Reconstruct Past Climate Data Source Discussion

# **Reconstruct Past Climate**

Data Source, Proxies

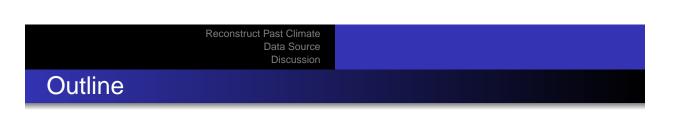
**Thomas Kuster** 

Department of Enviromental Science ETH Zürich

Large-scale climate variability, 13.11.2006

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3 Discussion

#### Reconstruct Past Climate Data Source

Discussior

## Parameter and Resolution

# Parameter temperature precipitation wind ... Resolution daily monthly seasonal annual

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- tree rings
- corals
- boreholes
- vermetids
- ice cores
- sediments (lake, ocean,...)

## **Descriptive Documentary Data**

## Weather Observations

- reports from chronicles
- daily weather reports
- travel diaries
- ship logbooks

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Documentary Data Speleothem

# Example of a Ship Logbook

4 5 6	Jush Winds from the N. ward with Joh Gall Main & Main Joh Gall? y	a large Swell . B.M. moderating got at
78 9	Saturday. 27.	
	Winds Triable of 1/2 past & a. M. Wer falling atta Mand Run lack again a	he & got as high as the San Sand, but as the other Shits & anchord in 7 F. Waker
2 22 4	with the Best Bower, the Burg of the . Sundaly. 28.	he & got as high as the Pan Sand, but and the other Shits & anchord in 7 F. Waker an Batch Sand MAR Dist. about 1/2 a Mile
6 78	Werly Winds & small Rain at 5 a.M. Me	Ad & got as high as the Brug of the Mouse gat
C X L	russed y arms to defend themselved. As 5 (	ges los Luitenante fo Impreso our Men which they M. Hughd & at ja part g BR. part the Conquistation but offer het bring our The proo, the Coople afaring?
Ľ	fining That at us one diwhich Auchor; his	ages tys Frigaly The albermaal bah Allson he
	interest of last with different of the	C.M. Hain Bearing & Litte aly dros found then came to let go the Optical Haly dros found then
	In the and head right on the the Shore of a	201 Jaing Brain Cour and the Interest in Stand Came of the Gond of the Selection of the stand of 4 A Mall all go the Aneffore all standing the adding fresh well, when the and form somether in all of the Netson I in offers bour tople which they at

Transcript

## Parameter and Resolution

#### Resolution

• daily or more

#### Parameter

- Wind: force and direction
- General accounts of the weather
- After 1850 most ships provided instrumental data

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Documentary Proxy Data	

More indirect evidence that reflects weather events or climate conditions

- agricultural activites e. g. grape-harvest (Swiss German: Wümmet)
- time of freezing and opening up of waterways
- religious ceremonies
- tax e.g. tithe (German: der Zehnte)
- ...

Good dating control and high temporal resolution

Documentary Data Speleothem

## **Documentary Proxy Data**



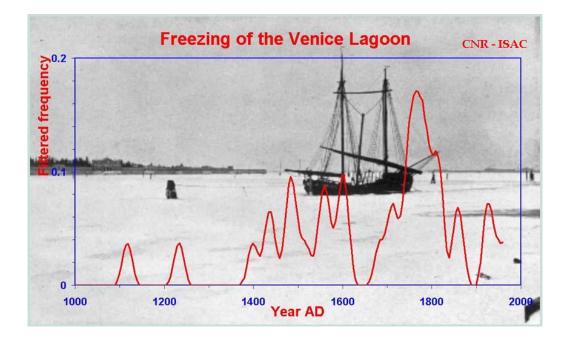
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# Documentary Proxy Data



Documentary Da Speleothem

#### Secondary Cave Deposits such as

- stalactites
- stalagmites

#### Speleothem

From the Greek for "cave deposit".

German: Speläotheme (sekundäre Mineralablagerungen in Höhlen)

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Documentary Data Speleothem

## **Stalactites and Stalagmites**



Documentary Dat Speleothem

## Memory hook

## English

Stalagmites grow from the ground, stalactites grow from the ceiling

#### German

Stalagmiten haben schon viel "mitgemacht" sind daher "müde" und deswegen am Boden, während Stalaktiten tropfen und an der Decke hängen.

Children: Die Stalaktiten kommen von der "T"ecke, und die Stalag**mit**en wachsen **mit** dir mit.

Adult: Die Mi(e)ten steigen und die (Stalak)tit(t)en hängen.

#### French

La Stalagmite monte, la stalagtite tombe

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Data Source

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**Development of Speleothems** 

Reaction	
$\begin{array}{c} CaCO_3 + H_2O + CO_2 \\ Ca_2^+ + 2 \ HCO_3^- \end{array}$	$Ca_2^+ + 2 HCO_3^-$ $CaCO_3 + H_2O + CO_2$

## Parameter

Example: Stalagmite Q5 from a Oman Cave (Fleitmann et. al., 2003)

• more negativ  $\delta^{18}O \rightarrow$  more precipitation

► Location of Oman

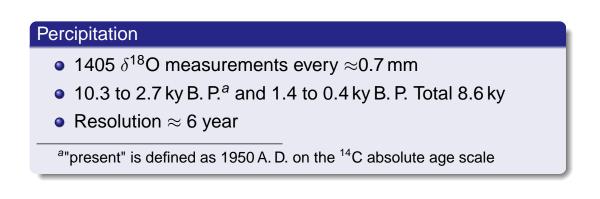
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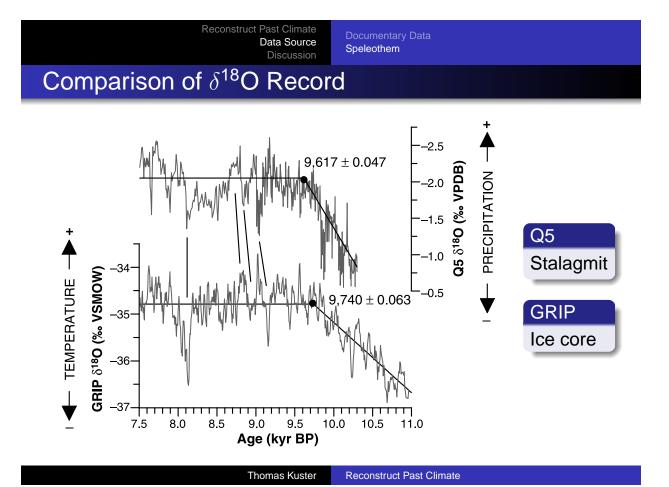
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Discussion			

- What proxy do you like best
- Why
- Different proxies and their pros and cons
- Parameters in ship logbooks
- δ<sup>18</sup>Ο

#### Appendix

List of figures Bibliography Additional Slides

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Wümmet http://images.gadmin.ch/5145/8331/picba 1168.jpg	se/
Freezing of the Venice Lagoon http://clima.ictr.pd.cnr.it/immagini/ freezing.jpg	
Ship logbook http://www.bl.uk/learning/images/texts/ ship/Oct-28th-81lg.jpg	
Cave with Stalactites and Stalagmites http://www.ici.ro/romania/images/turism dambo3.jpg	/mc_

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### Location of Oman Google Earth

Frequency of flooding tides at Venice http://clima.ictr.pd.cnr.it/immagini/ acqualta.jpg

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Drill to take samples for dendrochronology from trees http://en.wikipedia.org/wiki/Image: Dendrochronological\_drill\_hg.jpg

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## Bibliography

P. Lionello et. al. The Mediterranean Climate: An Overview of the Main Characteristics and Issues. <i>Developments in Earth &amp; Environmental Sciences</i> , 4:27–148, 2006.
D. Fleitmann et. al. Holocene Forcing of the Indian Monsoon Recorded in a Stalagmite from Southern Oman.

Science, 300:1737-1739, 2003.

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Appendix

Bibliography Additional Slides

## Transcript of the logbook

The Halsewell Logbook, 28th October, 1781

Fresh Winds form the Northward with a large swell. PM moderating got up Top gallant Mast and Main Top Gallant Yard

#### Saturday 27

Winds variable at 12 past 4 AM Weighed and got as high as the Pan Sand, but falling little Wind Run back again as did the other Ships Anchord in 7F Walter with the Best Bower, the Buoy of the Pan Patch Sand NNE Distance about 1/2 a Mile

### Sunday 28

Northerly winds and small Rain at 5 AM Weighed & got as high as the Buoy...

Ship Logbook

## Oman

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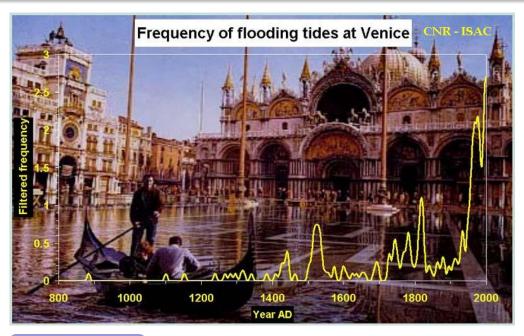
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# Frequency of flooding tides at Venice



Documentary Proxy Data