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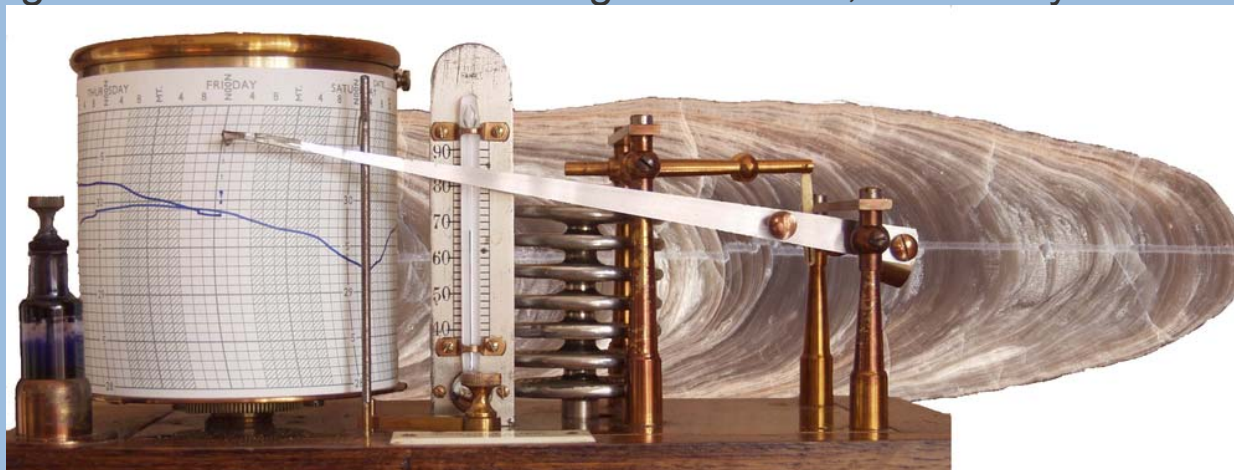
**OESCHGER CENTRE
CLIMATE CHANGE RESEARCH**

Climate in the southern Black Sea coast during the Holocene: Implications from the Sofular Cave record

Ozan M. Göktürk*, D. Fleitmann, S. Badertscher, H. Cheng, L. Edwards, A. Fankhauser, O. Tüysüz, J. Kramers

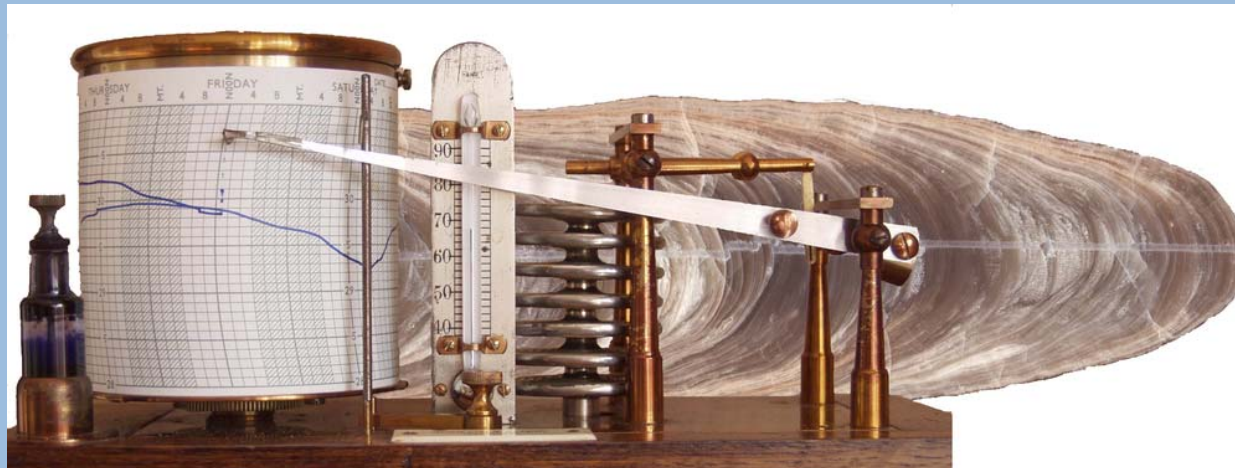
*Institute of Geosciences, University of Bern

*Oeschger Centre for Climate Change Research, University of Bern



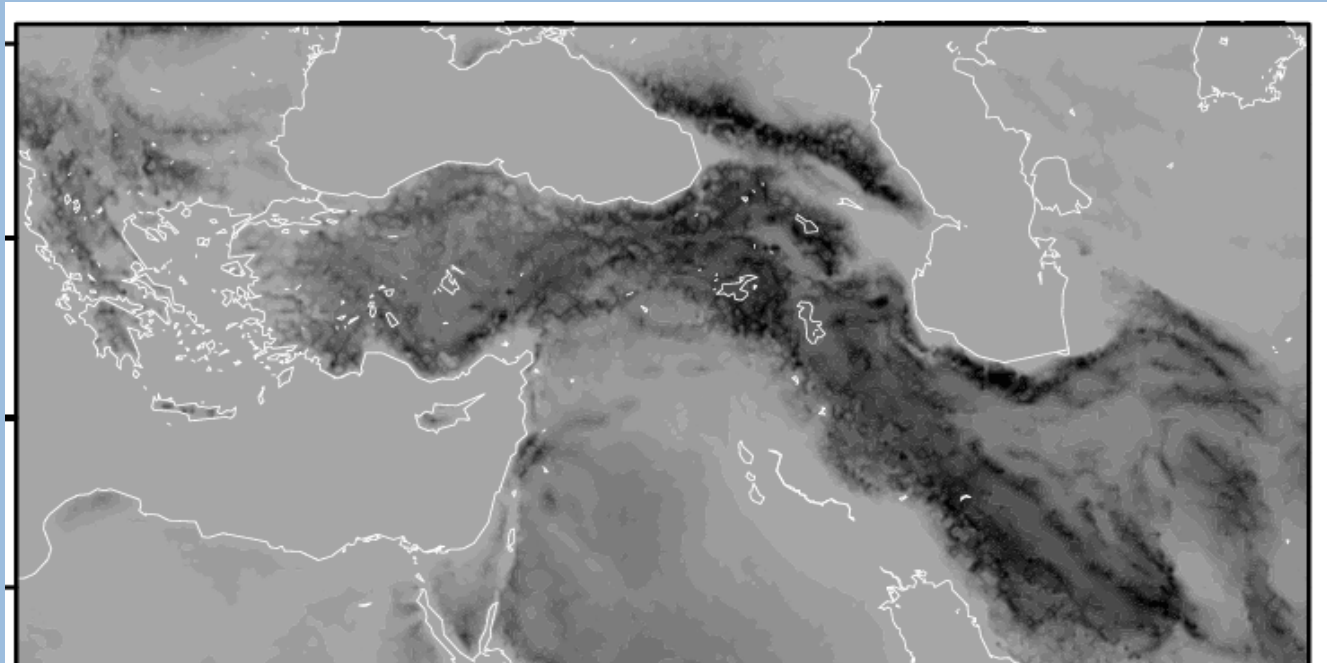
Talk Outline

- > Motivation and Study Site
- > Material and Methods
- > Results
- > Conclusions



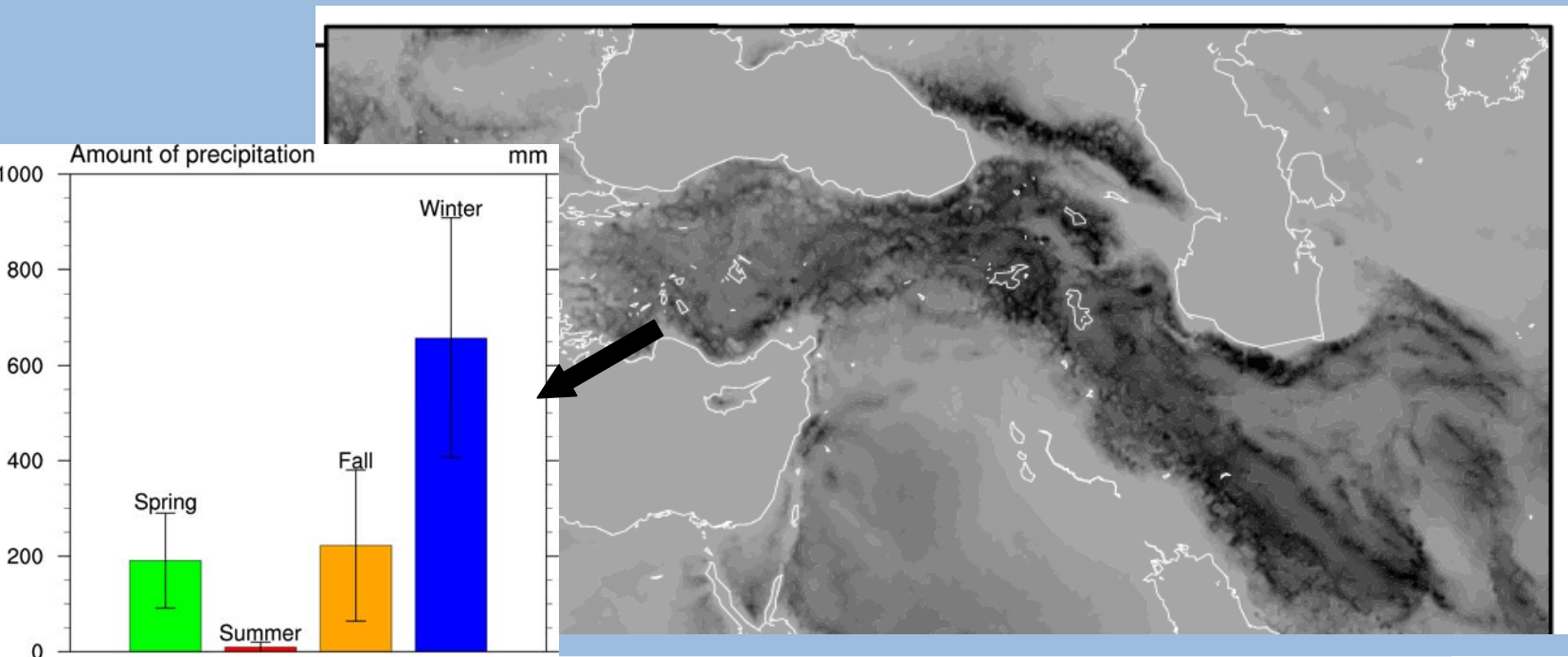
Motivation and Study Site

- > **Turkey: Intersection area** for North Atlantic, Eurasian, Monsoon influences
- > Complex topography + air-sea interactions → **Various climatic zones**
- > Peculiar location also in the **historical context**
- > Hosting **thousands of caves with stalagmites!**



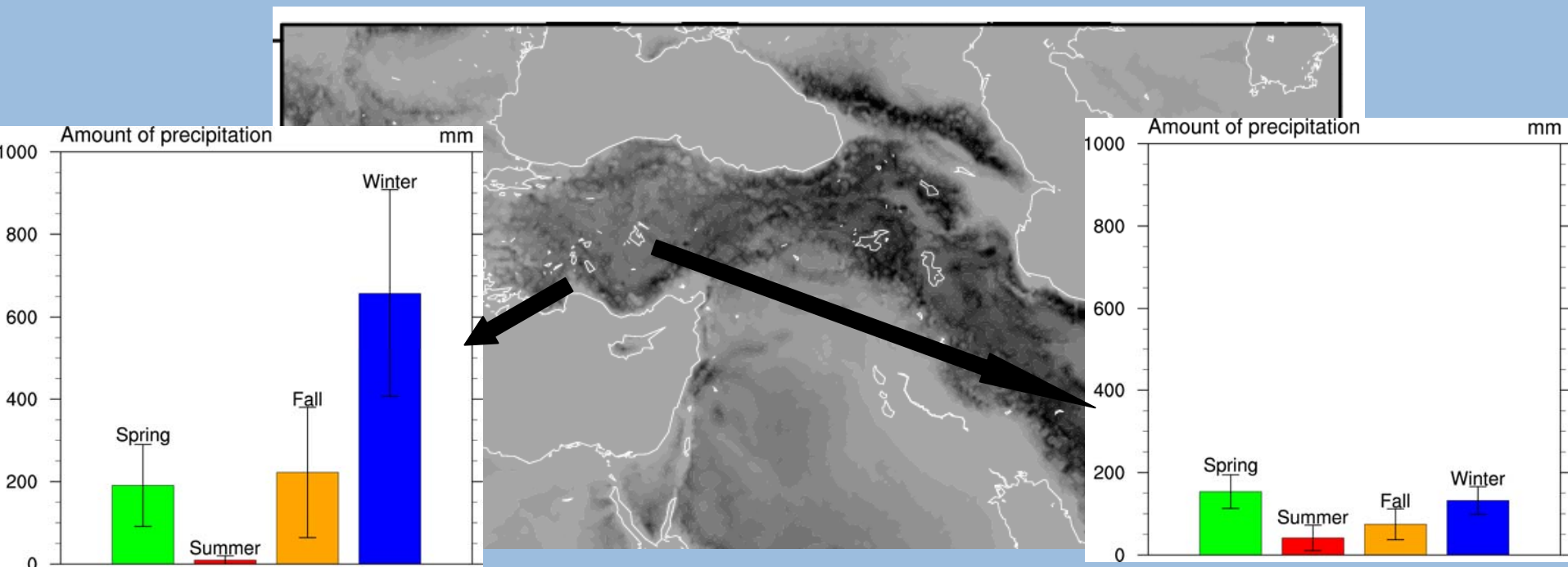
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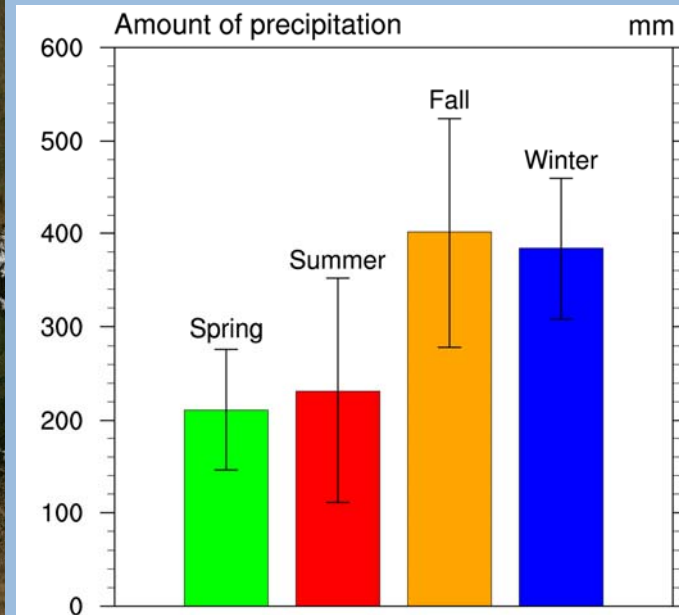
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Motivation and Study Site

- > **Southern Black Sea coast:** Year round humidity
- > Very few proxy data available



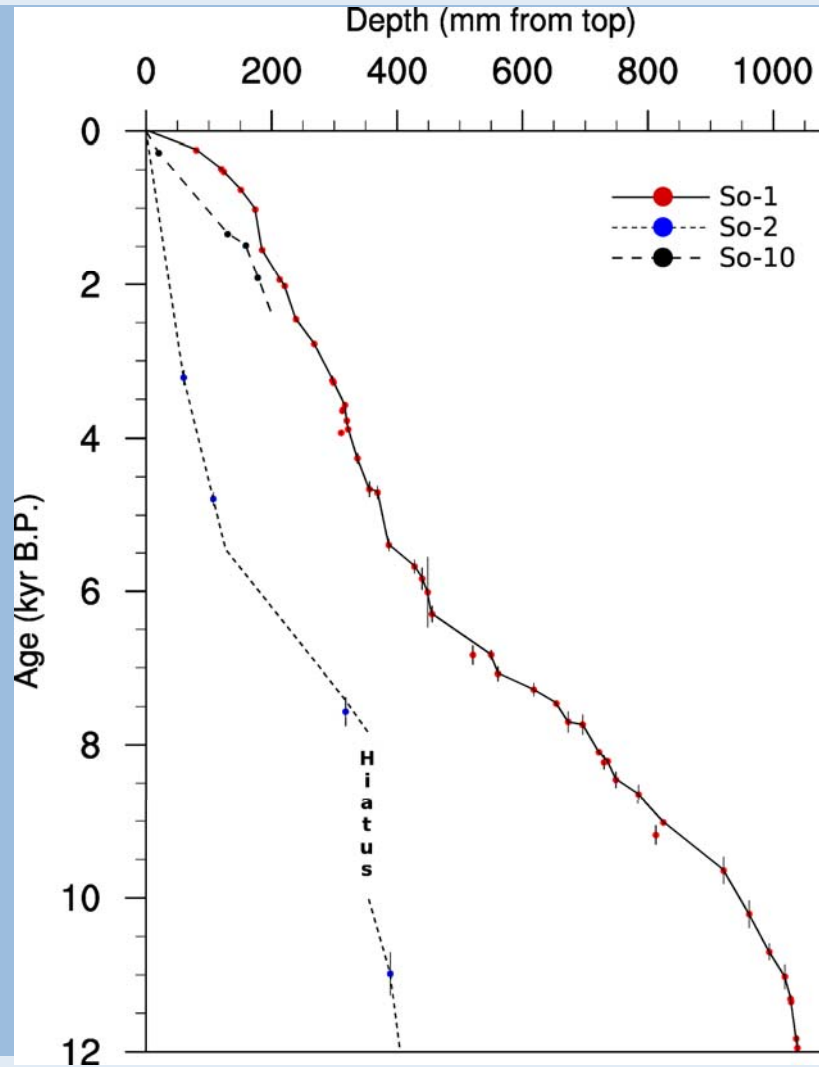
Material and Methods

- > **Stalagmite So-1**
- > **Stable Isotopes:** $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$, ~ 5 years of temporal resolution
- > **U-Th Dating:** 41 dates in the last 12 ka, errors $\leq 1\%$
- > $(^{234}\text{U}/^{238}\text{U})_0$ ratio
- > **Growth rates**

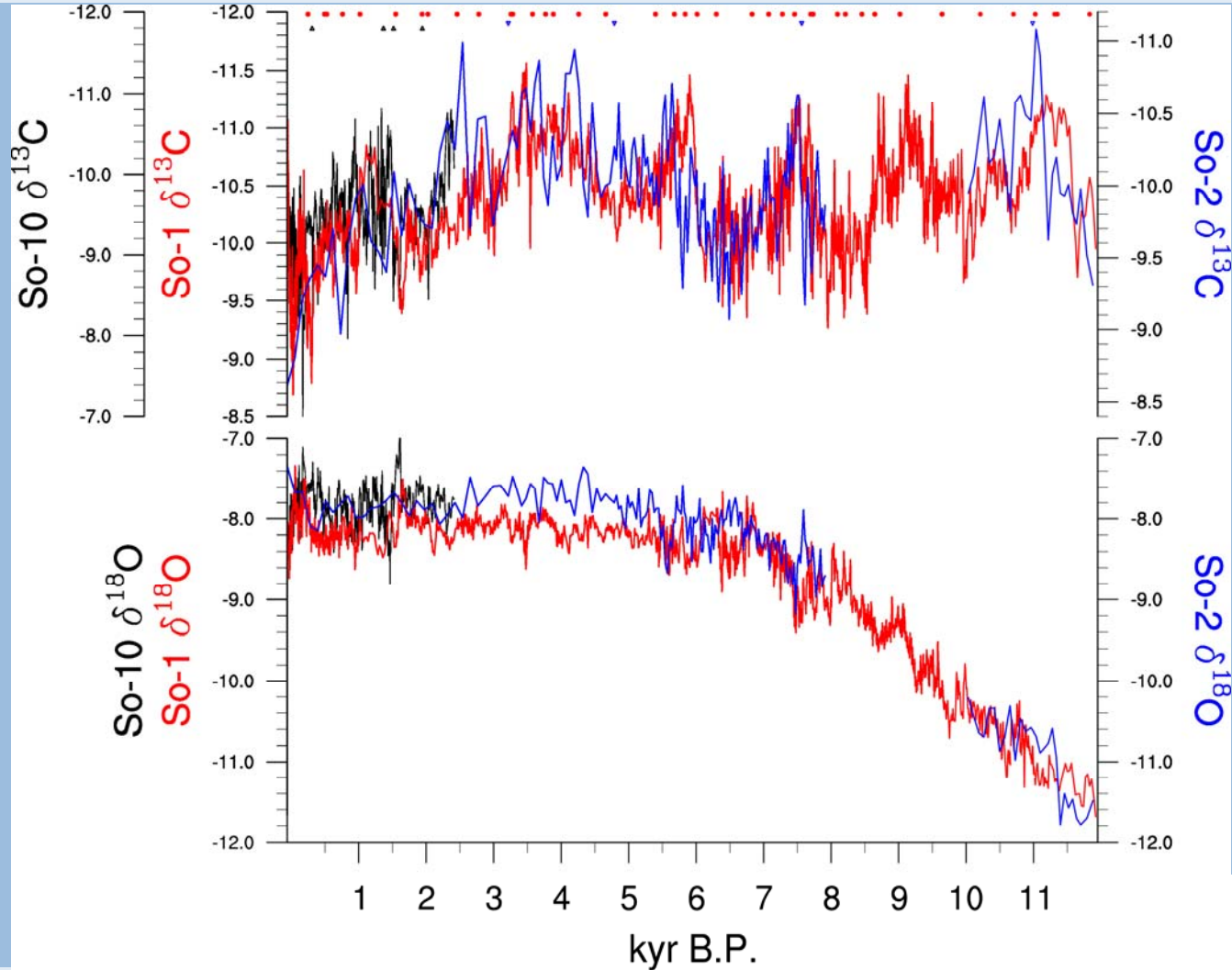
So-1

- > **Stalagmites So-2 and So-10:** Supplementary records with less robust dating and lower temporal coverage

Age Models



Stable Isotope Profiles

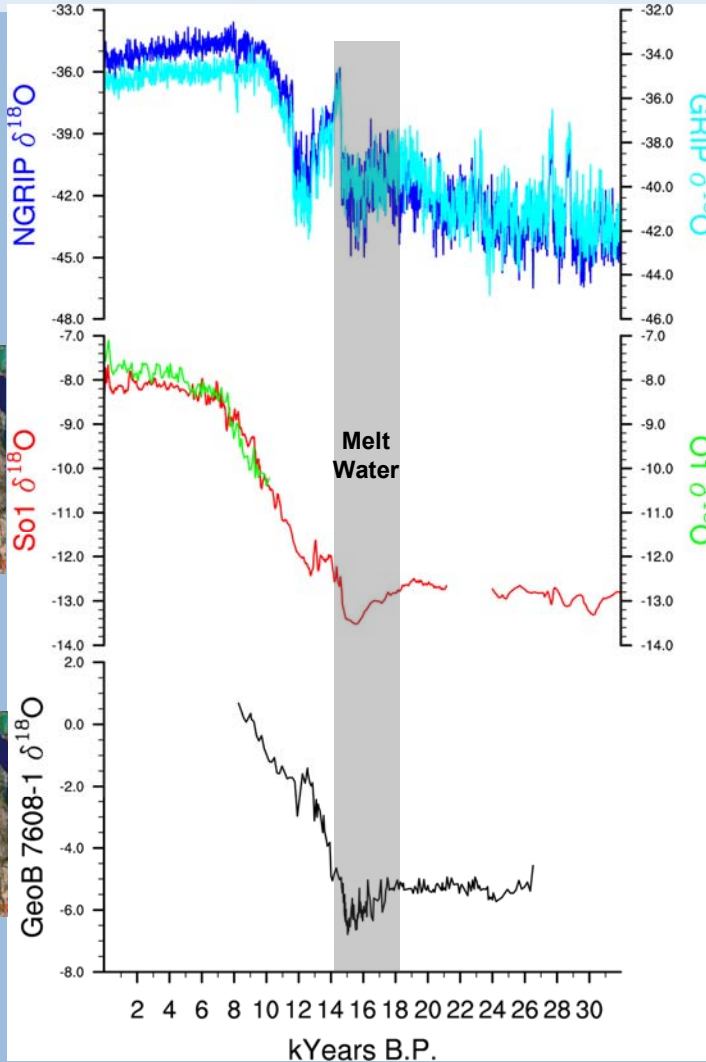


Proxy Interpretation

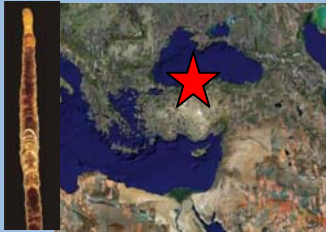
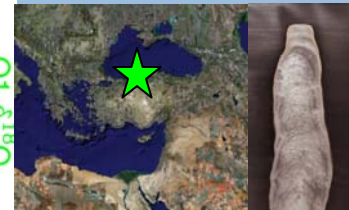
- > Rainfall amount / intensity **+** -> Growth rates **+** , $(^{234}\text{U}/^{238}\text{U})_0$ ratio **-**
- > Rainfall amount **+** -> $\delta^{13}\text{C}$ **-** , *but* beyond a rainfall threshold $\delta^{13}\text{C}$ **+**
- > $\delta^{18}\text{O}$ mainly reflects the Black Sea isotopic composition

$\delta^{18}\text{O}$: Black Sea effect - Meltwater

North
Greenland
Ice Core



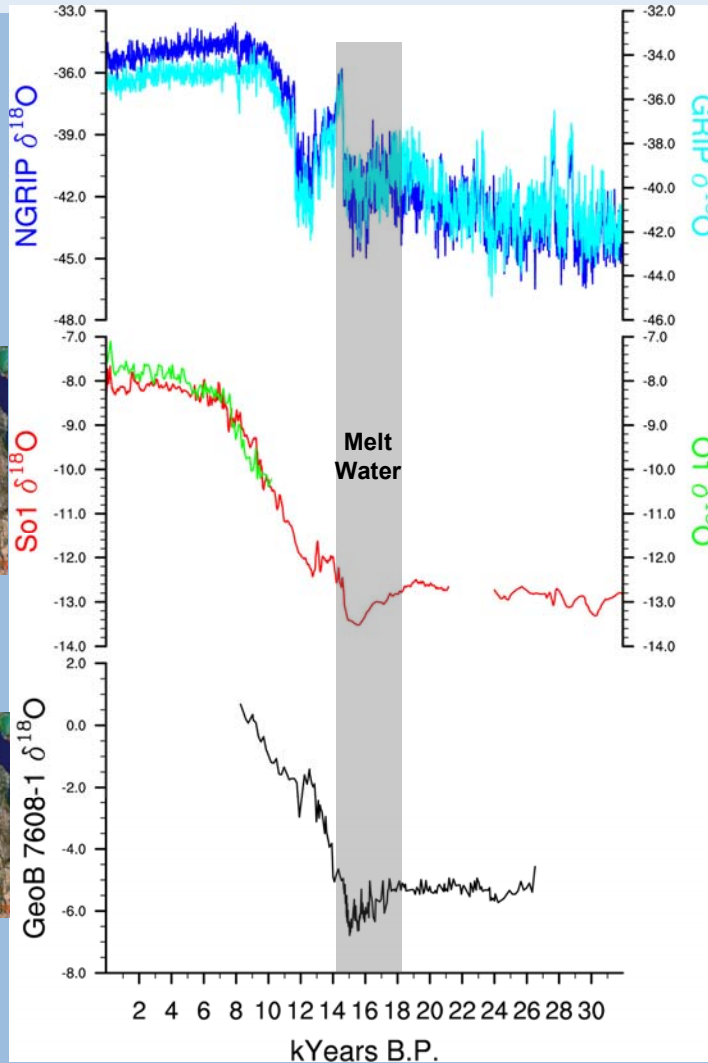
Greenland
Ice Core



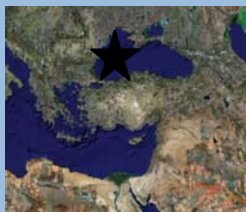
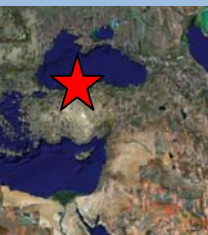
Deep sea core
Bahr et al, 2008

$\delta^{18}\text{O}$: Black Sea effect - Meltwater

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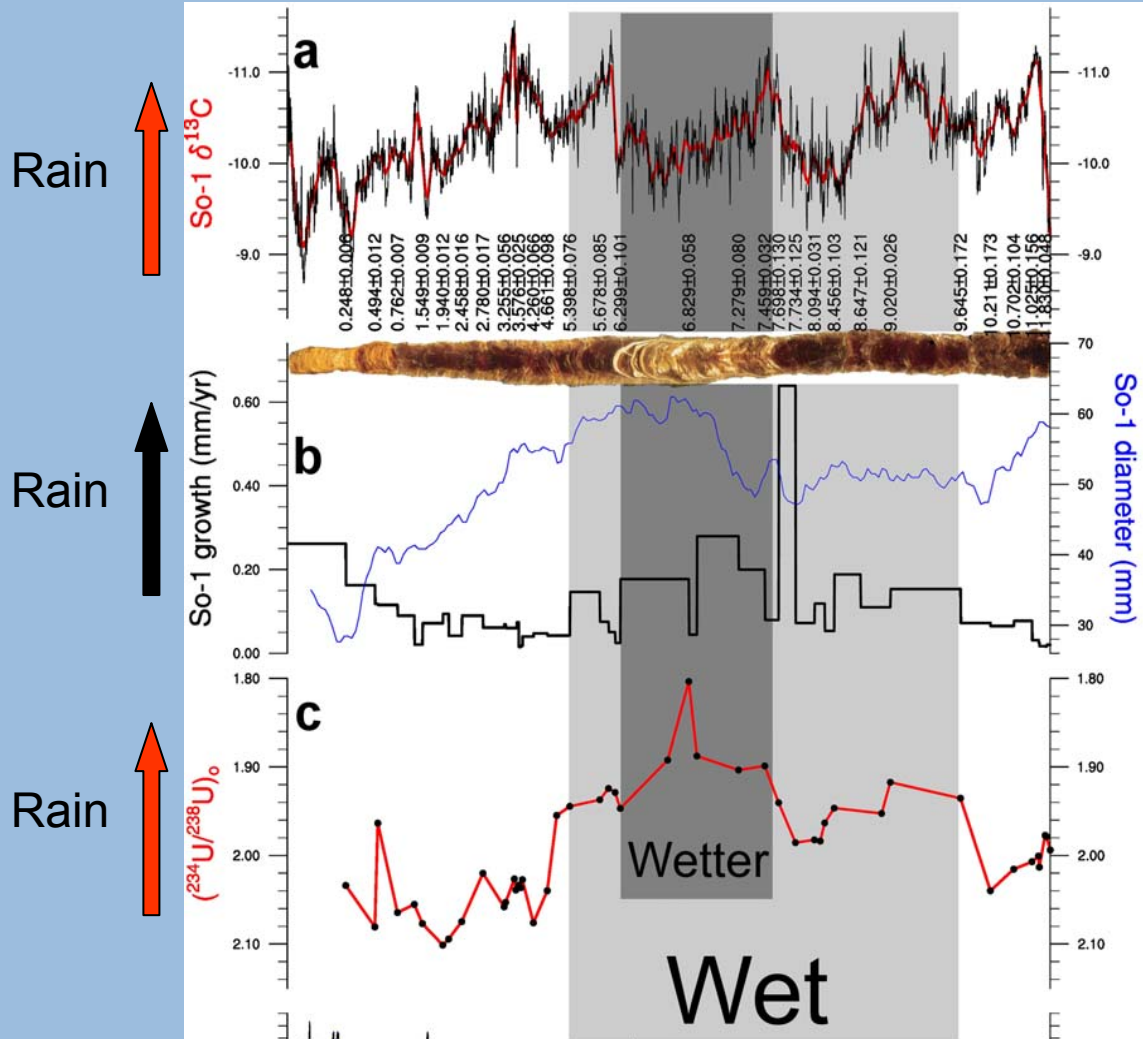


Greenland
Ice Core



Deep sea core
Bahr et al, 2008

Through the Holocene...



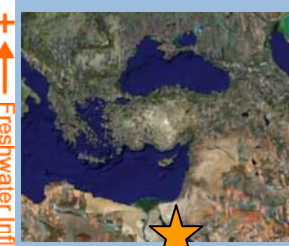
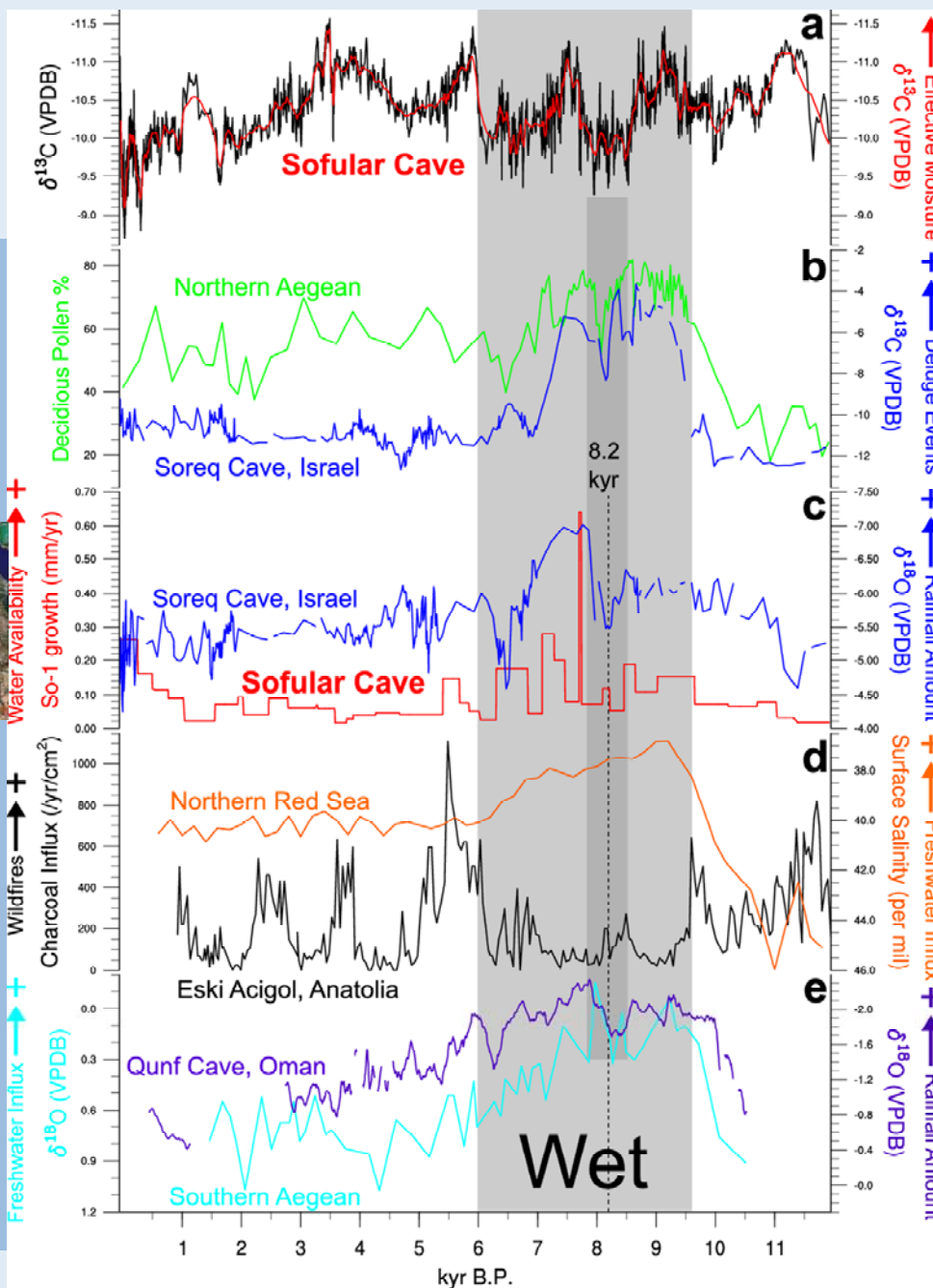
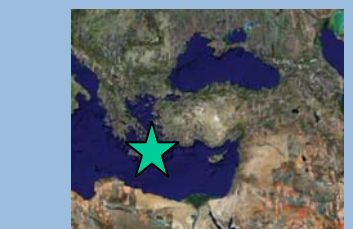
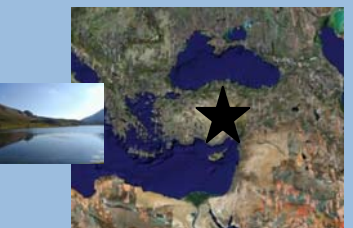
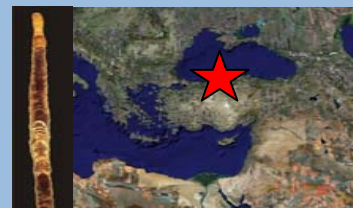
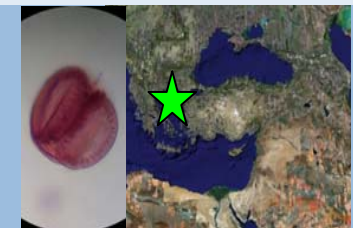
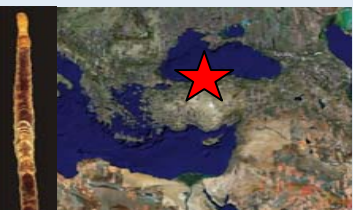
- > Wet between ~ 9.6 and 5.4 ka BP
- > Extremely wet between ~ 7.5 and 6.3 ka BP
- > Drying trend from 1.5 ka BP on, culminating in Little Ice Age

Comparison with East Med. Records

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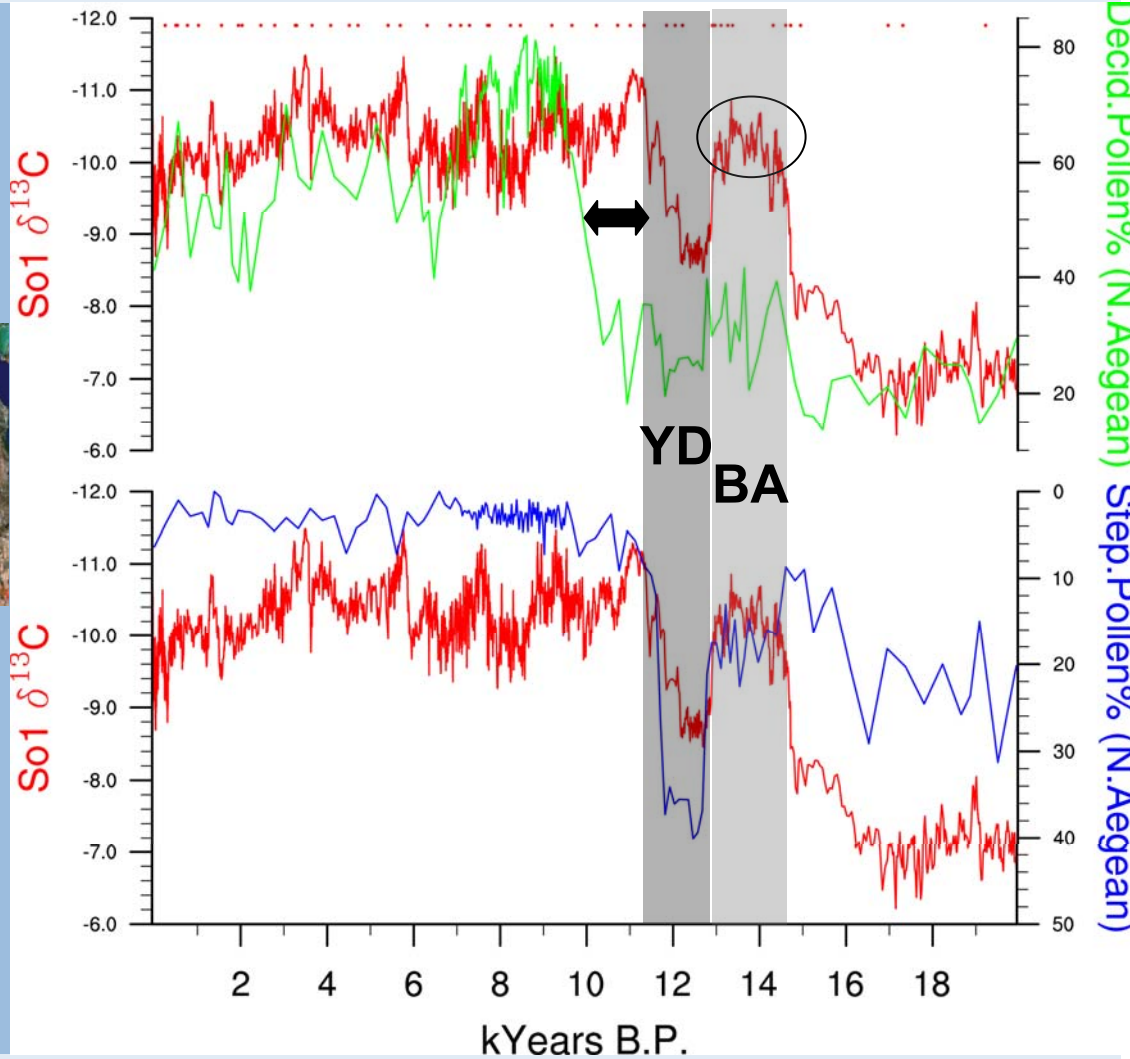
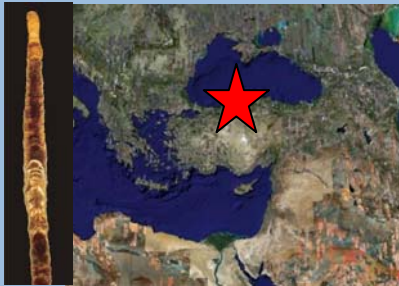
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Common mechanism...
SSTs ?
Summer rain ?

Vegetation response



Kotthoff et al (2008)



Conclusions and Suggestion

- > **Wet conditions between 9.6 and 5.4 ka BP**, in line with other Eastern Mediterranean records (late termination in the Sofular record) caused by a common mechanism which is absent or less effective today (Very high SSTs or summer rainfall)
- > **Drier Little Ice Age in Turkey ?**
- > **Very rapid post-glacial vegetation response** on the Black Sea coast, Black Sea mountains were glacial refugia
- > **Meltwater pulses clear, $\delta^{18}\text{O}$ reflects Black Sea isotopic composition**
- > Missing: SST reconstruction for the Black Sea !

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THANK YOU