Bayesian Spatiotemporal Modeling for Blending in Situ Observations with Satellite Precipitation Estimates

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Abstract

This study has developed a methodology for blending in situ gauge precipitation measurements with satellite precipitation estimates in a region, which uses a Bayesian spatiotemporal model. A fast and simple procedure is proposed for implementing the proposed methodology, which consists of four steps that use kriging, expectation- maximization, and Sampson-Guttorp methods in turn. The evaluation study has confirmed that the use of the new method has helped to improve the quality of the prediction when the available gauge stations are very sparse. For example, for the training sets of size 20, 40, and 70 and the evaluation sets of size more than 850 located in southwestern Canada, the 10 year (1994-2003) root-mean-square errors of the proposed method are respectively 1.278, 1.236, and 1.168. Moreover, the proposed methodology can be easily extended to blend in situ gauge observations with satellite estimates for other types of climate data.