Supporting Information

Contents:

Table S1: Average fluxes of TOC MAR, TOC gross sedimentation and the corresponding OC burial efficiency based on sediment trap data.

Lake	OC Burial effiency %	TOC MAR at deepest point gC m^{-2} yr^{-1}	benthic gross sedimentation gC m^{-2} yr^{-1}	Monitoring duration, month-year	Sampling interval	ref
Lake Baldegg	43.79	45.62	104.19	4-2013 to 11-2014	2 weeks	Rene Gächter unpublished
Lake Aegeri	77.45	22.77	29.40	3-2014 to 12-2014	2 weeks	
Lake Hallwil	41.59	22.51	54.12	1-2014 to 12-2014	monthly	
Lake Sempach	45.96	28.00	60.92	1-1984 to 12-1992	varying	

Table S2: Characteristics of three eutrophic, one mesotrophic, and two oligotrophic lakes. F_{red} data for Rotsee, Türlersee, Lake Sempach, Lake Murten and Pfäffikersee are from Müller et al. (2012) and F_{red} was calculated for Lake Erie (Adams et al., 1982), Lake Superior (Richardson and Nealson, 1989; Remsen et al., 1989; Klump et al., 1989; Heinen and McManus, 2004; Li et al., 2012), and Lake Baikal (Och et al., 2012). TOC MAR was calculated for all lakes based on literature data: Lake Murten (Müller and Schmid, 2009), Lake Baikal (Och et al., 2012), Lake Sempach (Müller et al., 2012), Rotsee (RO) (Naeher et al., 2012), Pfäffikersee (unpublished data), Türlersee (Matzinger et al., 2008), Lake Erie (Smith and Matisoff, 2008; Matisoff et al., 1977) and Lake Superior (Klump et al., 1989; Li et al., 2012).

Lake	Max. depth (m)	Mean hypolimnion depth zH	F_{red} gO_2 $m^{-2}d^{-1}$	TOC MAR gC m^{-2} yr^{-1}
Rotsee	16	4.2	0.46	172.16
Türlersee	22	7.0	0.44	43.37
Pfäffikersee	35	12.0	0.36	26.20
Lake Murten	48	20.1	0.32	144.81
Lake Sempach	86	38.8	0.21	28.00
Lake Erie	64	n.d	0.04	9.24
Lake Superior	406	125	0.00	4.00
Lake Baikal	1642	688	0.00	6.76

Figure S1: Porewater profiles of NH_4^+, CH_4, Mn(II) and Fe(II) from Lake Zug in the permanent oxic part of the lake at 62 m water depth.

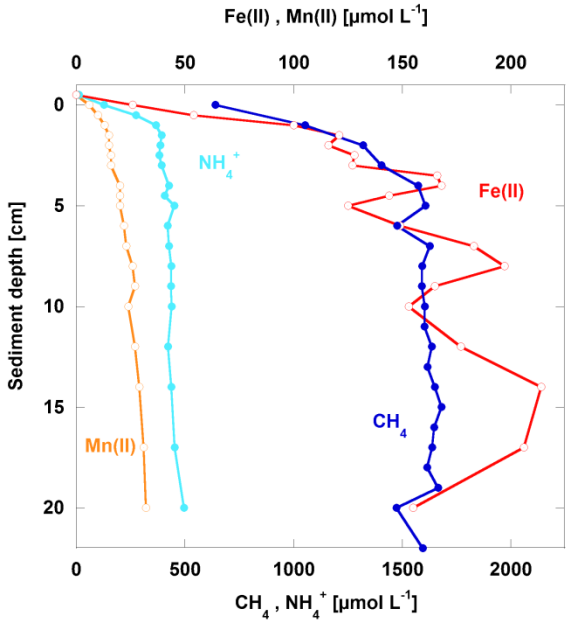
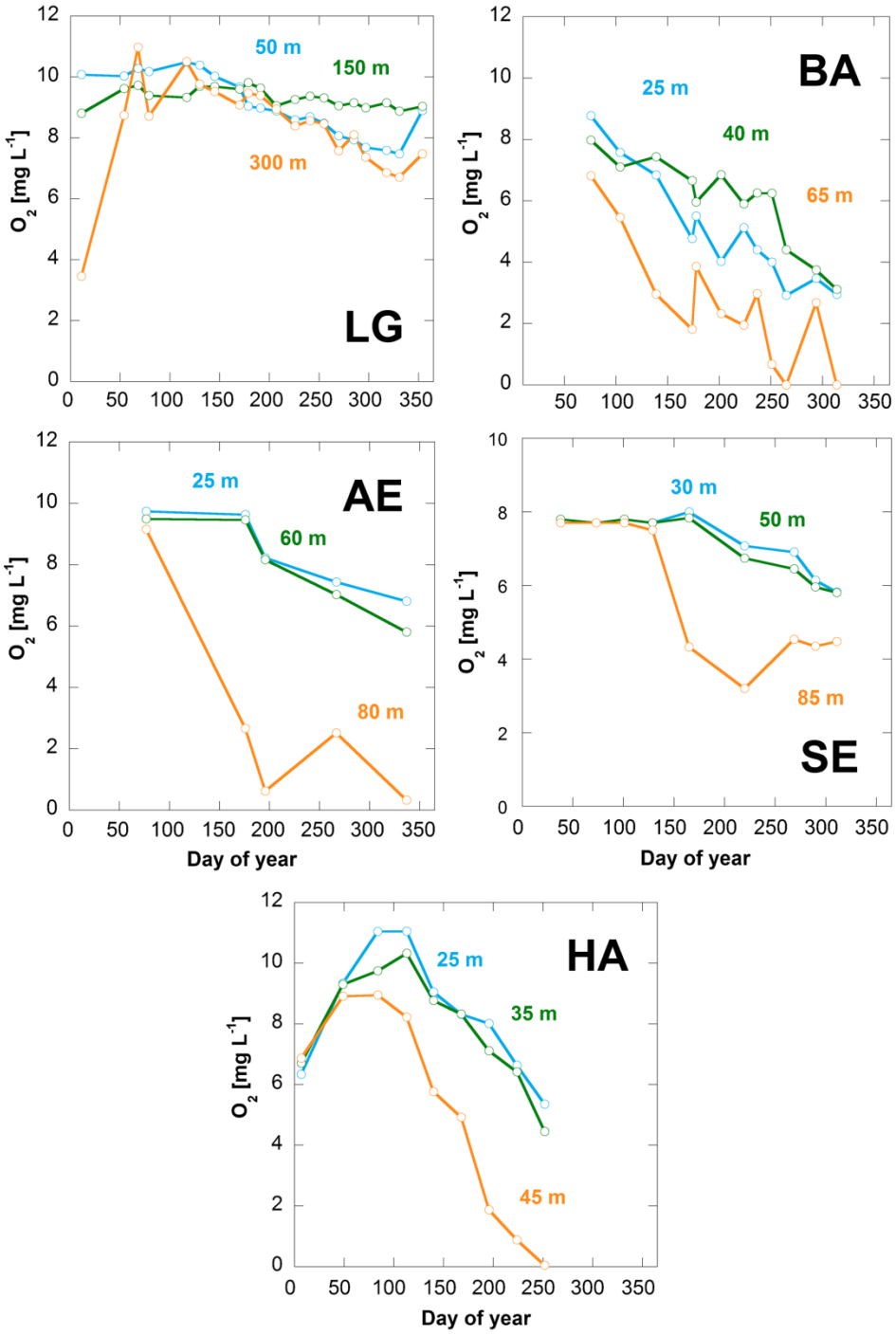


Figure S2: Oxygen concentrations in 5 lakes at distinct water depths during one year. The orange line represents oxygen concentrations at the deepest point of the lake. In Lake Geneva (LG) oxygen concentrations remained high throughout the year, while in Lake Baldegg (BA) and in the deepest layer of Aegerisee (AE) O_2 rapidly declined during the stratified season. Lakes Sempach (SE) and Hallwil (HA), both recovering from eutrophication, showed higher O_2 concentrations than the still eutrophic Lake Baldegg.



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