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The initiation and depositional process of the lake sediments in Lake Tonle Sap, Cambodia

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Lake Tonle Sap is a part of the Mekong River Basin. In dry seasons, water flows from the lake through River Tonle Sap River into R. Mekong. Whereas, in rainy seasons floodwater from R. Mekong enters back into the lake.

Paleolimnological studies have revealed that the beginning of the lake formation and the phenomenon of the water reversal can be traced back to the early Holocene (Penny et al., 2005, Penny 2006, Day et al., 2010). However, the low sedimentation rate from the middle to early Holocene suggests that there could be a hiatus in cored sediments.. In addition, no firm evidence has been provided as to whether to the bottom of cored sediments are the actual basement. To overcome these issues, we collected a 14-m long sediment core from the deepest part of the buried valley in the lake, where we observed the lake bed configuration using seismic records.

From the sedimentological analyses, we attempted to reconstruct the onset and subsequent process of sedimentation in Lake Tonle Sap.

Radiocarbon dating was undertaken for organic remains from the core. The onset of the lake environment in the Mekong basin was estimated to be ca. 11,000 cal yrBP, suggesting that the age of the lake formation may precede 2,000 to 3,000 years to those mentioned in the previous studies.

Sequential CNS records at an interval of 1 to 5 cm (n = 406) were obtained to clarify the temporal changes in depositional process of the lake. Our results suggested that five stages are identified as below:

Stage 1 (Depth 14.0-13.2 m): ave. 1 wt% of TOC (total organic carbon) contents and 10-20 of C/N ratio represent the transition between fluvial and lacustrine environments.

Stage 2 (13.2-8.1 m): ave. 2 wt% of TOC, 9-10 of C/N ratio and ave. 80 of C/S ratio represents a closed lake environment in which the valley was gradually filled with fine materials from surrounding.

Stage 3 (8.1-3.3 m): ave. 1 wt% of TOC, 5-6 of C/N ratio and ave. 35 of C/S ratio represents a moderately stable closed lake environment with an increment of lake productivity.

Stage 4 (3.3-0.6 m): 2-4 wt% of TOC, 11 of C/N ratio and ave. 0.15 wt% of TS (total sulfur) contents represents a closed lake environment with a seasonal fluctuation.

Stage 5 (0.6-0.0 m): ave. 1 wt% of TOC, 5-6 of C/N ratio and ave. 35 of C/S ratio represents the modern lake environment.

Keywords: Lake Tonle Sap, buried valley, sediment core, CNS element analysis, magnetic susceptibility, Holocene