PREDICTING SO_2 POLLUTION INCIDENTS IN THE VICINITY OF A COAL-FIRE POWER STATION USING GENERALIZED ADITIVE MODELS AND BOOTSTRAPPING

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ABSTRACT

The aim of this paper is to predict time series of SO_2 concentrations emitted by coal-fire stations in order to estimate, one hour in advance, emission episodes. An emission episode is said to occur when the series of bi-hourly means of SO_2 is greater than a specific level. For coal-fire power stations is essential to predict emission episodes sufficiently in advance so that they can take the appropriate preventive measures.

We proposed a methodology to predict SO_2 emission episodes based on using a Generalized Additive Model (GAM) with an unknown link function. A nonparametric estimation of the link function was perfomed by using local kernel smoothers. The bandwiths of these smoothers were automatically found by means of cross-validation. Given the high computational cost involved in the process, binning thecniques were used to reduce the computating time. Also bootstrapping was used to estimate the minimum number of terms in the time series requiered to construct the best models.

The proposed methodology was applied to the estimation of SO_2 emission episodes registered in sampling locations near a coal-fire power station located in Northern Spain. The results obtained indicate a good performance of the implemented models and also that only a few terms of the time series are actually necessary to reach the best predictions.

KEYWORDS: pollution incidents; time series, GAM, bootstrapping