

Zentralanstalt für Meteorologie und Geodynamik



Regionalization of future extreme hydro-meteorological events in Austria

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extreme



regional influence
(topographical)



synoptic situation

Extreme meteorological events:

causal weather events differ throughout the seasons and in different regions of Austria

occur in certain synoptic situations
- weather (circulation) types





Future extreme events?

General flow is represented in GCM, extreme precipitation on regional scale not well predicted

Establish **relation between circulation types and extreme events** in the past - same weather types then in the past cause extreme events in the future

If general flow well represented and a significant relation between extreme events and weather types is established > tell sth about **future extreme events** (the part caused by circulation).

Probability forecast

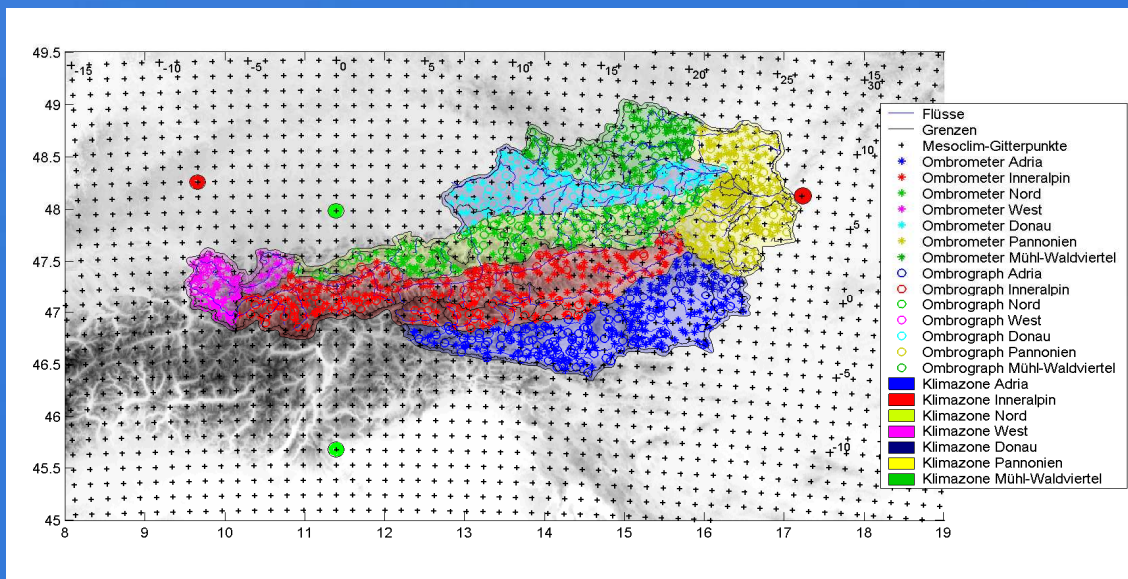


Data: Observation time series

Extreme Environmental Events
Cambridge, 13. – 17.12.2010



~ 150 Stations with daily precipitation data of 40 years (1961 - 2000)



Regions defined upon climatology

Defining extreme events

Regional station mean exceeds percentile

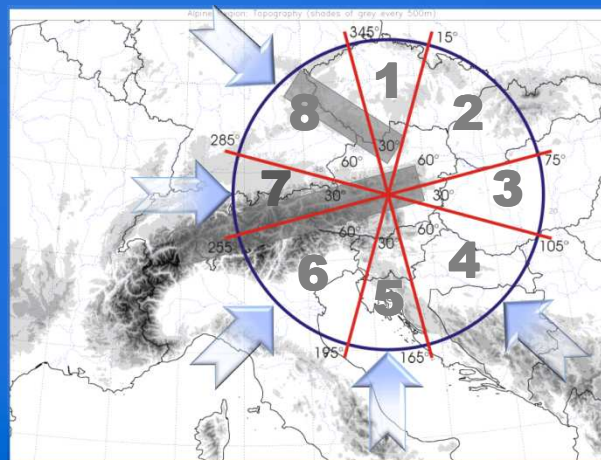
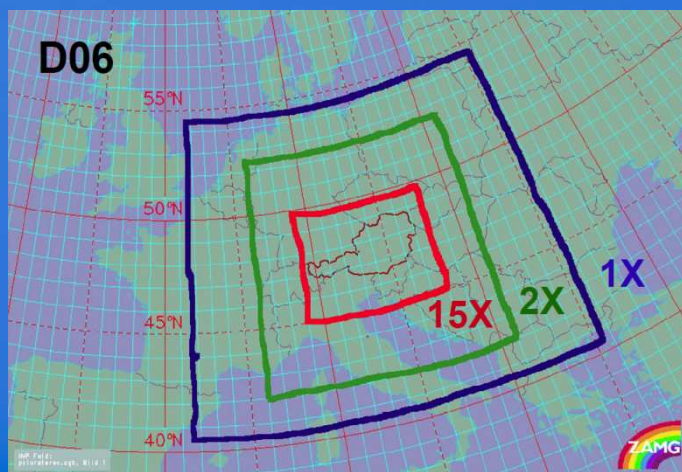




Reanalysis data:
ERA 40 reanalysis

Global Climate Models 2061 - 2080:
ECHMA5 A1B & B1, HADCM3C A1B

WLK733: Mean direction of flow, cyclonicity in different levels (A,C)



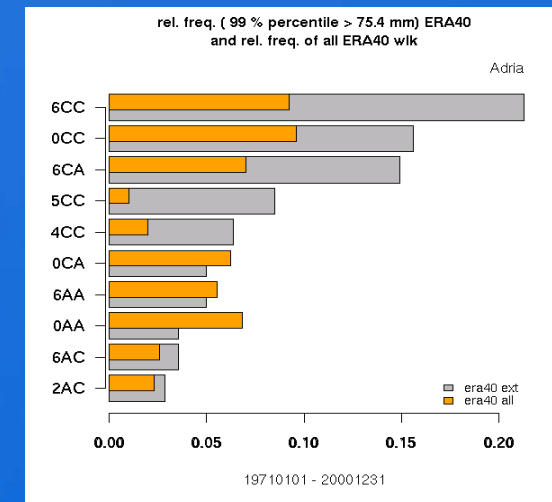
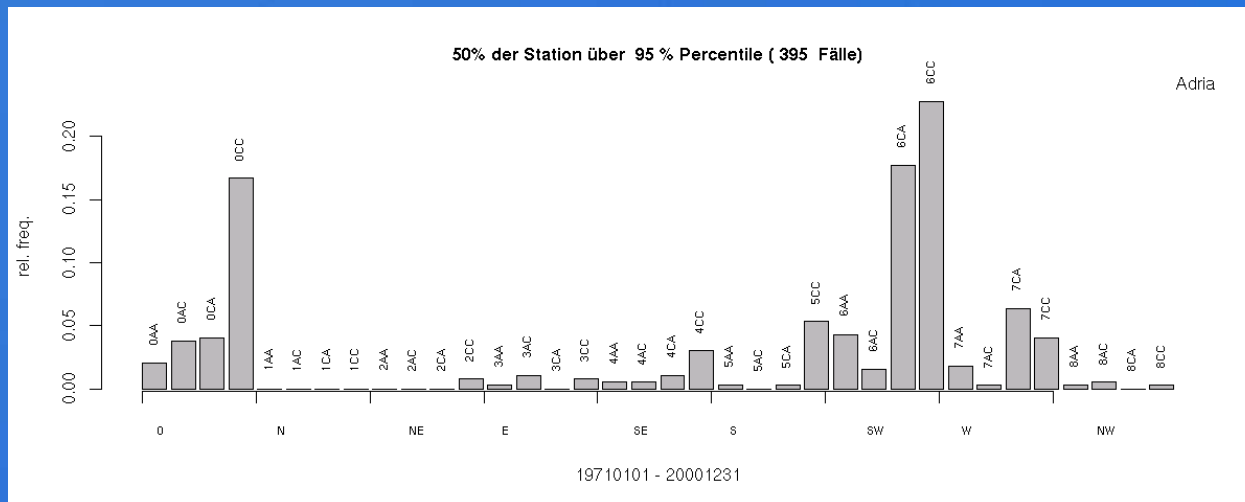
4AC:
Southwesterly,
anticyclonic in
lower level
cyclonic in
upper level





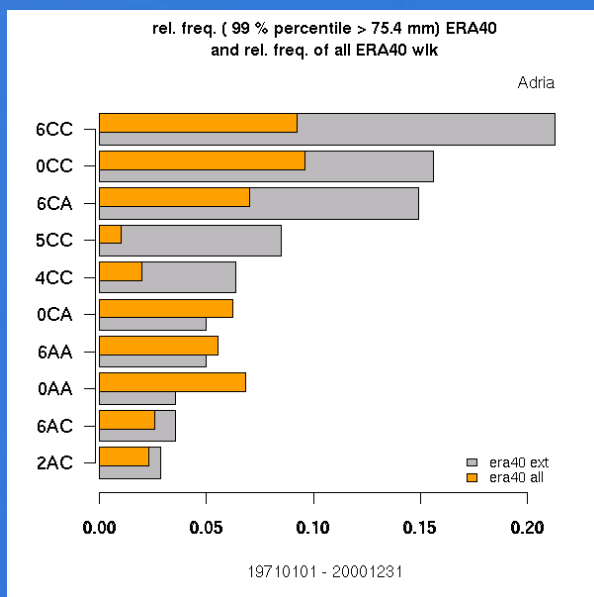
Select extreme events from observation data

Appoint the WLK733 from ERA40 to each extreme event
- How frequently is an extreme events caused by a CT

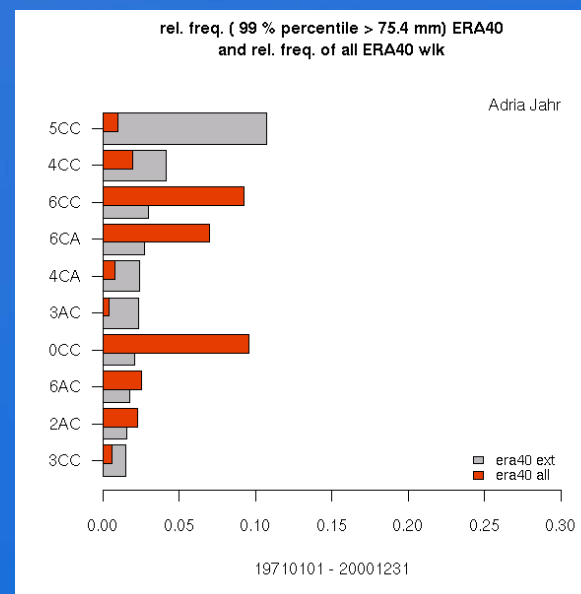




Frequency of CT in extreme events



Frequency of extreme events in CT



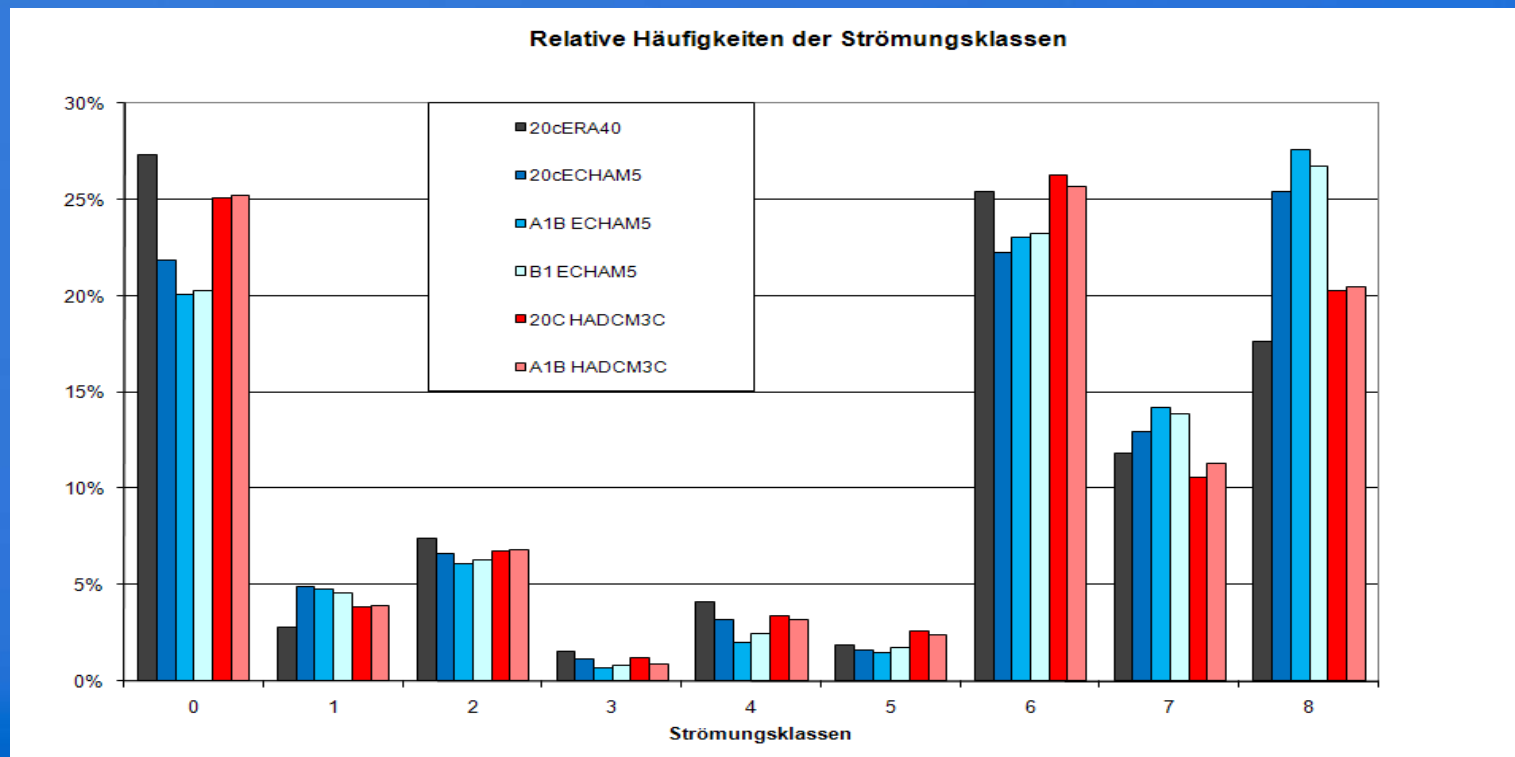
Effectiveness of a CT to produce an extreme event





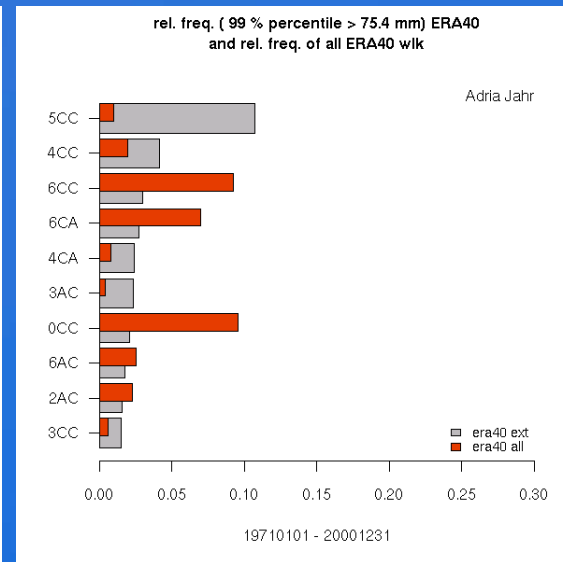
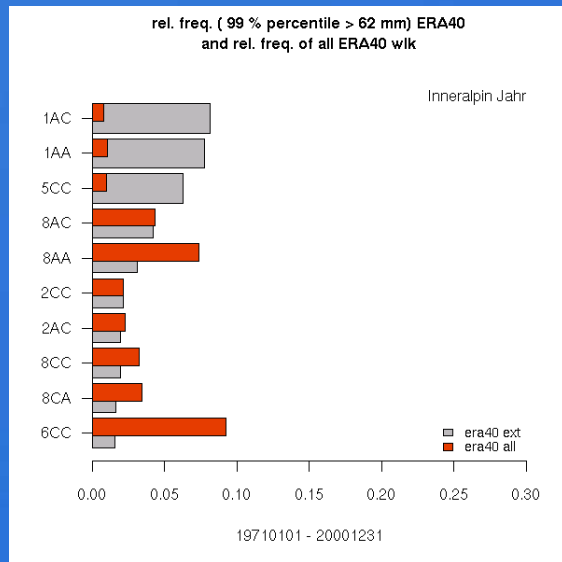
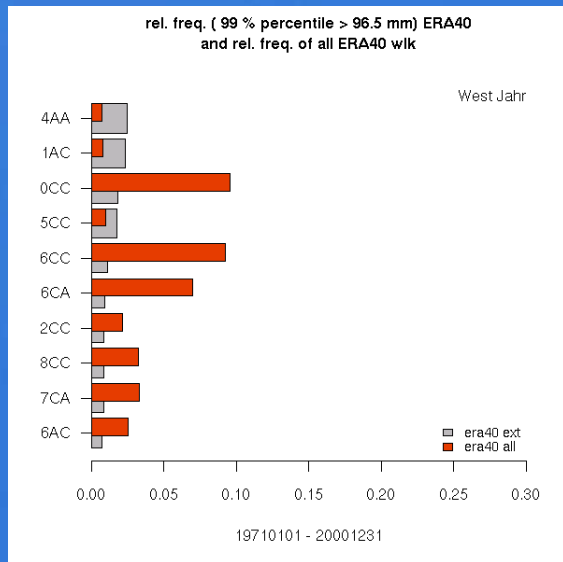
Calculate frequency of CT in the GCM's 20th century control runs and in the 21st century runs

Hypothesis: Changes in CT distribution cause changes in the extreme events distribution





Most effective CT in Regions



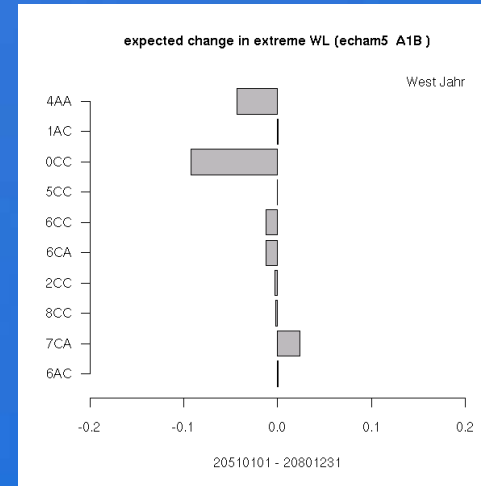
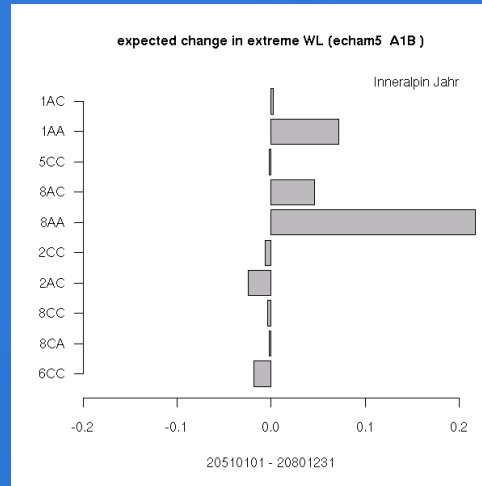
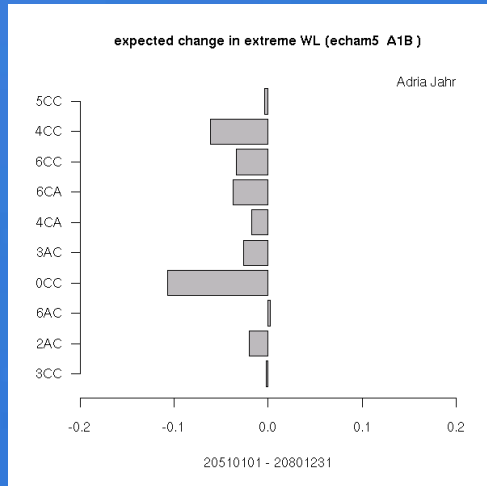
Results: Change of CT in the future

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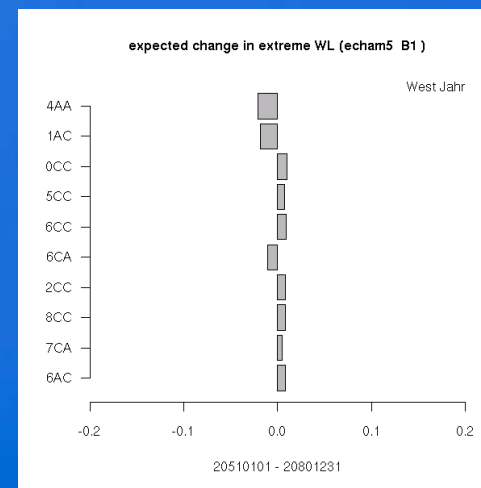
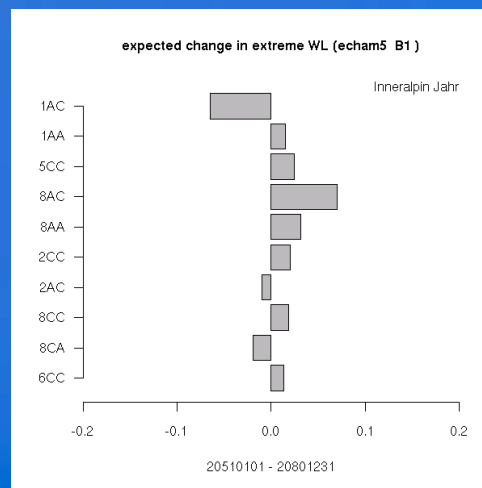
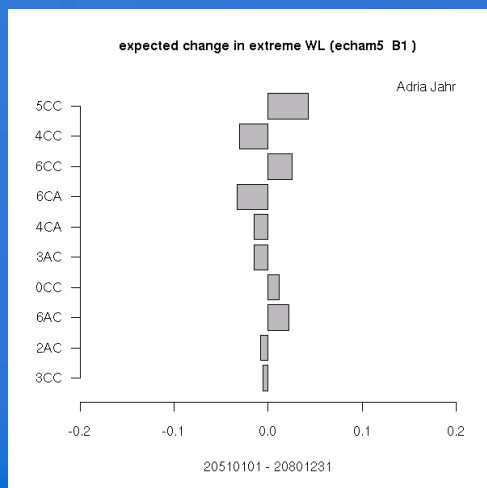


Difference: $(\text{freq}(\text{future}) - \text{freq}(\text{past})) * 365$

change in days/year



A1B



B1



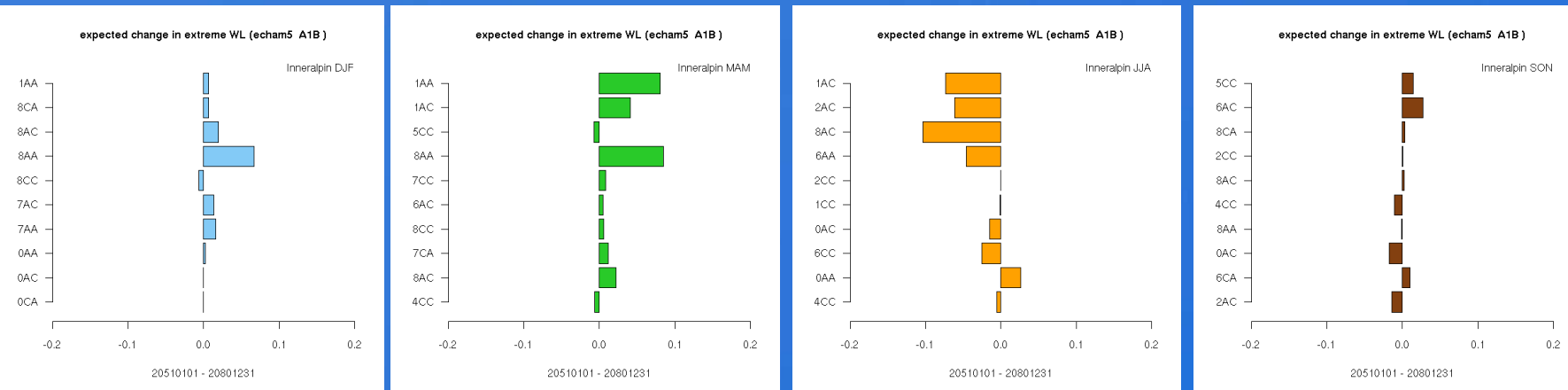
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Change of CT in the future

A1B



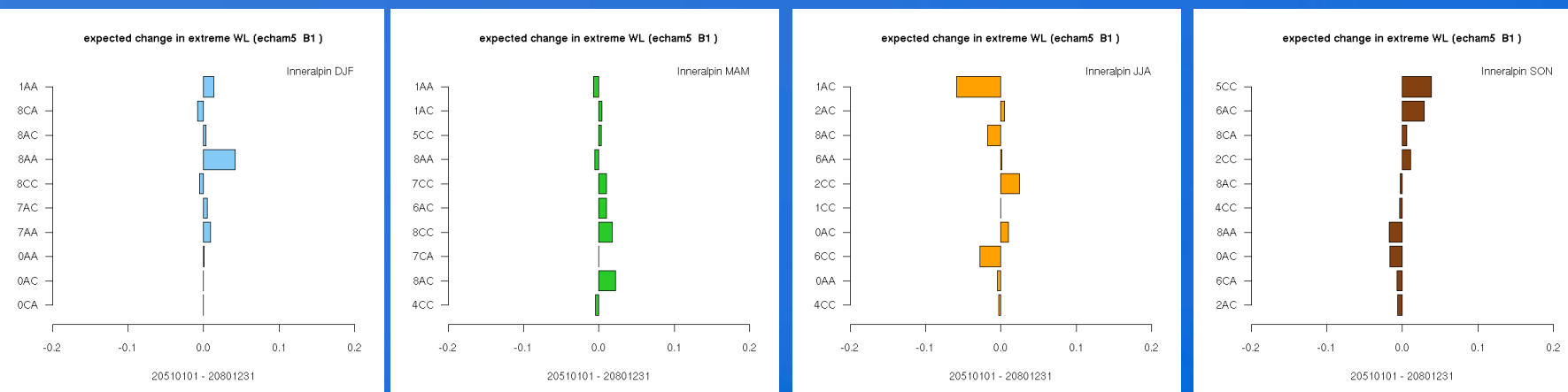
winter

spring

summer

autumn

B1





Most effective CT in Regions

No similar and significant trend for all the year, spring, autumn

In winter in the inner alpine region possibly an increase of extreme events
(no significant negativ trend in any of the CT causing extreme events)

Summertime decrease of extreme events seems likely, except for adriatic region

No general hint for increase of the CT's that are efficiently responsible for extreme events





THANKS
for your attention

