Geophysical Research Abstracts
Vol. 21, EGU2019-6082, 2019
EGU General Assembly 2019

Lake classification revisited: scaling of lake seasonal stratification

Georgiy Kirillin and Tom Shatwell
Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Ecohydrology, Berlin, Germany (kirillin@igb-berlin.de)

Hutchinson and Löffler's (1956) classification of lakes based on the seasonal thermal mixing regime has become a cornerstone of any analysis of lakes as elements of the earth surface. Until now however the lake classification has lacked a physically sound quantitative criterion distinguishing between two fundamental lake types: thermally stratified during a large portion of the year (mono- and dimictic) and predominantly mixed to the bottom (polymictic). Using the mechanistic balance between potential and kinetic energy we derived a generalized scaling for seasonal stratification in a closed lake basin. The scaling parameter is the critical mean basin depth, Hcrit, that delineates lakes that mix regularly from those that stratify seasonally based on lake water transparency, lake length, and an annual mean estimate for the Monin-Obukhov length. The scaling criterion consistently describes the mixing regime significantly better than either the conventional unbounded basin scaling or a simple depth threshold. Thus, the generalized scaling is universal for freshwater lakes and allows the seasonal mixing regime to be estimated without numerically solving the heat transport equations.