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Seasonal fluxes of particles and nutrients in mono-*pagotic*[*)] lakes of Northern Scandinavia and the Alps

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Since three years particle dynamics are studied in two different lakes, one of them in northern Sweden, the other in the Swiss Alps (table 1). Small, peri-glacial Nylandsjøn in Northern Sweden is situated at an altitude of 34 m a.s.l. within a mostly forested catchment. Pro-glacial, mountainous Lej da Silvaplauna in the Swiss Alps is located at the timberline at 1790 m a.s.l. and is dominated by seasonal clastic input of a glacier-fed tributary. Settings and character of the two lakes could not be more different, but Nylandsjøn and Lej da Silvaplauna have in common that both are mono-*pagotic*[*)] lakes: regularly, each winter the lakes are ice-covered continuously for a period of about 4-6 months followed by a continuous ice-free period for the rest of the year.

In order to investigate dynamics of particles formation and behavior during periods of ice-cover and during ice-free periods instrumental moorings have been deployed in both lakes since 2002. The moorings contain sets of different sediment traps. Integrating traps (EAWAG-130) are used to determine total annual fluxes throughout the year. Automated, sequencing traps (TECHNICAP®) are used to identify short-term seasonal fluxes under the ice and within ice-free periods.

Current results of integrating traps show very different average particle fluxes of 436 g $m^{-2}y^{-1}$ in Nylandsjøn (NYL) and 1536 g $m^{-2}y^{-1}$ in Lej da Silvaplauna (SILV), respectively. Also concentrations of C_{org} (NYL: 20.4%; SILV: 5.8%) and concentrations of N_{tot} (NYL: 1.9%; SILV: 0.9%) are distinctly different in the trap material

of the two lakes. Dominance/absence of glacial melt-water and heavy precipitation run-off as well as clear differences in catchment development are responsible for the different flux rates and C_{org}- and N_{tot}-concentrations.

However, results of trap data also point towards striking similarities in particle dynamics of the two lakes.

Firstly, C/N ratios of the organic material are similar in both lakes, showing values of 9 (8 to 11) for material of Nylandsjøn and 8 (5 to 14) for Lej da Silvaplauna. These similarities imply that the organic material in the sediments of both lakes is mainly of algal biomass origin, which is produced during short, warm stages during the ice-free period of the lakes.

Similarities can also be observed in the seasonal dynamics of particle occurrence within the lakes. Both lakes show maximum fluxes at or close to the time, when melting of the ice-cover starts and the lakes become ice-free. These fluxes are triggered by enhanced productivity and by melt-water runoff. Both lakes show additional but less pronounced peaks of particle fluxes, which occur during winter months, just at the time, when ice-formation starts or even, when the lakes are already ice-covered. The mechanisms, which lead to this peaks of 'winter-fluxes' are not yet clear.

*) 'Pagotic' lakes are defined as those that experience ice cover at least once during the year. **'**Monopagotic' lakes have only one uninterrupted period of ice-cover each year and open water during the rest of the year. 'Polypagotic' lakes freeze and thaw several times each year. 'Apagotic' lakes do not freeze over. Derived from the Greekgpagos (ice) andg?????o (icy).

Table 1: Parameters of investigated lakes and sediments

	NYLANDSJØN	LEJ DA SILVAI
lake type	low-land	pro-glacial
length [km]	0.9	3.1
width [km]	0.3	1.4
max. depth [m]	17.5	77
area [km^2]	0.28	2.7
volume [10^6 m^3]	2.6	127
catchment [km^2]	0.95	129
altitude a.s.l. [m]	34	1791
latitude	62˚56.800'N	46˚26.990'N
longitude	18˚17.280'E	9˚47.680'E
pH	7.4	7.8
P_{tot} [μg/l]	20	13
ice cover [month]	6	5
sedimentation rate [mm/y]	3.6	1
trap material C_{org} [%]	20.4	5.8
trap material N_{tot} [%]	1.9	0.9
sediment structure	diatom varves	clastic varves
landscape	hilly, forested (spruce, birch), pastures	mountainous, sp