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Kashiwaya Kenji: GEOMORPHOLOGY OF LAKE-CATCHMENT SYSTEM. A NEW PERSPECTIVE FROM LIMNOGEOMORPHOLOGY. *Singapore, Springer Nature, 2017, 139 pp. ISBN 978-981-10-5109-8.*

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REVIEW REPORT

In the year before last a remarkable book publication, dealing with lake-catchment systems as a tool to evaluate earth-surface changes, appeared. It will undoubtedly attract the attention of specialist in both dynamic and historical geomorphology as it is trying to contribute to uncovering the "missing link" between these disciplines. Its author is a distinguished, internationally well known geomorphologist of the Institute of Nature and Environmental Technology, Kanazawa University, Japan.

According to the author, geomorphology of lake-catchment systems (or limnogeomorphology) aims to contribute to both postdiction and prediction of landform changes. Understanding of recent processes and available quantitative data have to be extended to historical and geological timescales. On the other side, the same information is required also for estimation of future landform evolution. The lake-catchment systems are convenient for observing earth-surface changes both instrumentally and historically-geologically. If appropriate relationships between instrumental and lacustrine (proxy) data are established for the present observation interval, proxy data for the past may be available as quasi-instrumental ones. In the case of logical connection of both groups of data, it would be possible to obtain long continuous dataset for the past climate-environmental changes. Thus, the lake-catchment systems may be considered as proxy observatories.

The book consists of nine mutually complementing chapters. The introductory one refers to the fact that though studies on earth-surface processes (process/dynamic geomorphology) and on landform development (historical geomorphology) are inseparably connected in the field of geomorphology, they are often studied independently. According to the author, limnogeomorphology offers one of possibilities to combine smoothly both mentioned geomorphological branches.

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In the 2nd chapter, considering the temporal and spatial development of drainage systems and continuous records of various climatic regimes at various scales, the following questions are discussed: (1) the fractal structure of the drainage system in a catchment, and (2) the compatibility of drainage systems in various zones. Drainage system as a dominant structure of catchments is related to erosion and sedimentation. The author refers to prevailing fractal structure (self-similarity) of drainage systems. Additionally, a model of temporal development of drainage systems is introduced, that was verified for two areas by ergodic reasoning.

The 3rd chapter is dedicated to an assessment of the influence of external (climato-geomorphic) forces on lake-catchment systems. Consequences of long-term external forces are discussed on examples of Lake Biwa (Japan) and Lake Baikal (Russia) systems. Historical short-term external forces are examined using Lake Yogo (Japan) and Lake Biwa systems, and instrumental observations of short-term external forces are checked on the example of the pond Kawauso-ike (Kobe, Japan). Abrupt, the most drastic changes, are discussed on the example of the Darkhad lake-catchment system in Mongolia.

The 4th chapter evaluates the influence of internal (tectono-geomorphic) forces. Historical and long-term tectono (seismo)-geomorphic forces are discussed on examples of Lake Biwa and Lake Baikal systems. Modern activities of these forces are checked for three lake-catchment systems in Yunnan (China) and Kawauso-ike. Both historical and modern tectono (volcano)-geomorphic activities are studied using Lake Onuma system in Hokkaido and Lake Taisho-ike system (central Japan).

The effect of anthropogenic forces on lake-catchment systems is discussed in the 5th chapter, namely in the form of silting of both historical and modern reservoirs. As examples the author uses historical reservoirs Pyeokgolje and Euirimji in Korea and modern reservoir of Riyuetan Power Plant station in Taiwan. He also analyses anthropogenic influences on sedimentation in some above mentioned Japan lakes (Yogo, Kawauso-ike, Onuma).

Two experimental models are introduced in the 6th chapter. The first, erosion-sedimentation one, is based on field observations in Kawauso-ike system. This model assumes that the sedimentation in ponds is mainly related to three factors: the catchment conditions under which the sediment material is produced, the erosional conditions and the internal pond conditions. The second, process-oriented model, is based on some elementary processes in three lake-catchment systems in Japan and Korea showing similar climatic conditions. The idea that the seasonal sedimentation rate is a power function of seasonal rainfall intensity in the system is basically approved.

The 7th chapter refers to the necessity of quantitative expression of temporal changes in physical phenomena to understand lake-catchment processes. The

author introduces a mathematical model of temporal changes in the Kawauso-ike system observed in the course of 10 years after the 1995 Kobe earthquake. Three stages are assumed for establishing the model: (1) rapid increase and gradual decrease in the sedimentation rate, (2) stationary stage, and (3) new weathering-limited stage, similar to that before the earthquake.

The 8th chapter is dealing with the possibility to use mathematical models for proper understanding of causal relations in lake-catchment systems based on lake sediment information. Models established emerge from simplified imaginary ideas and they are phenomenological ones in the outlined form. Two cases (small/no or large glacier effect) of such models are formulated, considering data given by Lake Baikal and Lake Biwa with small/no effect and Lake Khuvsgul (Mongolia) with large effect. The research showed that sediment discharge may be significantly influenced by glaciers.

In the last chapter the author discusses in general the position of solar activity in terms of external forcing and, especially, looks for (and finds) the relationship between the Milankovič forcing, long-term climatic changes and related landform changes. A comparison of responses to long-term external forcing (Milankovič cycles), recorded in lacustrine sediments of Lake Baikal and Lake Biwa, has shown divergences influenced by different environmental conditions.

The reviewed book represents a significant contribution in the field of limnogeomorphology. The author evaluates the influence of external, internal and anthropogenic forces on lake-catchment systems. A common denominator of his investigation of numerous lakes in the eastern Asia is the use of lacustrine sediments in the assessment of their catchment evolution. The author discusses actual knowledge in study of lake-catchment systems, brings new results and outlines future trajectories of limnogeomorphological investigation. I should like to congratulate prof. Kenji Kashiwaya, the sincere friend of Slovakia, for publishing such valuable scientific work.