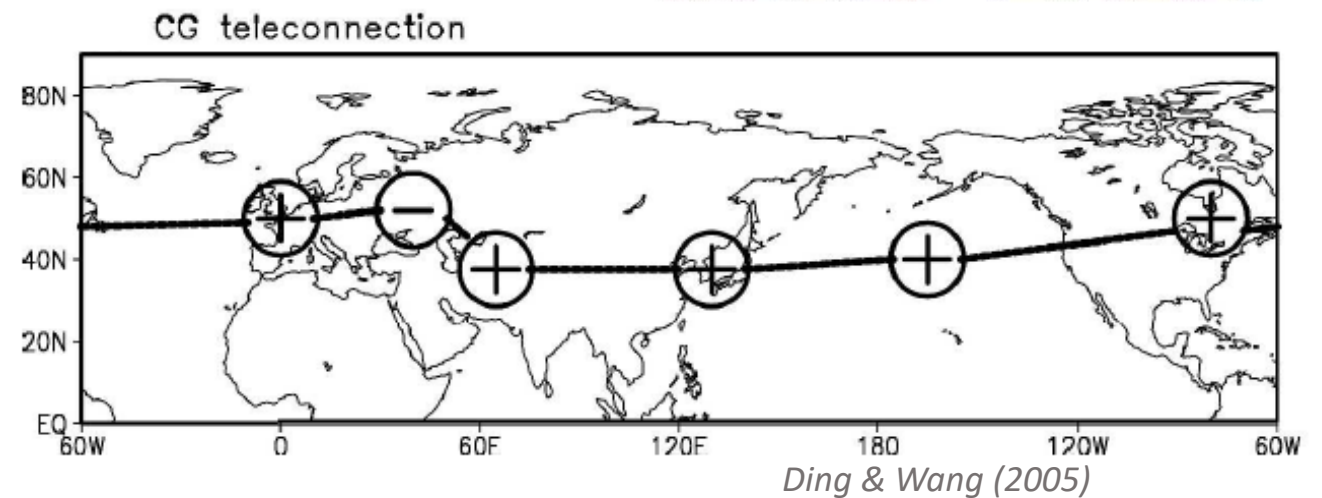
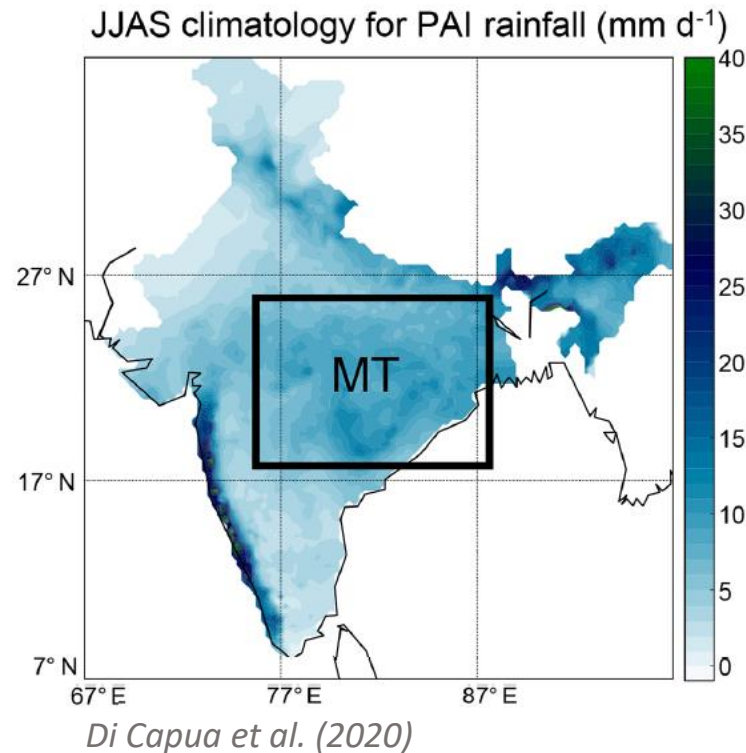
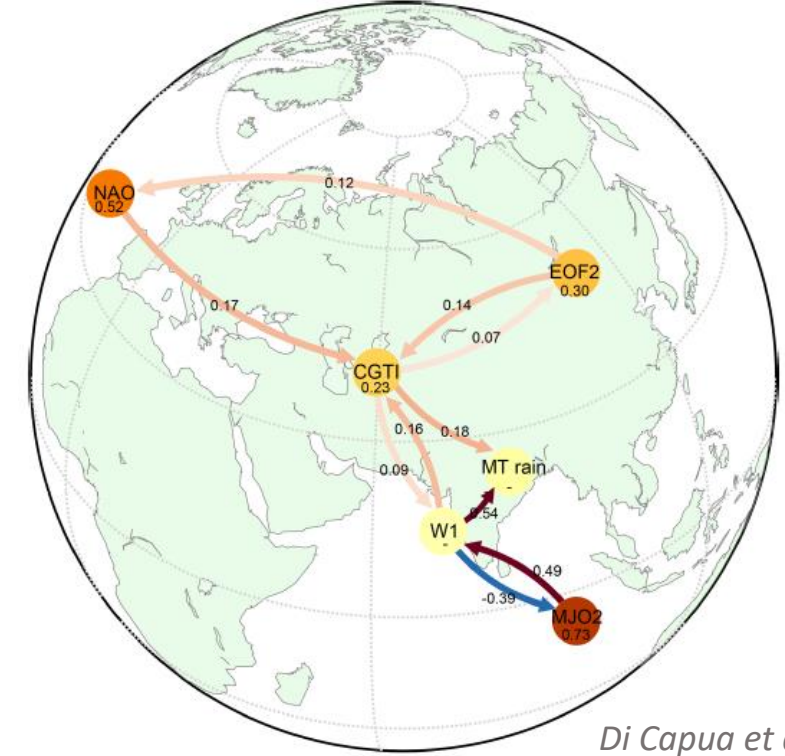
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Motivation - Monsoon Trough region

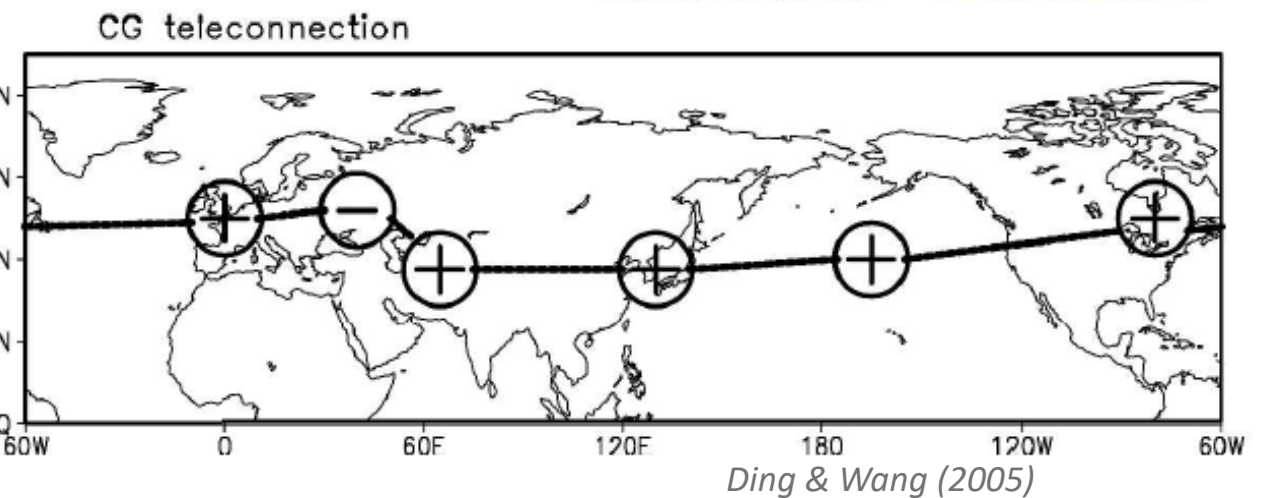
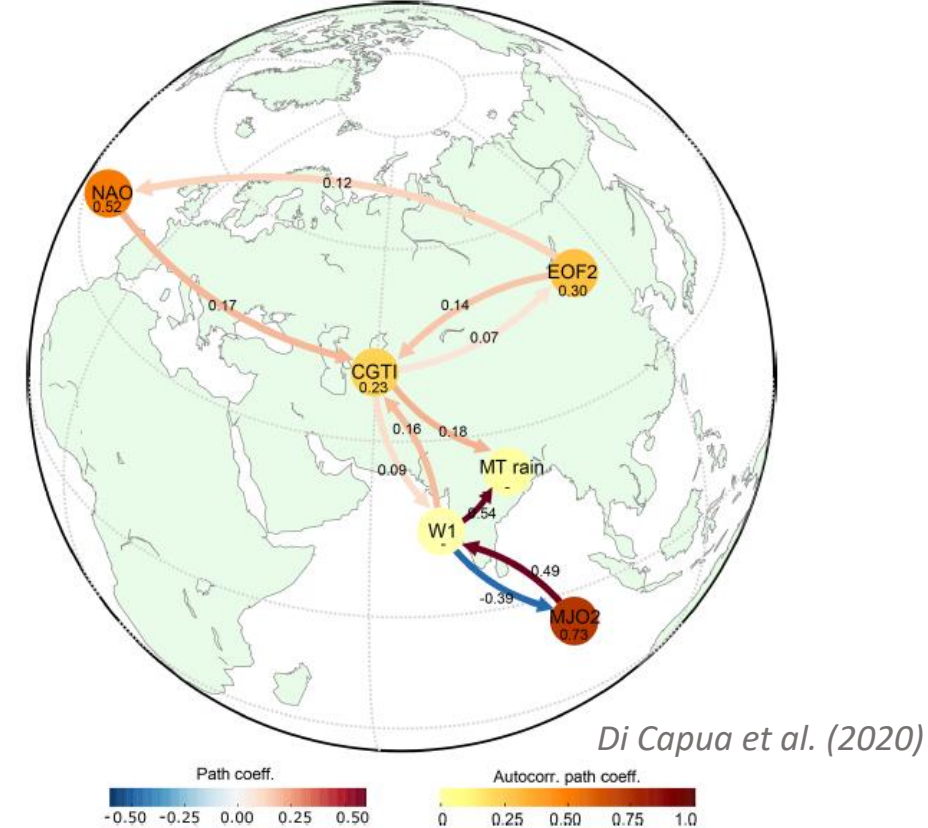
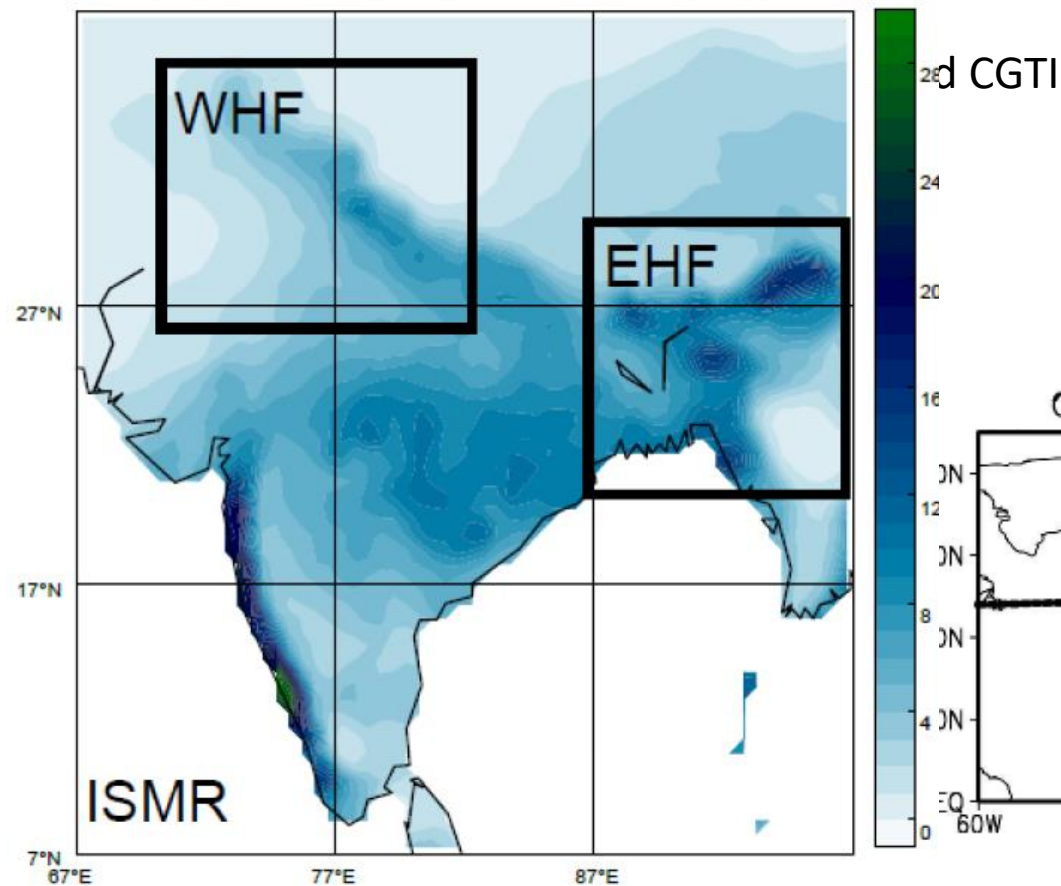
- Monsoon core region at 18°-25°N, 75°-88°E
- CGTI: Z200 averaged over 35°-40°N, 60°-70°E for JJAS
- Drivers of ISM rain
 - Two-way interaction between ISM and CGTI



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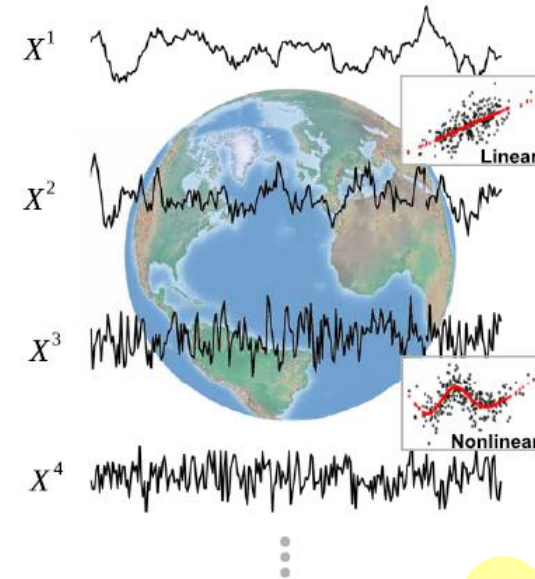
ISMR, WHF and EHF - CPC, mm*day⁻¹



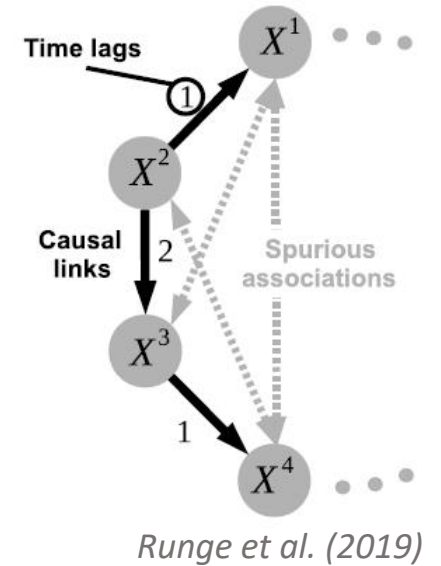
Causal Discovery Tools

- Goal: Assess relationship between climate variables
- Causality relative to the set of analysed precursors
- RGCPD (Response-Guided Causal Precursor Detection)

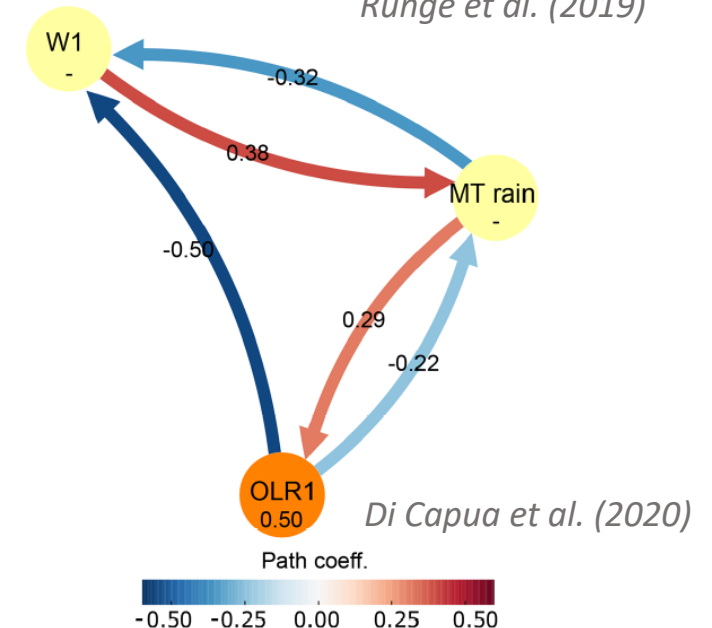
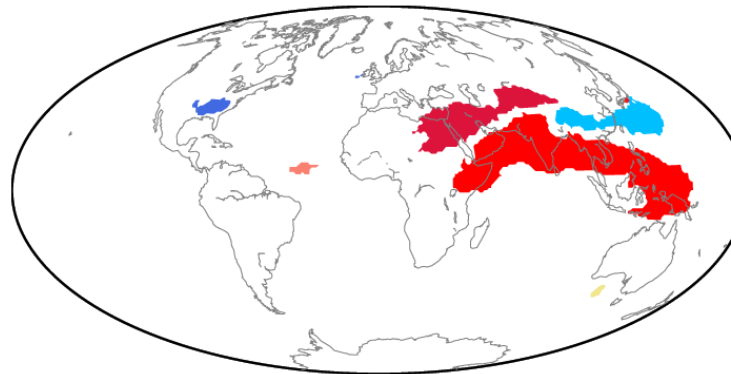
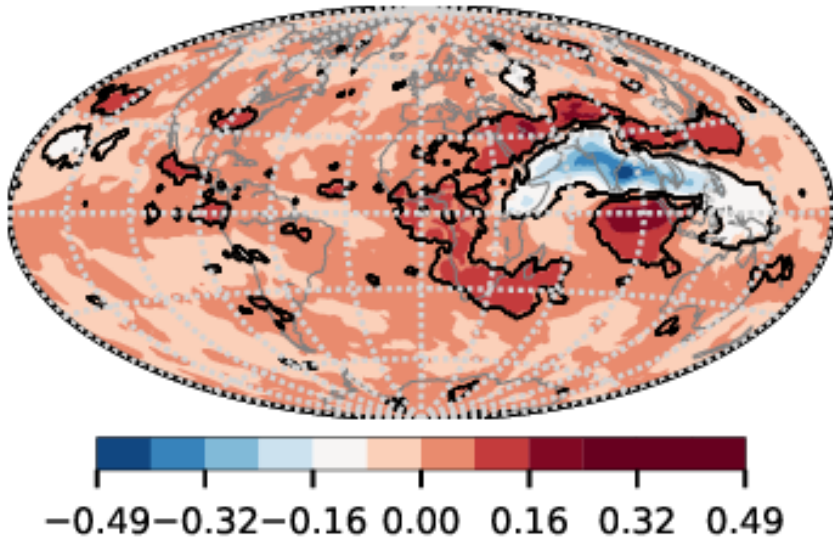
A Large-scale time series dataset



B Causal discovery



OLR lag = -1

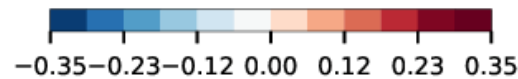
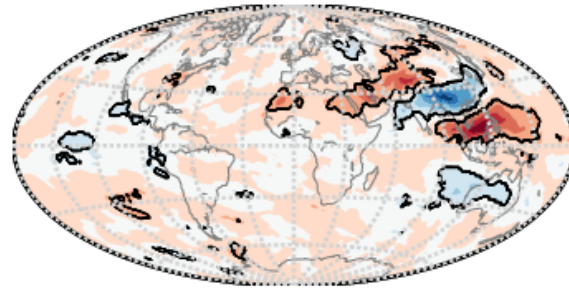


Preliminary results

- Goals:
 - Recreate causal linkages influencing MT rainfall
 - Identify causal drivers of WHF and EHF rainfall
- 3-days reanalysis data (ERA5) from 1979-2020
- Summer months JJAS

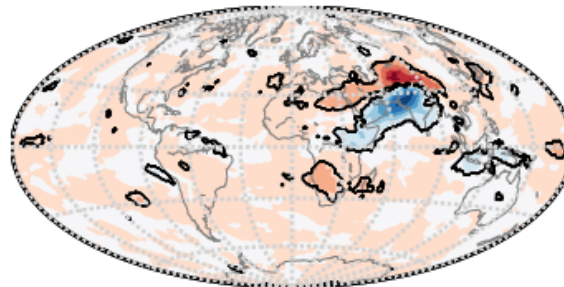
**Dynamics of EHF
rainfall are faster than
WHF!**

OLR
with
EHF

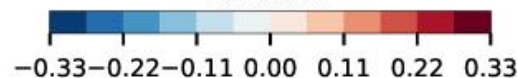
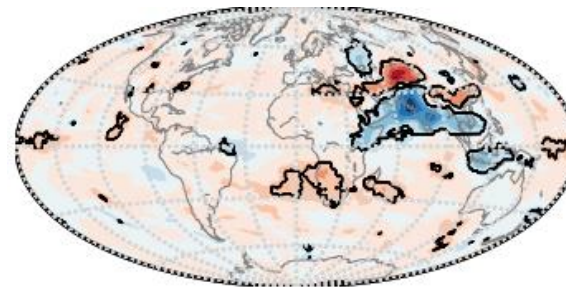
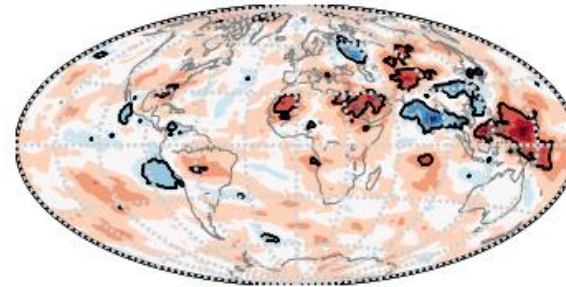


and

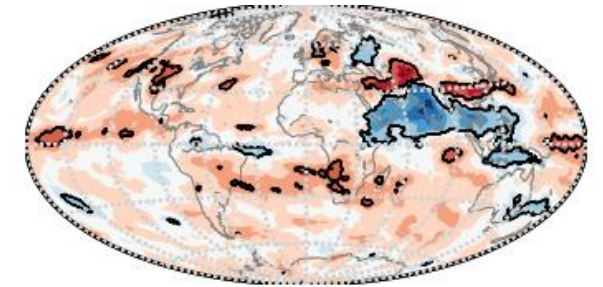
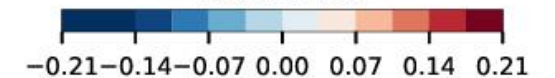
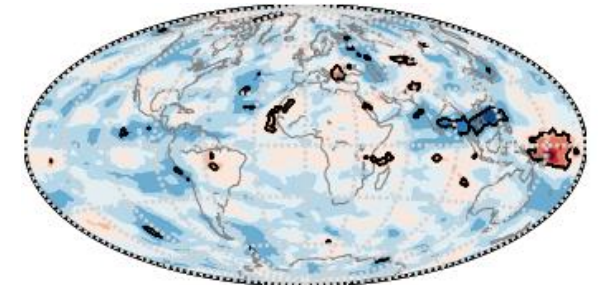
WHF



Lag = -1



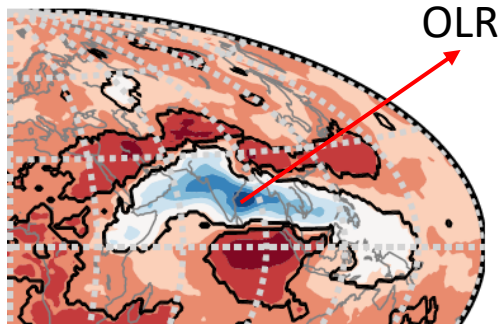
Lag = -2



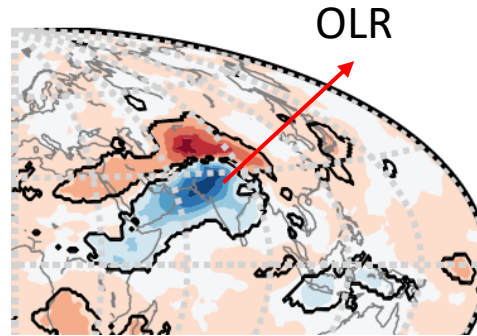
Lag = -3

CENs with CGTI – comparison among MT, WHF and EHF

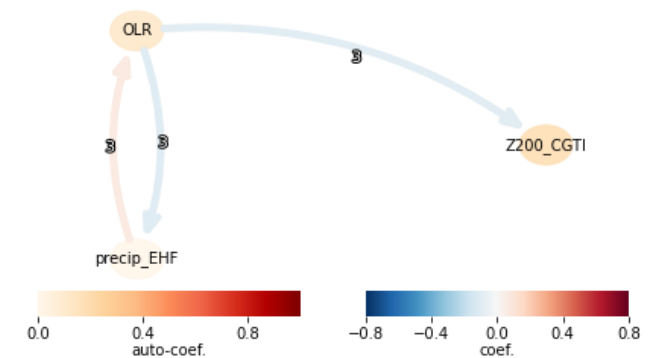
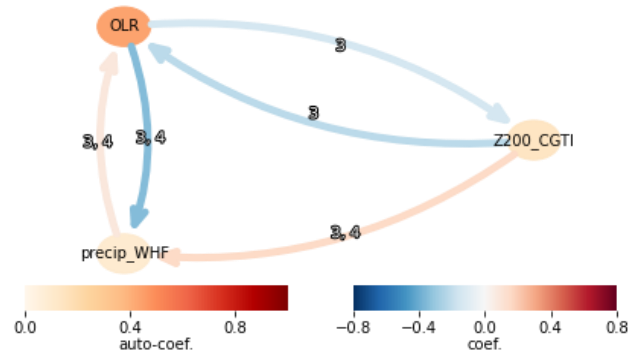
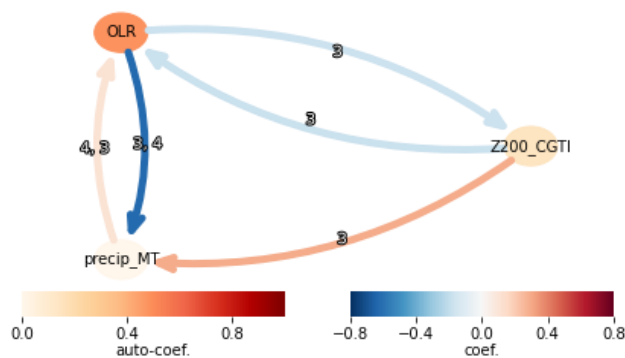
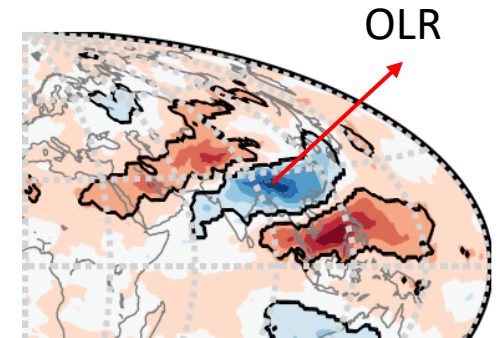
MT



WHF



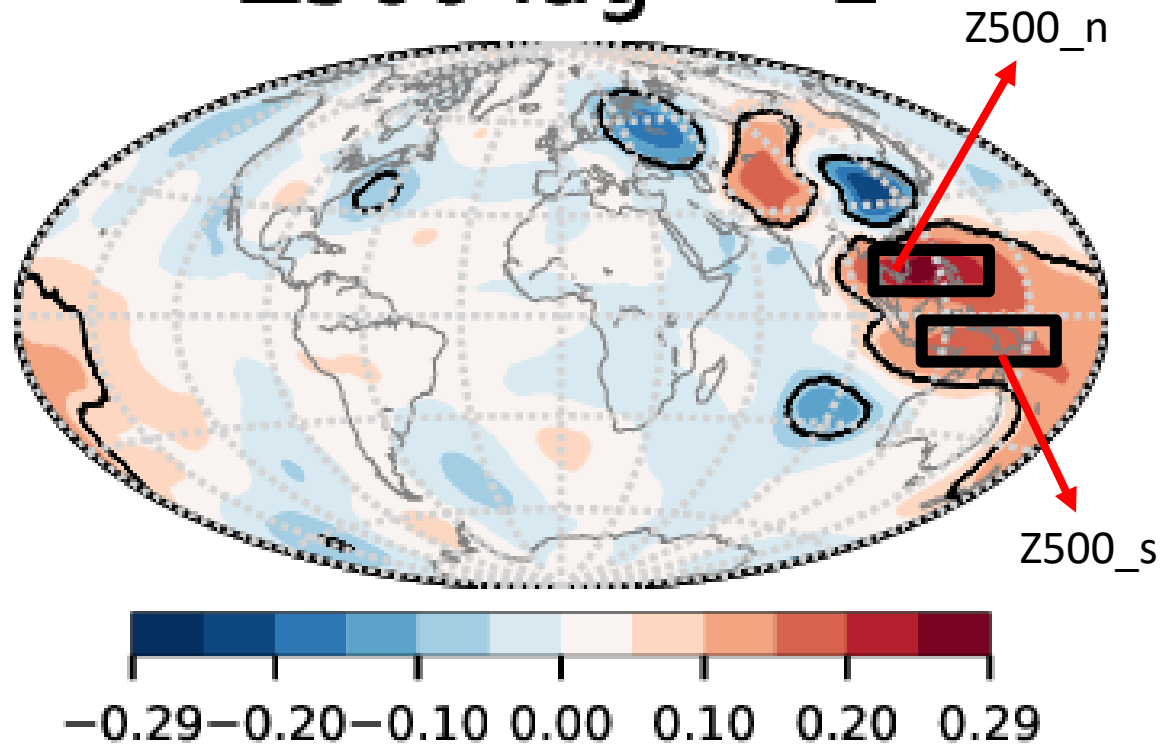
EHF



MT and WHF rainfall are both linked to the CGTI - this coincides with earlier results.
By contrast, the EHF rainfall has different causal precursors.

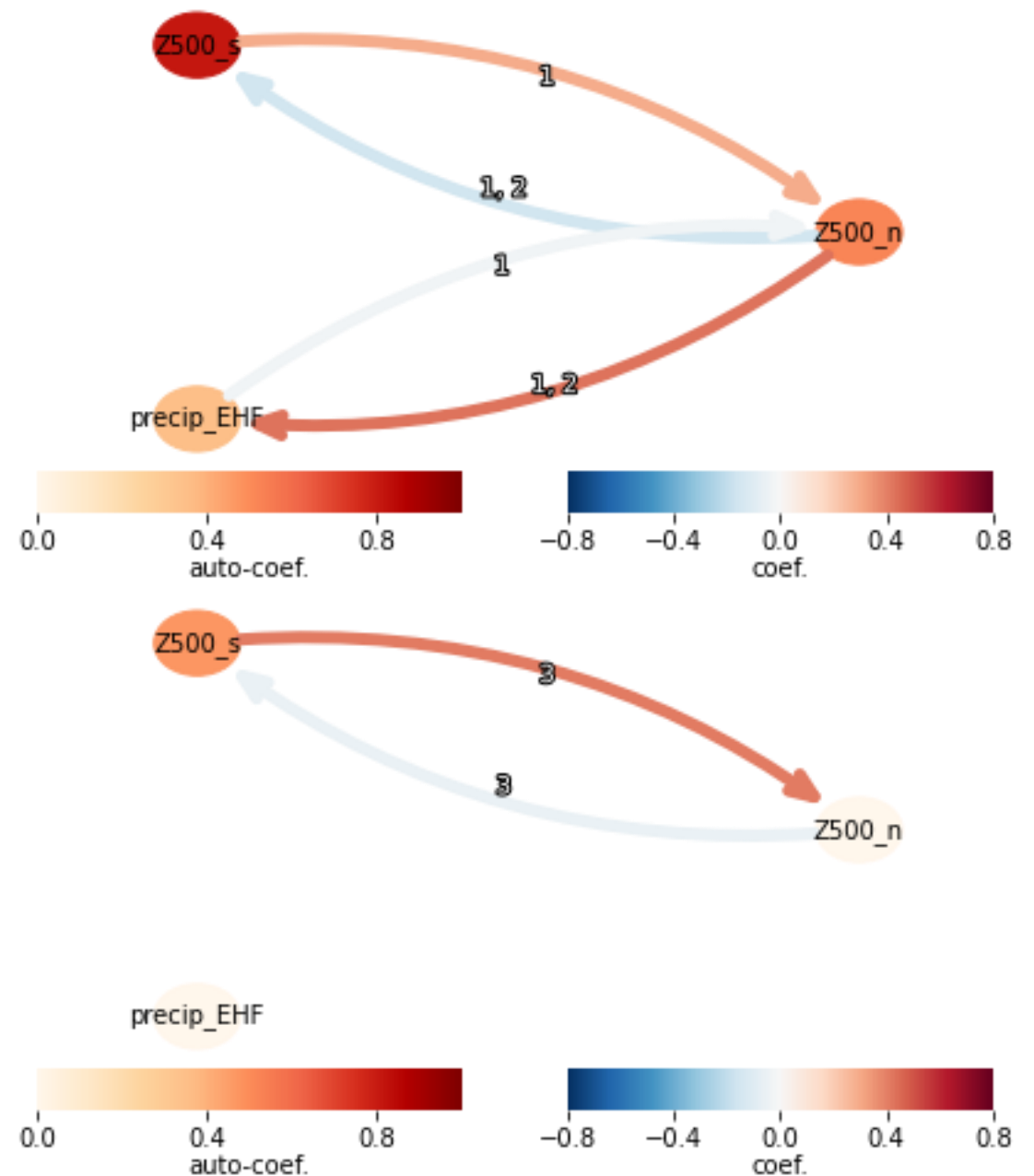
EHF – Connection to MJO

Z500 lag = -1



Idea: Find chain of causality!

Is the signal related to the Walker circulation and/or the MJO?





Thank you for your attention!