

Application of Convolutional Neural Networks (CNN) for Bias Correction of Satellite Precipitation Products (SPPs) in the Amazon River Basin

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Abstract

The Amazon River basin is one of the largest basins in the world, and its ecosystem is vital for biodiversity, hydrology, and climate regulation. Thus, understanding the hydrometeorological process is essential to the maintenance of the Amazon River basin. However, it is still tricky to monitor the Amazon River basin because of its size and the low density of the monitoring gauge network. To solve those issues, remote sensing products have been largely used. Yet, those products have some limitations. Therefore, this study aims to do bias corrections to improve the accuracy of Satellite Precipitation Products (SPPs) in the Amazon River basin. We use 331 rainfall stations for the observed data and two daily satellite precipitation gridded datasets (CHIRPS, TRMM). Due to the limitation of the observed data, the period of analysis was set from 1st January 1990 to 31st December 2010. The observed data were interpolated to have the same resolution as the SPPs data using the IDW method. For bias correction, we use convolution neural networks (CNN) combined with an autoencoder architecture (ConvAE). To evaluate the bias correction performance, we used some statistical indicators such as NSE, RMSE, and MAD. Hence, those results can increase the quality of precipitation data in the Amazon River basin, improving its monitoring and management.

Keywords: Precipitation bias correction, Machine learning, CHIRPS, TRMM, Amazon River basin

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