New Dynamic Classification of Lake Systems and Their Geological Records Paul E. Olsen (LDEO, Palisades, NY: polsen@LDEO.columbia.edu)



Figure 3C

I propose a classification of lakes and their records based on three variables (**Fig. 1**, left):

For illustrative purposes I have depicted AWB as a precession-related signal representing water input into the lake basin (with **mpv** being a time of maxiuum precessional variability), but it could have any form or not vary at all. If AWB = 0, this system yields the classification of Carroll & Bohacs (1999) lake types (1): "overfilled", with PMD > MLD; "balanced fill", with PMD = MLD; and "underfilled", with PMD < MLD (**Fig. 2**,

However, AWB $\neq 0$ in general, but fluctuates in frequency and amplitude, leading to a huge range of lake behavior and sediment sequence types, some examples of which are shown below. The first 3 examples are of early Mesozoic age and illustrate the classification with the three styles of sequences seen in the rifts of Eastern North America (Olsen, 1990). Applications to a modern lake (Malawi) and the Eocene Green River Fm. show the versatility of the method. This method has some similarities to that of Keighley et al. (2003).



'igure **3**B

151 - 18







Figure 5: Newark-type sequences: A, (above-right relationship between variables; **B**, \sim 6 m thick cycles (black to black) tracking climatic precession in the Late Triassic, lower Lockatong Fm, Newark basin, PA; C, ~11 m cycles, (black to black layers, tracking precession), Early Jurassic East Berlin Fm., Hartford basin, CT. Black layers are organic-rich and microlaminated with whole fish.



C, (left-bottom) sand patch cycles, also from the Fundy basin.





Figure 7B

- MLD, maximum lake depth from floor to outlet.
- **PMD**, potential mean depth of the lake relative to MLD unconstrained by the outlet or lake
- floor; **AWB**, amplitude of water balance variability deviating from PMD

Figure 2: Lake types of Carroll & Bohacs (1999) in terms of new classification (see left).

dif-ferent synthetic stratigraphies. Which is a better fit to reality?

PMD = MLD = outlet

PMD < MLD

My Thanks to Malka Machlus for Fig. 9E and Mohammed Et-Touhami for Fig. 4(right).