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## Bayesian Spatio-temporal Geostatistics-based Method for Multiple Satellite Products Fusion and Downscaling

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High-level satellite remote sensing products of Earth surface play an irreplaceable role in global climate change, hydrological cycle modeling and water resources management, environment monitoring and assessment. Earth surface high-level remote sensing products released by NASA, ESA and other agencies are routinely derived from any single remote sensor. Due to the cloud contamination and limitations of retrieval algorithms, the remote sensing products derived from single remote sensor are suspected to the incompleteness, low accuracy and less consistency in space and time. Some land surface remote sensing products, such as soil moisture products derived from passive microwave remote sensing data have too coarse spatial resolution to be applied at local scale. Fusion and downscaling is an effective way of improving the quality of satellite remote sensing products.

We developed a Bayesian spatio-temporal geostatistics-based framework for multiple remote sensing products fusion and downscaling. Compared to the existing methods, the presented method has 2 major advantages. The first is that the method was developed in the Bayesian paradigm, so the uncertainties of the multiple remote sensing products being fused or downscaled could be quantified and explicitly expressed in the fusion and downscaling algorithms. The second advantage is that the spatio-temporal autocorrelation is exploited in the fusion approach so that more complete products could be produced by geostatistical estimation.

This method has been applied to the fusion of multiple satellite AOD products, multiple satellite SST products, multiple satellite LST products and downscaling of 25 km spatial resolution soil moisture products. The results were evaluated in both spatio-temporal completeness and accuracy.