Cyclicity instead of linearity: The C3/C4 transition archived in Neogene calcisols

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In Cappadocia, Central Turkey, climate and vegetational changes are archived in sequences of Late Neogene paleosols. The paleosol-sequences are interlayered with ignimbrites and fallout tephra layers providing the necessary temporal constraint of 11-3 Ma (K-Ar ages [1]). The stratigraphic interval is of paleo-ecosystematic interest as it encloses the Late Miocene phase of extreme aridity (the "Messinian crisis"). Aridisols (calci- and gypsisols) containing palygorskite indicate the semi-arid to arid conditions in these terrestrial records, which are represented in the marine record of the Mediterranean Sea by widespread salt deposits (5.5 – 4.8 Ma).

Pedogenic calcretes conserve the last major global ecosystem change from a paleo-vegetation dominated by C3 plants (e.g. brush/tree-steppes) to the modern vegetation that is characterized by dominance of C4 plants (e.g. grass-steppes) in their carbon isotope systematics. This change is documented between 7 and 4 Ma as $\delta^{13}C$ isotope shift in Kenya, Pakistan, North America, and China [2-5].

In Cappadocia the total variation of $\delta^{13}C$ values amounts to about 10 ‰ which is comparable to the shift of about 12 ‰ measured in paleosol reference profiles in Pakistan [2]. The largest variation, as well as the most positive values, is represented in the youngest calcretes, which may indicate that the final dominance of C4 vegetation was established only as late as 4.0 Ma. However, the most negative value of –6.6 ‰ measured in Cappadocia in the lowermost calcretes (age 6.6 Ma) amounts to only half the value that is characteristic for the Mid Miocene C3 vegetation in Pakistan. The vegetational change may thus already have been initiated in Cappadocia prior to the climatic change of the Messinian event. The transition to a C4 dominated vegetation is nonlinear as repetitive shifts to increasingly positive values are recognised on the small scale of subsequent calcrete horizons.

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Holocene records of regional dust deposition using peat bogs

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Present and future environmental changes, including climate change, will induce variations in atmospheric particle loading that have necessarily environmental feedbacks. Records of dust loading summarized in the network DIRTMAP exist for different places in the world on a 10^2-10^3 ky. timescale. However, there is no precise investigation on dust loading on a shorter timescale and for the Holocene in Europe. Peat cores from ombrotrophic peatlands can offer high-resolution records of dust intensity and origin in Europe. During the last 20 years, cores from ombrotrophic Sphagnum peatlands have proved to be meaningful archives of atmospheric deposition of trace elements, especially lead. Whereas the potential of peat cores as archives of recent and ancient pollutions has been increasingly investigated [1], using peat cores as archives of atmospheric deposition of trace elements for the entire Holocene remains less investigated [2, 3]. This presentation will first focus on our recent progress in sampling, analyses and age dating peat profiles to offer a continuous and high-resolution record of atmospheric trace elements deposition and the possibility to compare them with other archives. A multiproxy approach based on trace elements (refractory elements, Pb, Sr, Rb, REE), different isotopic systems (Pb, Sr, Nd) and mineralogical analyses is then used to trace dust origin in different European peat bogs along a N-S transect during the Holocene.

[1] Le Roux *et al.* (2005) *Atm. Env*. **39**, 6790-6801. [2] de Jong *et al*. (2006) *JQS* **21,** 905-919. [3] Kylander *et al.* (2005) *EPSL* **240,** 467-485.