Eawag
Überlandstrasse 133
8600 Dübendorf
Switzerland
seminars@eawag.ch
www.eawag.ch

eawag
aquatic research

Eawag Seminar Invitation

Offshore freshened groundwater: State of knowledge and future directions

Speakers **Prof. Aaron Micallef, Department of Geosciences, University of Malta, Malta**

When **September 23, 16.00 – 17.00, CET**

Where **Online via Zoom, contact seminars@eawag.ch for access details.**

Abstract Offshore freshened groundwater (OFG) is water with a total dissolved solid concentration below that of seawater that is stored in sediments and rocks in the sub-seafloor. In this talk I will present: (i) the current understanding of the general characteristics and controlling factors of OFG; (ii) the geophysical, geochemical, and modelling approaches that are used to detect and characterise OFG; (iii) the major knowledge gaps in OFG research and recommendations on how to address these; and (iv) frontier applications that will benefit from an improved understanding of OFG.

OFG has a global volume of 1 million km^3 and predominantly occurs within 50 km of the coast and down to water depths of 100 m. OFG is mainly hosted in siliciclastic aquifers on passive margins and recharged by meteoric water during Pleistocene sea level lowstands. Key factors influencing OFG distribution are topography-driven flow, salinisation by haline convection, permeability contrasts, the continuity/connectivity of permeable and confining strata, and high permeability conduits.

Geochemical and stable isotope measurements of pore waters from boreholes have provided insights into OFG emplacement mechanisms. Recent improvements in marine electromagnetic systems have allowed electrically resistive sub-seafloor freshened groundwater to be resolved. Inversion and interpretation of electromagnetic and seismic reflection data provide important constraints on lithologies, geologic structures and palaeo-environmental evolution. OFG systems have been numerically modelled since the 1980s. Analytical methods, numerical solutions using sharp-interface theory, and finite difference and element methods have provided a cost-effective method for estimating OFG volumes and emplacement.

Key knowledge gaps include the extent and function of OFG, and the timing of its emplacement. These can be addressed by the application of isotopic age tracers, joint inversion of electromagnetic and seismic reflection data, and development of three-dimensional hydrological models. Such advances, combined with site-specific modelling, are necessary to address frontier applications of OFG, such as its potential use an unconventional source of water and its role in sub-seafloor geomicrobiology.