عنوان مقاله:

Regression Models and Hybrid Intelligent Systems for Estimating Clear-Sky Downward Longwave Radiation in Equatorial Africa

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خلاصه مقاله:

Modelling downward longwave radiation (DLR) in Equatorial Africa is challenging due to dense cloud cover and data scarcity. In this twofold study, daily cloudless DLR in Ilorin (۸° ۳۲′ N, ۴° ۳۴′ E), Nigeria, was modelled using two atmospheric factors, namely water vapour pressure and air temperature. Firstly, four cloudless DLR models were reformed and tested with others. Secondly, both particle swarm optimization (PSO) and genetic algorithm (GA) were deployed to optimize the adaptive neuro-fuzzy inference system (ANFIS) and artificial neural networks (ANN). The statistical measures used to evaluate the performance of the models were the coefficient of determination (r۲), the mean bias error, and the mean square error (MSE). While restructuring clear skies DLR models typically reduces the estimation errors, it may not necessarily impact r۲ positively. The regression models have r۲ values ranging from approximately ۰.۸۲ to ۰.۸۷, while MSE lies between ۵۶.۶ W/m۲ and ۷۶۷.۵ W/m۲. There are instances where MSE drastically reduces from ۶۹۲.۶ to ۷۲.۳ (W/m۲) and from ۷۶۷.۵ to ۶۶.۲ (W/m۲) after restructuring two different models. A recently developed expression for the region remains the best, possibly because of its format. During the training phase of the computationally intelligent systems, r۲ approximately ranges between ۸۸% and ۹۲% but lies between ۵۵% and ۷۶% during testing. Although reproducibility inclusion in the code can meaningfully improve ANN systems at training, GA optimizes better than PSO. Furthermore, hybrid intelligent systems had higher r۲ values than standalone computationally intelligent modes at the testing phase. Due to the efficient generalization based on r۲ during the testing phase, ANN-GA is viable for modelling cloudless DLR at this site, though ANFIS .has the lowest MSE at this same stage

کلمات کلیدی:

reformed modes, particle swarm optimisation, Genetic Algorithm, Adaptive neuro-fuzzy inference system, Artificial Neural Networks

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