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Verfügbar unter/Available at: <https://hdl.handle.net/20.500.11970/104273>

Vorgeschlagene Zitierweise/Suggested citation:

Durand, Nathalie; Pham, Chi-Tuan; Gineau, Audrey; Lorrain, Nicolas (2014): “Heat exchange with atmosphere” module in TELEMAC-3D. In: Bertrand, Olivier; Coulet, Christophe (Hg.): Proceedings of the 21st TELEMAC-MASCARET User Conference 2014, 15th-17th October 2014, Grenoble – France. Echirolles: ARTELIA Eau & Environnement. S. 199-199.

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“Heat exchange with atmosphere” module in TELEMAC-3D

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Abstract:

A good knowledge of the spatial and temporal evolution of water temperature is crucial to model biogeochemical processes. TELEMAC-3D software enables to model the advection-diffusion of temperature. Temperature is strongly influenced by heat exchange between water and atmosphere. An accurate modelling of such phenomena is thus necessary.

Modelling of heat exchange between water and atmosphere in TELEMAC-3D can be done with a linearised formula of heat fluxes balance at the free surface. To improve the modelling of heat exchange with atmosphere, a module that calculates the complete balance of exchanged fluxes has been developed. It calculates the solar radiation, the atmospheric radiation, the water radiation, the sensible heat and the latent heat and takes into account the solar radiation penetration in the water column.

This module has been validated and sensibility analyses have been carried out. Two cases have been treated: the modelling of a schematic case that is compared to a solution from a 0D thermal model used for lacustrine modelling and the modelling of a real lake that is compared with in situ measurements.