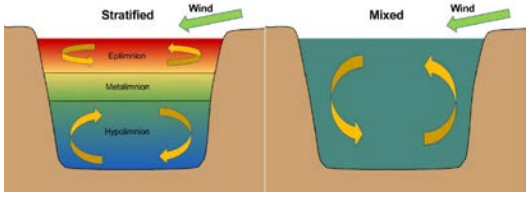
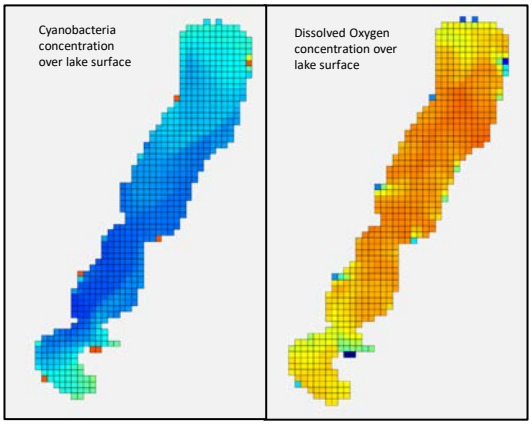
Introduction to Limnology

Lakes and reservoirs are an important part of the aquatic environments, in which physical and biogeochemical processes play a key role. The science of Limnology studies the interaction between many different physical, ecological, biological, and geochemical aspects within these water resources. Furthermore, the direct and indirect effects of climate change endanger the physical and biogeochemical processes and health of inland waters, more of which are still unknown and require more in-deep research.

The lecture “Introduction to Limnology”, which will be taught in English, mainly aims the master’s students of Environmental Science and Technology, but also other fields e.g. Civil Engineering and Ecology and Environmental Planning who would like to extend and deepen their knowledge on theoretical and practical aspects of Limnology, as well as modeling lakes and lake management techniques.

Lecturer: Behnam Zamani (Postdoc at the dept. of Water Quality Science and Engineering; Wasserreinhaltung)





Credits: LP3 (SWS 2)

Summer Semester 2024 (beg. 17.04.)

Wednesdays 14:00-15:30

Location: Room H0111 (Charlottenburg)

Course number: 3313 L 001

For further information please contact:
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Course plan

The lecture includes three main blocks of *physical limnology*, *biogeochemical limnology* and *lakes management*.
After an overview of the main processes within these two blocks, which are connected and overlapping topics are included, modeling of these processes and simple examples will be discussed.

Block	KW	Session contents
Physical	16	Introduction Inland waters in the hydro-system; aquatic systems Importance of lakes; Lakes and reservoirs; Origin of lakes; global distribution of lakes
	17	physical and biogeochemical processes; Hydrology of lakes; lake morphometry; physical properties of water; light penetration and transparency of water and turbidity;
	18	Hydrodynamics mass balance in lakes; steady-state solution; transfer function and residence time; fate and transport (dispersion; diffusion); one dimensional example
	19	Physical limnology thermal processes in lakes; stratification and mixing; stratification theories; thermal classification in lakes; surface waves; internal waves; Schmidt Wedderburn and Lake Numbers;
	20	Density currents; sediment transport; bottom sediments; resuspension;
	21	Hydrodynamic modeling modeling methods; Navier Stokes equation; numerical schemes; 1D modeling example
Biogeochemical	22	Introduction to lake ecosystem; biogeochemical processes and water quality; nutrients cycle, oxygen, contaminants; aquatic life; Zonation of lakes;
	23	Food web phytoplankton, zooplankton, fish; macrophytes; bacteria and pathogens???; primary production; biomass;
	24	Production and loss processes Solar radiation, energy, and dissipation (PAR, extinction etc.); photosynthesis and photosynthetic response, respiration, excretion, mortality
	25	Trophy in lakes trophic state and identification; Nitrogen, nitrification, denitrification, decomposition; Phosphorus; dissolved oxygen, BOD, saturation, anoxia/hypoxia; Lake-Sediment biogeochemistry
	26	Biogeochemical modeling 0D box modeling example, coupling with hydrodynamic models
	27	Water quality modeling process connection of hydrodynamic and water quality modeling, models calibration and validation, modeling technique (performance, computers, resolution etc.)
Lake management	28	Lake and reservoir management uses and functions; bad management; indicators and classification of water quality; watershed methods, in-lake methods, the role of modeling, coping with climate change