NextData

Multi-proxy reconstruction of Eastern Alpine Holocene climate

Progetto d'Interesse "*NextDATA*"
topic 6

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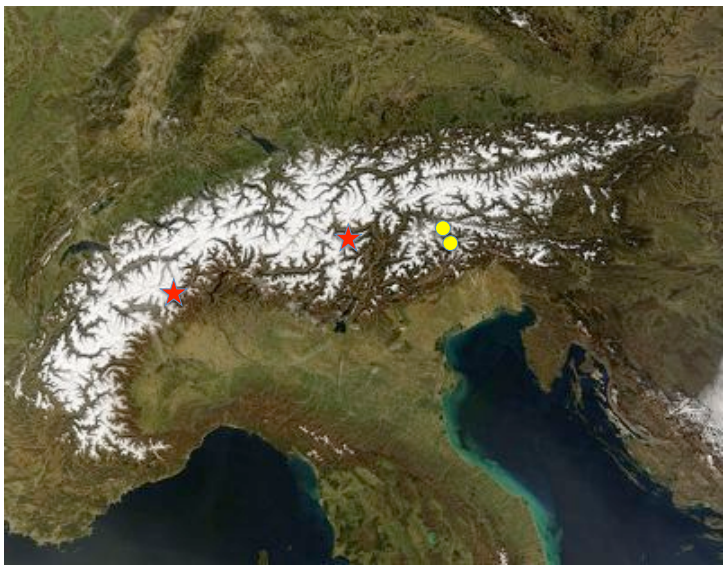
Roma, 3 Giugno 2013

Archivi glaciali e terrestri

Ice core

Peat bog



Vedretta Alta dell'Ortles

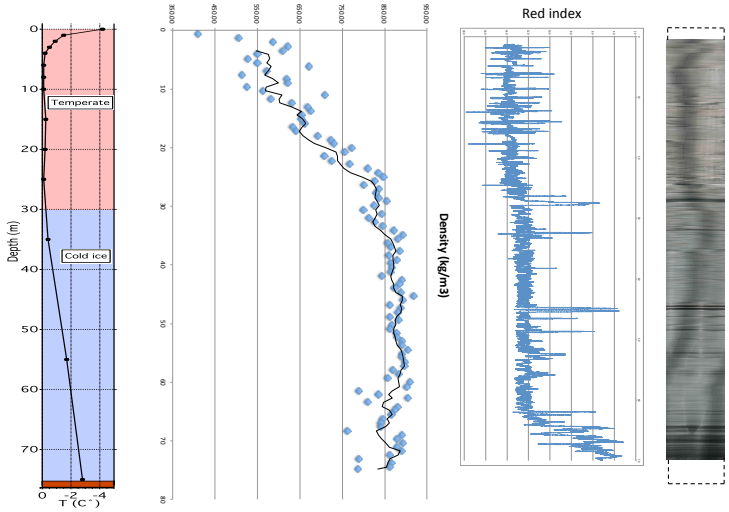
Vedretta Alta

Surface (2006): 105 ha
Maximum elevation: 3905 m
Minimum elevation: 3018 m
Average elevation: 3535 m
Exposure: NW
Average slope: 29°

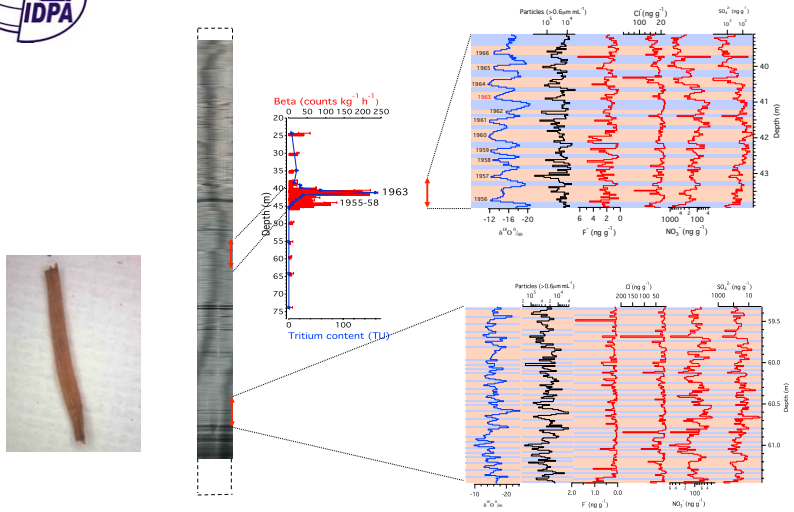
Climatology

Precipitation (valley floor, 1900 m): **750 mm y^{-1}**
Annual air temperature (3850 m): **-9°C**

Vedretta Alta dell'Ortles: ghaccio caldo o freddo?



Vedretta Alta dell'Ortles: datazione



- Climatic signal preserved
- Conventional flow model ~ 400yr
- Annual layer counting 360 - 390 yr
- Basal ice (cal ^{14}C) 650 ± 165 BC

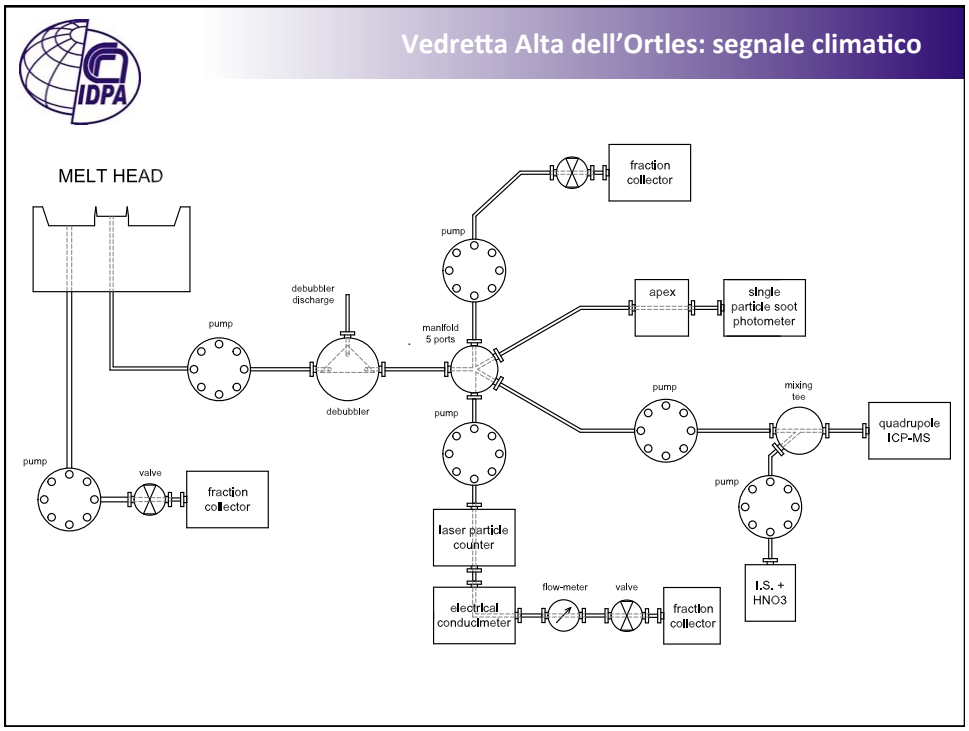
Vedretta Alta dell'Ortles: segnale climatico

2000-1900 10-16 campioni/anno (3.0 – 7.5 cm)
1900-1800 6-10 campioni/anno (2.0 – 3.0 cm)
1800-1700 3-5 campioni/anno (2.0 cm)
1600-1700 2-4 campioni/anno (2.0 cm)
<1600 (?) sub-annuale (2.0cm)

FUNZIONE TRASFERIMENTO

- Snowpit estivi/autunnali 2010-2014 (75-180 campioni anno)
- Dati AWS + catena termometrica
- PROBLEMI…. ? accumulo, fusione, percolazione…

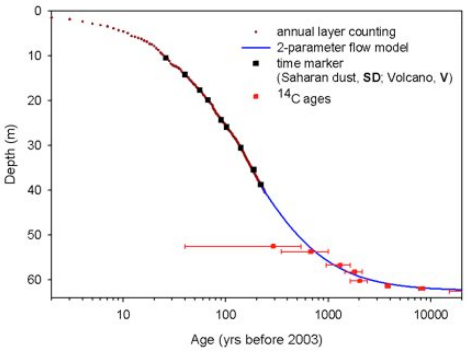
Vedretta Alta dell'Ortles: segnale climatico



Colle Gnifetti, Monte Rosa

- Italian-Swiss border
- GPS 45°55’50.4’’N, 07°52’33.5’’E
- 4455 m a.s.l.
- Borehole T between -14.0 to -12.5°C
- Low accumulation (0.32 m w.eq./y)
- 2 parallel cores (81m)
- Mainly summer snow
- Close - off 35.5 m

Colle Gnifetti: datazione



Orizzonti stratigrafici (n=10)

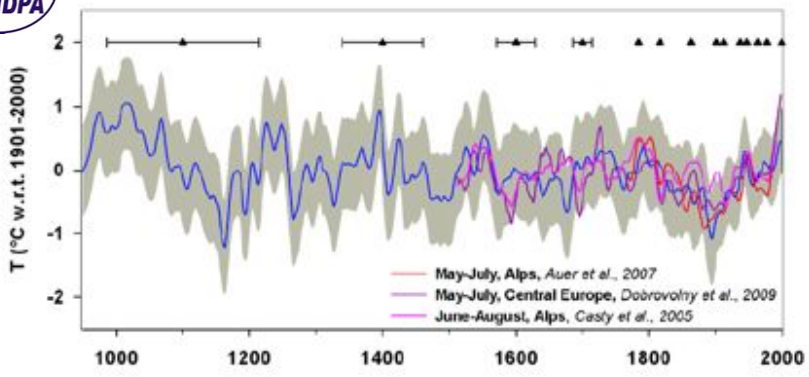
18.85	1977 sahariana
24.45	1963 picco ^{3}H, ^{239}Pu
29.21	1947 sahariana
32.00	1936 sahariana
37.31	1912 tephra vulcanico (Katmai)
39.20	1901 sahariana
44.39	1863 sahariana
49.81	1815 tephra vulcanico (Tambora)
53.52	1783 tephra vulcanico (Laki)
70.20	1259 tephra vulcanico ???

Conteggio strati annuali fino al 1766

Date al ^{14}C su particolato organico (n=5), test su GRIP e QUELCAJA

67.83	1673±120	^{14}C
68.79	1463±160	^{14}C
70.13	1223±190	^{14}C
73.46	798±245	^{14}C
75.14	333±250	^{14}C

Colle Gnifetti: segnale climatico



Profilo completo $\delta^{18}O$, δD

2000-1900	~8-10 campioni/anno (2.0 – 7.5 cm)
1900-1800	~5-3 campioni/anno (2.0 cm)
1800-1700	~4-2 campioni/anno (2.0 cm)
1700-1400	~2-1 campioni/anno (1.5 – 2.0 cm)
< 1400	risoluzione sub-annuale (1.5 cm)

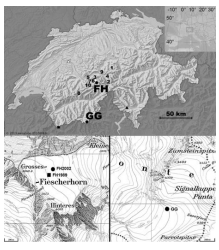
Colle Gnifetti: segnale climatico

FUNZIONE TRASFERIMENTO

- Diversi tentativi…
- Snowpit 2010, 2011 ... (325 campioni)
- AWS Capanna Margherita (ARPA Piemonte)
- PROBLEMI… accumulo!

Clim. Past, 10, 1093–1108, 2014
www.clim-past.net/10/1093/2014/
doi:10.5194/cp-10-1093-2014

Climate of the Past
Open Access



Temperature and precipitation signal in two Alpine ice cores over the period 1961–2001

I. Mariani[1,2], A. Eichler[1,2], T. M. Jenk[1,2], S. Brönnimann[2,3], R. Auchmann[2,3], M. C. Leuenberger[2,4], and M. Schwikowski[1,2,5]

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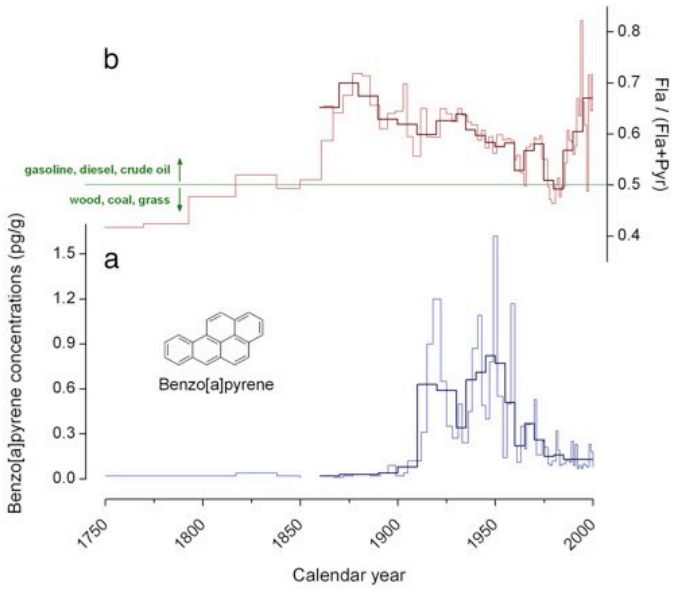
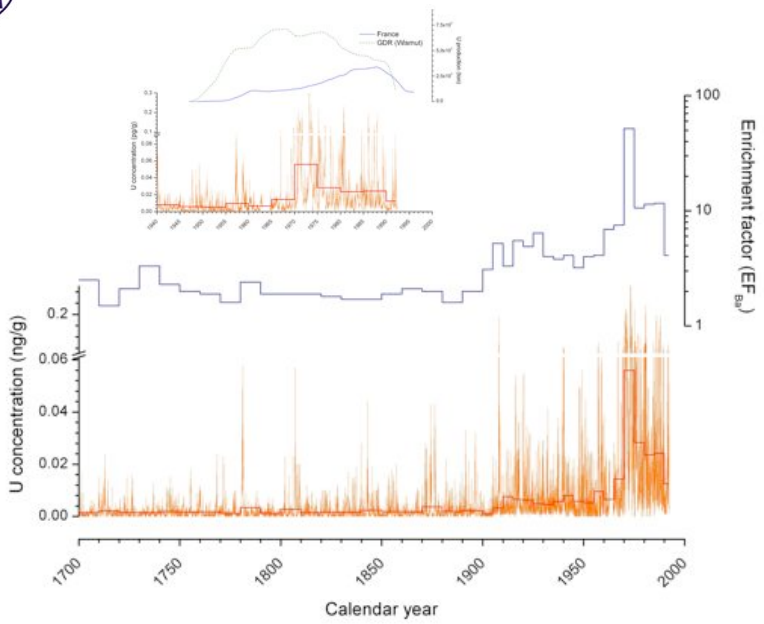
Colle Gnifetti: deposizioni di PAHs



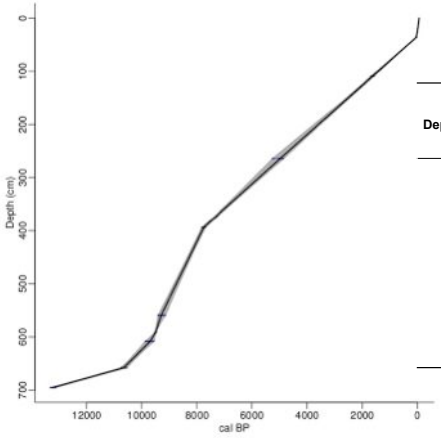
Colle Gnifetti: deposizioni di U



Torbiere di Danta di Cadore e Coltrondo

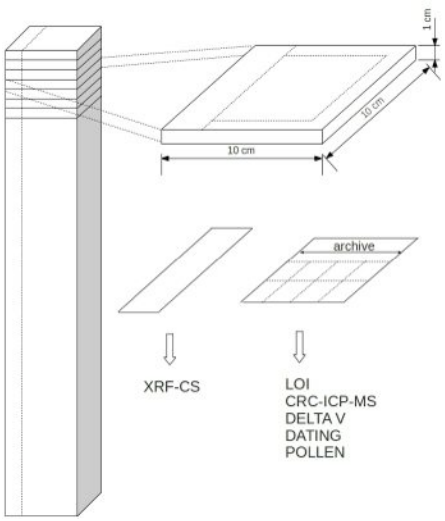
Danta di Cadore: datazione

- ^{210}Pb 24 campioni (0-40cm)
- ^{137}Cs 4 campioni
- ^{14}C 8 (+4) campioni (65-700cm)
- CLAM MODEL



Depth (cm)	**^{14}C yrs BP**	**Estimated 2σ range** (age cal BP)	**Median value** (age cal BP)	**Analysed fraction**
109	1713 ± 23	1555 - 1695	1619	Bulk peat
264	4388 ± 45	4850 - 5060	4957	Wood
394	6939 ± 31	7687 - 7839	7763	Wood
559	8287 ± 33	9198 - 9421	9303	Wood
591	8497 ± 37	9466 - 9539	9506	Wood
608	8728 ± 39	9554 - 9824	9686	Wood
658	9427 ± 43	10554 - 10764	10658	Wood
695	11338 ± 53	13110 - 13330	13221	*Pisidium* shells

Danta di Cadore: analisi geochimiche

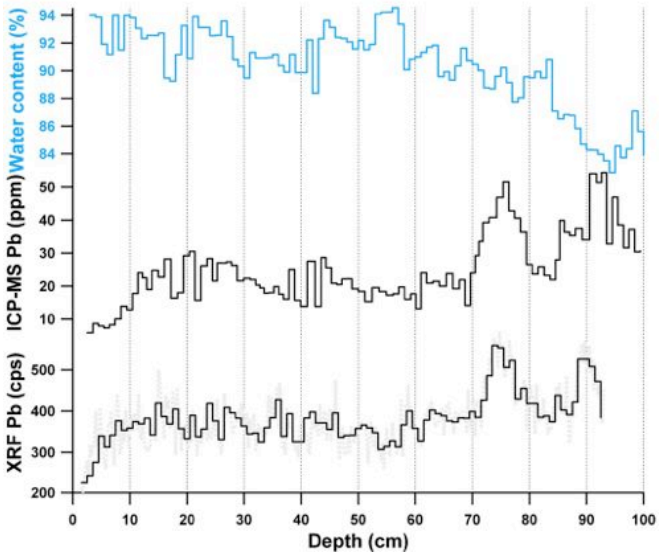


Danta di Cadore: analisi geochimiche

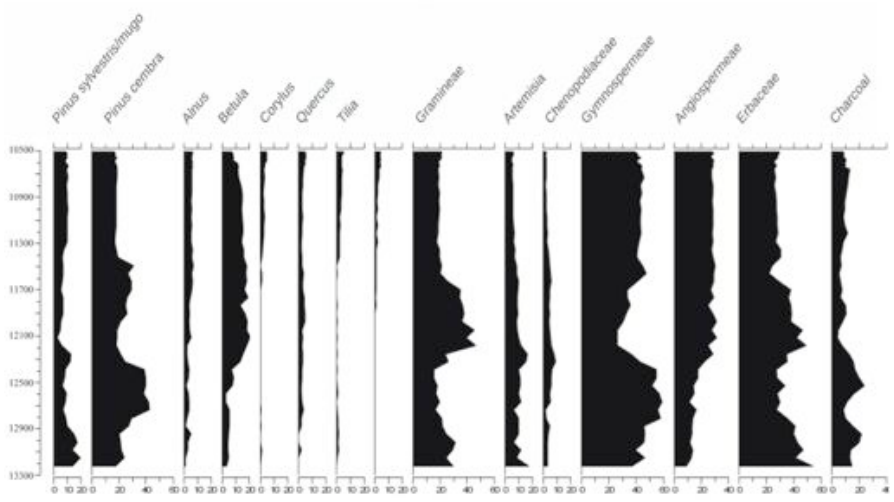
Peat sub-samples cut in coldroom

- Fresh
  - **Macrofossil ^{14}C dating**
- Pore water
  - **pH**
  - **EC**
- Bulk 105°C
  - **LOI**
    - **Water content**
    - **Organic matter content**
    - **Ash**
- Bulk 105°C
  - **^{210}Pb dating**
- Bulk 105°C
  - **Delta+**
    - **C tot**
    - **N tot**
    - **$\delta^{13}C$, $\delta^{15}N$**
- Bulk 105°C
  - **ICP-MS previous microwave digestion HNO_3 + HF**
    - **TE**
    - **REE**
    - **Pb isotopes**

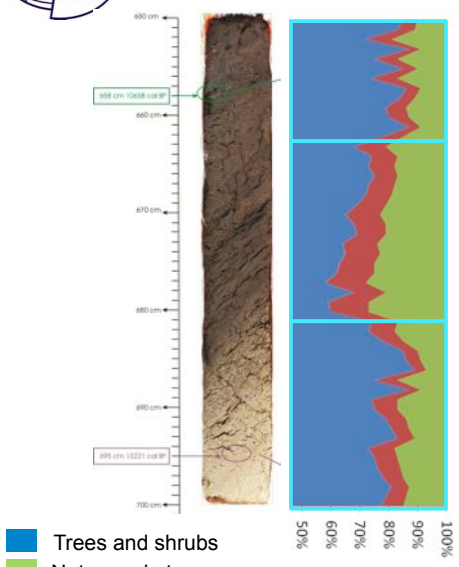
Danta di Cadore: Pb



Danta di Cadore: analisi polliniche



Danta di Cadore: analisi polliniche

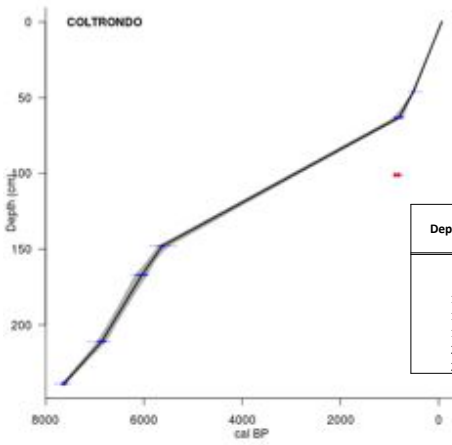


Mixed forest development

Forest regression and xerophyte increse

Forest development and progression

Coltrondo: datazione



- ^{210}Pb 30 campioni (0-40cm) NO DATA
- ^{137}Cs NO DATA
- ^{14}C 6 (+2) campioni (65-250cm)
- CLAM MODEL

Depth (cm)	14C yrs BP	Estimated 2σ range (age cal BP)	Best value (age cal BP)	Analysed fraction
46	469	493 – 535	515	cone
63	885	737 – 901	811	wood
101	922			wood
148	4891	5501 – 5723	5630	bulk peat
167	5259	5936 – 6175	6042	wood
211	6019	6764 – 6950	6858	bulk peat
239	6790	7580 – 7692	7634	wood

Coltrondo: analisi polliniche

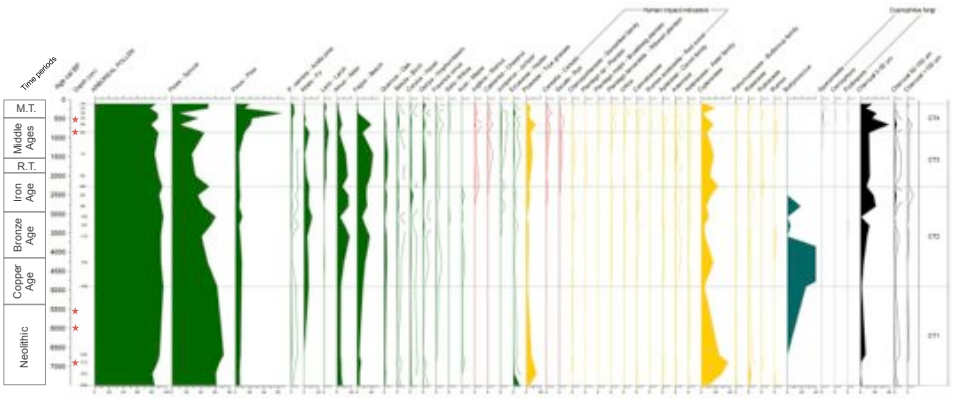


Fig. 1 - Simplified pollen diagram, percentage values are shown; Time periods: R.T. = Roman Time; M.T. = Modern Time.

Nuovi "proxy" climatici ???

Geophysical Research Abstracts
Vol. 12, EGU2010-3374, 2010
EGU General Assembly 2010

Carbon and oxygen isotope composition of Sphagnum cellulose and their dependence on temperature and precipitation in a Scandinavian mire (Kiruna, northern Sweden)

Stable isotopes and organic geochemistry in peat: Tools to investigate past hydrology, temperature and biogeochemistry

Erin L. McClymont[1], E. Pendall[2] and J. Nichols[3]
[1]School of Geography, Politics and Sociology, Newcastle University, UK; erin.mcclymont@ncl.ac.uk
[2]Department of Botany and Program in Ecology, University of Wyoming, USA; [3]NASA Goddard Institute for Space Studies, New York, USA

Characterizing the stable isotope and biomarker geochemistry of peat cores enables reconstruction of key climatic and environmental variables in the past, including temperature, hydrology and the cycling of carbon.

PAGES news • Vol 18 • No 1 • April 2010

Nuovi "proxy" climatici ???

- Elemental analyzer (COSTECH)
- Thermo ConFLOW V


Jacopo Gabrieli , Carlo Barbante
Consiglio Nazionale delle Ricerche (CNR)
Istituto per la Dinamica dei Processi Ambientali
IDPA
The “drilling team”
Grazie per l’attenzione!
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