

Trentino (Dolomites, NE Italy) has been documented since the Late Glacial. Lake Lavarone sediment sequence, which is the first, complete Late Glacial to present day record from this region, however, indicates that the environmental impact of humans was almost negligible until the Roman Age. Here, we present a multi-disciplinary study on the topmost part of Lake Lavarone (1100 m asl, 0.05 km<sup>2</sup> large, 17 m deep) sediment sequence, which covers the last 2000 years, with particular attention to the last 150 years. The occurrence of *Castanea* and *Cerealia* and the high concentration of micro-charcoal at about 2000 yrs BP are considered as indicators of the Roman settling in the area (Roman Imperial Period, I-III sec. AD). The onset of the medieval period is marked by arboreal pollen decrease (from 90-70%), micro-charcoal concentration increase (from 10,000-30,000 particles/cm<sup>3</sup>) and anthropogenic indicators (ca. 10%), such as *Cannabis*. Sedimentology, physical proprieties, mineralogical and geochemical data, together with algal distribution changes, indicate important variations in Lake Lavarone hydrology dated to the Early Middle Ages. In the last century, diatoms distribution clearly shows significant changes in the lake trophic status, with a peak of eutrophication at the end of the 1960s, and a subsequent slight tendency to lake recovering to lower trophic level. Ongoing geochemical analyses on metals will help to highlight the impact of human industrial activities.

HUMAN IMPACT, PALEOLIMNOLOGY, HISTORICAL TIME, EUTROPHICATION

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## The Younger Dryas in the Italian Alps: Climate and cultural evolution

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The discovery of Late Paleolithic (ca. 13.000 yrs BP), excellently preserved painted stones in the Dalmeri rock shelter (ca. 1300 m asl) in the Alps of Italy, with stylistic echoes of French-Cantabrian art, provides a unique testimony of pre-Younger Dryas (YD) cultural evolution. After the YD, the Mesolithic hunter-gatherer lifestyle indicates a connection with North European populations. A stalagmite (SV1) stable isotope record from Grotta Saviin NE Italy reveals evidence of climate instability between 17.0 to 12.0 kyr BP. Since 11.0 kyr BP, isotope series show less intense fluctuations. In SV1,

the YD (12.0 and 11.4 kyr BP) is characterized by high <sup>18</sup>O values, coinciding with <sup>13</sup>C enrichment of up to +1‰. The extension rate of the stalagmite during this interval is the lowest (<8 µm/year) during the past 16.0 kyr. We infer that the YD was cool and relatively dry, with short warm seasons. Near the Dalmeri Shelter, lake sediments and their pollen content support the hypothesis that during the YD mid-high altitude Alpine environments were deglaciated, thus allowing cultural exchange with northern Europe. Geological and archaeological data suggest that Alpine Paleolithic art was a response to Pre-Holocene climate instability, which required deep knowledge of the environment, as already hypothesized by Mithen (2003). The relatively stable Holocene climate did not require a similarly deep knowledge. In agreement with Mithen (2003) we infer that the YD was the harbinger of the western modern mind.

ENVIRONMENT CHANGE, DEGLACIATION, CLIMATE, CULTURE, PALEOLITHIC

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## Human impacts on a Holocene inland wetland (Las Tablas de Daimiel National Park, central Spain)

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The Las Tablas de Daimiel National Park in central Spain is one of the scarce freshwater wetlands still preserved in southern Europe. This system is very sensitive to changes in climate but the sedimentary record also reveals environmental changes due to human activity since around the 10th century AD. The combination of geochemical and pollen data allow us to reconstruct the main environmental and ecological changes. The record shows the transition from a saline prairie to a wet meadow and eventually to a freshwater wetland. An increase in rainfall was probably the reason for a decrease in salinity of waters and soil that allowed the development of hydrophytes, a type of vegetation that requires higher water levels. Finally, the pollen record shows changes in vegetation evolution: arboreal pollen decrease abruptly during the 10th century, followed by a progressive increase in *Pinus* and *Artemisia*. From the late 17th until the 19th centuries, vegetation changes were very frequent and with higher amplitudes. Finally, since the end of the 19th century, the vegetation

changes are interpreted to reflect man-made changes of the environment such as water overexploitation and soil degradation. Regeneration measures for this area have taken place since the late 1980s.

#### CLIMATIC CHANGES, POLLEN, HUMAN ACTIVITY

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#### The impact of last interglacial and last glacial maximum vegetation changes on the Australian monsoon

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The potential impact of large scale vegetation changes on the Australian monsoon during the last interglacial and last glacial maximum are explored. We use the Regional Atmospheric Modelling Systems (RAMS) at a grid resolution of ~50 km forced by fixed sea surface temperatures. This model produces an excellent monsoon rainfall pattern and wind field over northern Australia. The control simulation uses present vegetation, simplified to be mainly sparse forest in the north and grasslands further south. In the last interglacial simulation, vegetation is replaced by dense woodland in the north and sparse woodland in the south. In the last glacial maximum simulation, grassland covers the northern areas and semi-desert exists further south. An ensemble of seven simulations for each time period is performed to ensure that results due to vegetation change can be identified above noise associated with the monsoon system. We find a substantial impact of the vegetation change on temperature and the latent heat flux (evaporation). We find no significant impact on the rainfall over northern Australia (changes were limited to ~5% of the control simulation). However, there were substantial impacts on the monsoonal flow associated with the vegetation changes as a result of changes in the aerodynamic roughness. These were weakening/strengthening of the winds - not a change in direction. We therefore find no evidence in our simulations of a strong vegetation feedback affecting the Australian monsoon and we find no suggestion of a link between changes in vegetation patterns north of 23°S and climate changes south of 23°S.

#### VEGETATION, CLIMATE, MONSOON, AUSTRALIA

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#### Forest clearance and its impact on fluvial environments in the last 100 years in the Tokachi Plain, northern Japan

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The northernmost island of Japan is well known as the region where deforestation and agricultural land use had drastically progressed only since last 100 years. How had the fluvial processes responded to the drastic change? On the basis of the sediments facies, chronostratigraphy using <sup>137</sup>Cs, marker tephra, tree ring and the monitoring data of present flooding and so on, we will examine the change of fluvial environments, sensibility to changes and sustainable development, etc. Major knowledge is as follows: 1. Topographic maps show the timing from the natural forest to agricultural land in each drainage basin particularly in term of the intensity. 2. Fluvial sediments after the forest clearance are significantly coarser, comparing with those of the pre-deforestation. 3. The timing of grain size change of sediments has clearly coincided with the deforestation in each drainage basin. This fact implies that the fluvial processes immediately respond to the human environmental disturbance. 4. The <sup>137</sup>Cs analysis showing the horizon of sedimentation in 1963 make us possible to evaluate the recent accelerated sedimentation rate. 5. Monitoring of river water level and rainfall from 2000 to 2002 recorded the over bank flooding 4 times, when the total amount of rainfall attained to ca. 100 mm or more. 6. Suspension load during the over bank flooding contains the coarse particles composing the over bank sediments since the beginning of forest clearance.

#### HOKKAIDO, FOREST CLEARANCE, FLUVIAL SEDIMENTS, RESPONSE TO FLUVIAL SYSTEMS, <sup>137</sup>Cs

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#### Holocene colluviation in response to monsoonal climatic change and human impact on the loess lands in the Weihe River Valley, Northern China

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Colluvial components incorporated in loess-soil sequences have preserved evidence of soil erosion