

# Prediction of water temperature in a Spanish small river

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## Introduction

The goal of this research was develop three Artificial Neural Networks (ANNs) to determine Maximum, Average and Minimum water temperature in a small river in the Northwest of Spain (Galicia). Water temperature has a very important effect over river ecology, amount of oxygen dissolved, photosynthesis or metabolic rates [1-4]. ANNs are a complete mathematical tool for data analysis to characterize relationship between input and output data [5,6].

The studied river drain, a small basin of 10.7 ha located in Abegondo, its characteristics have been described in previous work [1,7]. Data available between year 1997 and year 2008 were used. Years 1997 to 2006 were used to train the models, and years 2007-2008 were used to validate the different models implemented [1]. We collected seven variables, four variables were used as input variables: i) Julian day, ii) Maximum, iii) Average, and iv) Minimum air temperature. Maximum, Average and Minimum water temperature, were used as output variables [1].

Table 1. Adjustment for Training (T) and Validation (V) phases. Table modified from Araujo et al. 2011a.

Output	R <sub>T</sub>	R <sub>V</sub>	RMSE <sub>V</sub> / °C
Water T <sub>min</sub>	0.87	0.91	0.83
Water T <sub>max</sub>	0.82	0.90	0.75
Water T <sub>average</sub>	0.90	0.94	0.48

ANNs developed present a low RMSE in validation phase, between 0.48 and 0.83 °C (Table 1). Likewise, all models present an R upper than 0.90.

## Conclusion

Taking into account the different models implemented and the results obtained we can say that ANNs can be a useful tool to evaluate the impact of climate change on river water temperatures (Araujo et al., 2011a). We recommended improve the models with more years to get a greater prediction power.

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