COMMENTS ON THE NATURE OF PERSISTENCE IN DENDROCHRONOLOGIC RECORDS WITH IMPLICATIONS FOR HYDROLOGY AND CLIMATOLOGY

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ABSTRACT

Jurate Landwehr discussed the use of surrogate hydrologic records, specifically dendrochronologic records, to study the nature of persistence which is characteristic of hydrologic phenomenon. These proxy records are generally considered to correspond to such hydrologic measures as mean annual discharge but are much longer in length than directly measured hydrologic records. Consequently, they allow one to explore questions pertaining to the structure of candidate stochastic processes with greater validity than permitted by the latter. In the course of this work, (done in collaboration with N. C. Matalas) a finite-memory stationary process which arose naturally from physical concepts, reflecting both macro- (e.g. climatic) and micro- (e.g. local physiographic) conditions and persistence, was developed. It was shown that this class of finite memory processes could account more satisfactorily for the persistence seen in dendrochronological records than other models suggested here-to-fore, in particular the infinite memory stationary process suggested by Mandelbrot. A second point of discussion was the concept of trend. Noting that LaMarche et al. (Science, 1985) have suggested that the increase in ring widths observed for three Western U.S. dendrochronologic records since 1800 might be interpreted as a trend corresponding to increasing amounts of atmospheric CO_2, Landwehr discussed this observation within the context of the entire record available at one of the sites. She pointed out that if "trend" is interpreted to just be a period during which the parameter of interest has a positive correlation with time, then there are at least two other periods in the entire record for which the slope of the least square line is as large as that for the period following 1850 and for which and explanation in terms of increasing CO_2 from anthropogenic sources as suggested for the current period would be inappropriate. Indeed, the fitting of least square lines to the record over periods of climatologic significance suggests that the ring width increases during the current period accord with a cycle or rebound following the termination of the mini-ice age, ending 1850.