Comparison of varve preservation and characteristics between remote and urban lakes in Finland

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The occurrence of varved sediments in Finnish lakes is known to be dependent on certain features, such as morphometry of the lake and its catchment. However, varve preservation triggered by recent hypoxia has been observed in Finnish lakes of which sediments are not naturally laminated. In these lakes human-induced eutrophication and hypoxia might have been the major factor triggering varve preservation.

Here we compare varve preservation, varve characteristics, and varve qualities between one remote and naturally laminated (Lake Lehmilampi in Eastern Finland) and two lakes close to urban areas (Lake Vesijärvi in Southern Finland and Lake Kallavesi in Eastern Finland) with recent start of varve preservation.

Surplus of organic matter leading to hypoxia seems to have triggered the start of varve preservation in Lake Vesijärvi and possibly in Lake Kallavesi in the 20th century. In these two lakes several varve microfacieses were identified representing human-induced changes in the catchment. In the remote Lake Lehmilampi sedimentation rate is lower compared to the two urban lakes and the number of identified microfacieses is lower. The results suggest that in these three lakes varve characteristics, varve quality, and the cause of varve preservation as well as the continuity of varve preservation differ between lakes as a result of regional and local factors. In Lake Lehmilampi varve preservation seems to be dependent on lake and catchment morphometry as well as climate, whereas in Lake Vesijärvi and Lake Kallavesi varve preservation mainly seems to
be dependent on anthropogenic factors. For instance, in Lake Vesijärvi rehabilitation actions seem to have affected varve preservation turning the sediment non-laminated. Furthermore, varve characteristics and quality seem to be sensitive to climate in Lake Lehmilampi, whereas in Lake Vesijärvi and Lake Kallavesi they correspond to anthropogenic changes.

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