ADAPTING P-k-C\* MODEL IN MEDITERRANEAN CLIMATE FOR ORGANIC REMOVAL PERFORMANCE IN HORIZONTAL CONSTRUCTED WETLANDS

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**Keywords: horizontal constructed wetland, P-k-C\* model, semi-arid climate**

**Abstract.** The P-k-C\* is considered as the most suitable in modeling constructed wetland (CW) performance (IWA, 2017), providing a good compromise between accuracy and computational simplicity to assess the degradation processes for selected pollutants (Dotro et al., 2017). The kA indicates the treatment process rate and is related to water temperature through the Arrhenius theta factor (θ) (Kadlec and Wallace, 2009). There is a need to test the model in different climate conditions due to its high sensitivity to temperature. This, in fact, could deepen the knowledge on model application. This study aims at demonstrating the applicability of P-k-C\* model to describe the response of horizontal CWs (H-CWs) for domestic and agro-industrial wastewater treatment, and evaluating key design parameters for the model optimization in Mediterranean semi-arid conditions. In particular, kA20 (m year-1) and θ values were assessed in two H-CWs in Eastern Sicily, characterized by different organic loads and hydraulic and design features. The model was evaluated for simulating BOD5 and COD effluent concentrations at the outlet of the H-CW units. Calibration parameters, kA20 and θ, were found by summing and minimizing the squared differences between measured and modeled data, obtained by simultaneous adjustment of kA20 and θ for all samples (15<n<30). The coefficient of determination, R2, the Nash–Sutcliffe efficiency, NSE, and the root mean square error, RMSE, were used as statistical performance measures for the model. Results showed a good reliability of the model to describe water quality response in terms of BOD5 and COD effluent concentrations. In particular, the performance got worse when the influent and effluent concentrations did not differ a lot and when the flow was lower than the designed one. Moreover, generally the model overestimated the smallest effluent concentrations and underestimated those highest. Most important finding was that a θ<1 should be used from practitioners to optimize H-CW design in Mediterranean conditions.