

Background

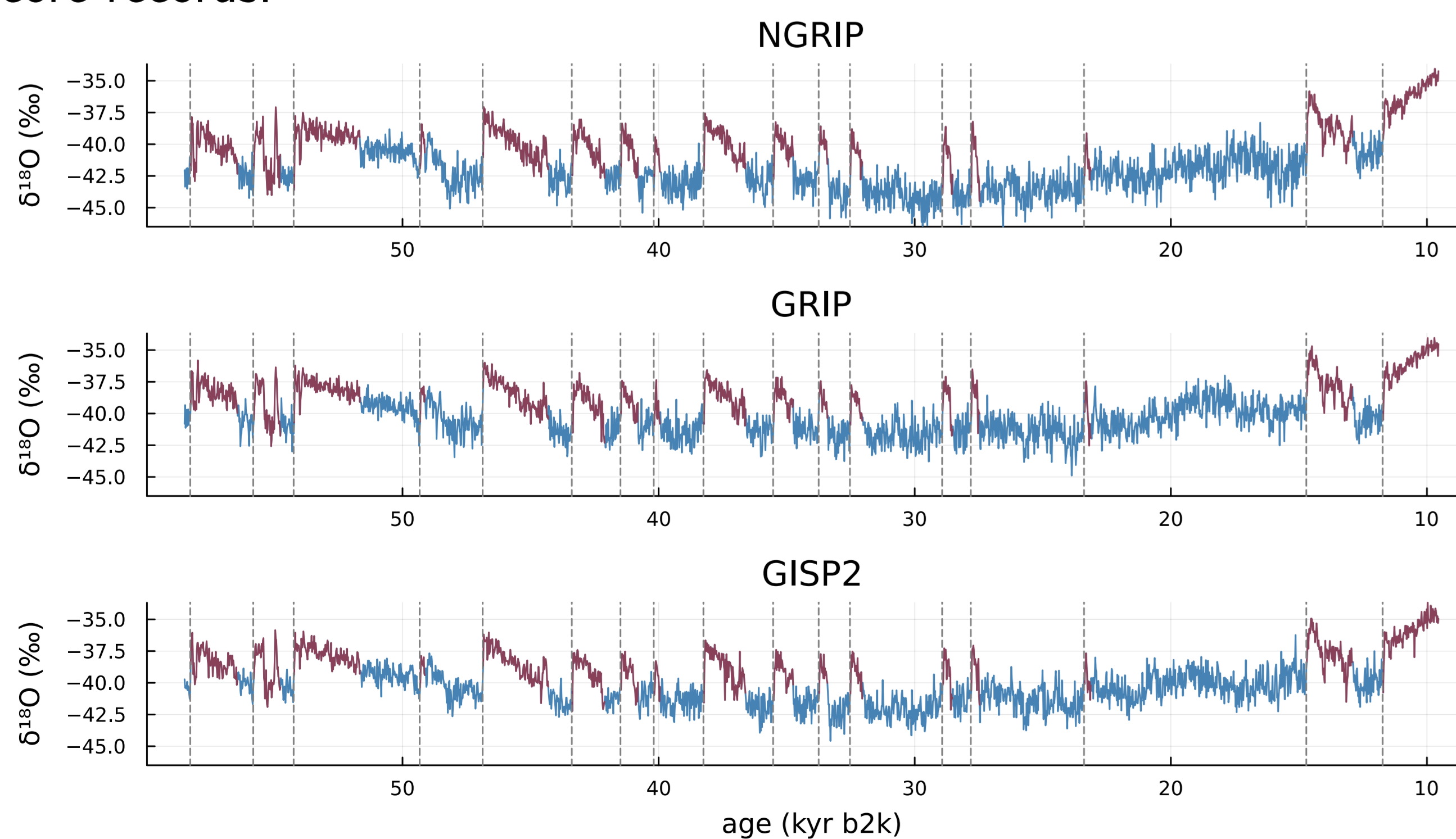
- Dansgaard-Oeschger (DO) events, abrupt climatic transitions, manifest themselves in $\delta^{18}\text{O}$ records from Greenland ice cores
- Early warning signals (EWS) have been found for individual DO events in the high frequency variability of the NGRIP record, but not on the the whole frequency spectrum

Research questions

- Is the variability of $\delta^{18}\text{O}$ records from three different Greenland ice cores comparable before DO events?
- Can similar EWS be found in the different cores?
- Do the observed fluctuations stem from a common climate background?

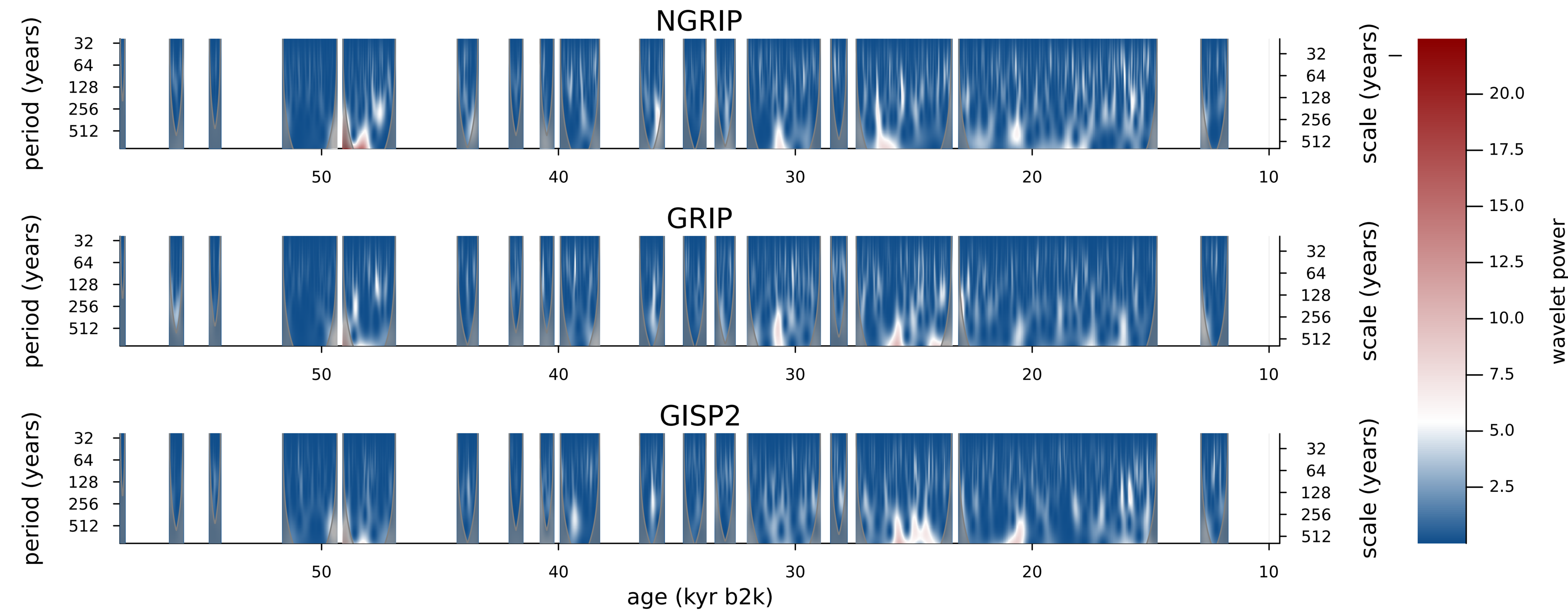
Approach

- Wavelet analysis to study fluctuations
- Scale averaged wavelet coefficient \hat{w}^2 over different scale bands as possible EWS applied to the **Greenland Stadials (GS)** prior to DO events in three ice core records.



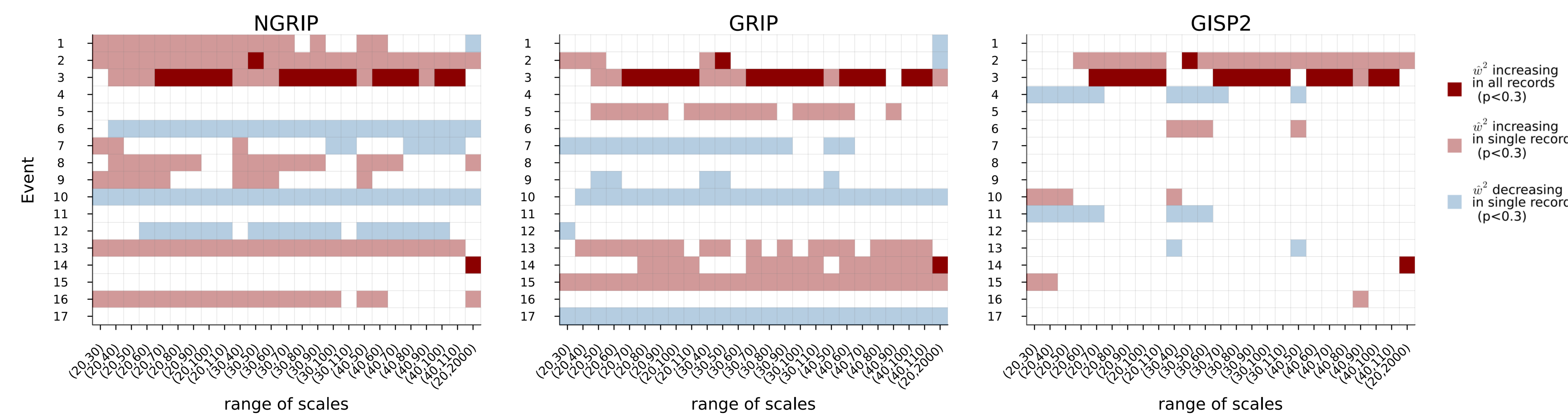
Fluctuations in the ice core records: wavelet power spectra

- The wavelet spectra for the GS in the three records are similar, especially for longer scales



Early warning signals for DO events: the scale averaged wavelet coefficient

- There are increases in the scaled averaged wavelet coefficient \hat{w}^2 over different scale bands ranging from 20 to 2000 years, but not always during the same GS
- Only very few events show common "significant" EWS



Key results

- Even though the NGRIP, GRIP and GISP2 records show similar behaviour for variation on longer scales, the fluctuations on shorter scales differ substantially
- (Wavelet-based) EWS are not consistent between the three ice cord records
- Captured EWS might not reflect a common regional climate signal, but location or core specific variability

Future work

- Include NEEM ice core record into the analysis
- Explore a greater range of scales for EWS detection
- Comparison with other possible EWS (e.g. variance, lag-1 autocorrelation, Hurst exponent)
- Verify results on synthetic data



References

Boers 2018; Ditlevsen and Johnsen 2010; Rasmussen et al. 2014; Rypdal 2016; Seierstad et al. 2014; Torrence and Compo 1998

Acknowledgment

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