

## **Dating the beginning period of regional intensive human activities in the northeast China: implication for ecosystem recovery and anthropocene identify**

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Anthropocene has been proposed as a new geological epoch, in which human activities have modified or even destroyed the nature ecosystem. Ecosystem recovery needs nature ecosystem without anthropogenic influence as the baseline condition. Dating the beginning period of regional intensive human activities is important for identifying the starting time of Anthropocene, also helpful for researchers found the baseline condition for ecosystem recovery. However, scarce studies have focused on revealing the regional beginning period through sedimentary archives. To address this knowledge gap, wetlands sedimentary archives in Sanjiang Plain (Northeast of China) were chosen to identify the beginning period of regional intensive human activities (starting time of Anthropocene). Combustion sources and emission intensities reconstructed via polycyclic aromatic hydrocarbons (PAHs), charcoal and black carbon (BC), and pollution indexes reconstructed via trace elements were analyzed in four wetland profiles in Sanjiang Plain. Combine <sup>14</sup>C age-depth model and previous sedimentary and archaeological studies in surrounding regions, we try to dating the beginning period of intensive anthropogenic influence on wetland ecosystem in northeast China.

The results showed that pollution indexes revealed by trace elements were fluctuated widely and increased after 1000 cal yr BP, which indicate the intensity of human activities were fluctuation and increased around 1000 cal yr BP in Sanjiang Plain. In eastern of Sanjiang Plain, combustion emissions influenced by human activities and increased obviously were started at around 1200 cal yr BP. In summary, before 1200 cal yr BP, human activities were minor, such that the wetland ecosystem in the Sanjiang Plain before this period acted as a baseline condition for wetland recovery. After 1200 cal yr BP, as the human population increased, the wetland ecosystem was gradually influenced by human activities, and 1200 cal yr BP could be regarded as the starting time of Anthropocene in northeast China.