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From a climate to man-controlled C budget in a temperate wetland (Las Tablas de Daimiel National Park, Central Spain)

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Las Tablas de Daimiel National Park is a fluvial wetland, located in the Mediterranean area (central Spain), characterized by a noticeable bioaccumulation of C (both organic and inorganic) since more than 3000 years ago. Man is present in the area since Late Pleistocene times, but without a noticeable impact on the system. So, for most of the record, the bioaccumulation of C was controlled by climate as rainfall and temperature ruled the water table level and, therefore, the available space for sediment accumulation and the relation between the aquatic and the paludal vegetation. But, for the last millennium, man-induced changes on land use and on the vegetal cover have increased substantially and, for this period, it is possible to follow the transition from a natural (climate) dominated system to a pure anthropogenic system and the changes induced in the C budget of the area. For the climate-controlled period (up to the second half of the 19th century AD), short aridity pulses are recorded as a decrease in the accumulation of inorganic C, as the water table shallows and retreats, while organic C increases, as result of the expansion of the paludal fringe. But, for decadal to centennial scale, increased aridity is recorded as an increase in the background of inorganic C while organic C upper limit drops as consequence of higher tolerance to salinity changes of the aquatic taxa. During this period, man action is restricted to occasional changes in the grazing lands or punctual fires that do not affect noticeably the C budget. However, spreading of farming against livestock (late 19th century) and introduction of machinery and irrigation (second half of the 20th century) caused the rupture of the hydrological cycle and, consequently, the previous relations between the elements of the C-cycle were broken. Accordingly to these arguments, we identify three periods for the last millennium: 10th-13th century AD: warm and wet stable conditions. It is the period with less total-C stored per unit area but, probably, the accumulation area was the greatest. 14th-late 19th century AD: very fluctuating climate, alternation of droughts and floods but with a trend to aridity, chiller temperatures and cooling trend. Instantaneous C values reach their maxima but a decreasing trend is recorded during this period as result of the degradation of the emergent vegetation. In addition, the flooded area reduced. Late 19th-present: man action is too intense to derive a relation between climate and environmental changes. Changes in C storage are related to man-induced fluctuations of the water table and alterations of the vegetal cover. The flooded area almost disappears. Acknowledgements This research is supported by the Spanish Ministry of Science and Education (MEC) projects REN2002-04433-CO2 and CGL2005-06458-CO2-01/HID.