Geophysical Research Abstracts
Vol. 16, EGU2014-8034, 2014
EGU General Assembly 2014
© Author(s) 2014. CC Attribution 3.0 License.

Catchment sediment flux: a lake sediment perspective on the onset of the Anthropocene?

Richard Chiverrell

University of Liverpool, Environmental Sciences, Geography, Liverpool, United Kingdom (rchiv@liv.ac.uk, +44 (0) 151 7942866)

Definitions of the Anthropocene are varied but from a geomorphological perspective broadly can be described as the interval of recent Earth history during which 'humans have had an 'overwhelming' effect on the Earth system' (Brown et al., 2013). Identifying the switch to a human-dominated geomorphic process regime is actually a challenging process, with in the 'Old World' ramping up of human populations and impacts on earth surface processes since the Neolithic/Mesolithic transition and the onset of agriculture. In the terrestrial realm lakes offer a unique window on changes in human forcing of earth surface processes from a sedimentary flux perspective, because unlike alluvial and hill-slope systems sedimentation is broadly continuous and uninterrupted. Dearing and Jones (2003) showed for a global dataset of lakes a 5-10 fold increase in sediment delivery comparing pre- and post-anthropogenic disturbance.

Here sediment records from several lakes in lowland agricultural landscapes are presented to examine the changes in the flux and composition of materials delivered from their catchments. By definition the lakes record the switch to a human dominated system, but not necessary in accelerated sediment accumulation rates with changes in sediment composition equally important. Data from Crose, Hatch and Peckforton Meres, in lowland northwest England are interrogated producing quantitative land-cover reconstructions from pollen spectra calculated using the REVEALS model (Sugita, 2007), geochemical evidence for changes sediment provenance and flux, and 14C and stable Pb pollutant based chronological models detecting changes in sediment accumulation rate.

The lake sediment geochemistry points to several phases of heightened human impact within these small agricultural catchments. Following small-in-scale forest cover reductions and limited impacts in terms of sediment flux during the Neolithic, the Bronze to Iron Age saw the first substantial reductions in forest cover and widespread expansions of agriculture. In some cases the catchment responses, for example here detected via dry mass Zr concentrations, were substantial and outstrip later impacts driven by more intensive agriculture e.g. early Medieval, Norman Conquest and 19th century AD. These themes are developed in relation to the concept of an Anthropocene and wider European lake sediment record.

References

Brown AG, Tooth S, Chiverrell RC, Rose J, Thomas DSG, Wainwright J, Bullard JE, Thorndycraft VR, Aalto R, Downs P. 2013. The Anthropocene: is there a geomorphological case? Earth Surface Processes and Landforms 38: 431–434.

Dearing JA, Jones RT. 2003. Coupling temporal and spatial dimensions of global sediment flux through lake and marine sediment records. Global and Planetary Change 39: 147–168.

Sugita S. 2007. Theory of quantitative reconstruction of vegetation I: pollen from large sites REVEALS regional vegetation composition. Holocene 17, 2: 229-241.