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A Bayesian technique for conditioning radar precipitation estimates to rain-gauge measurements

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Abstract. The paper introduces a new technique based upon the use of block-Kriging and of Kalman filtering to combine, optimally in a Bayesian sense, areal precipitation fields estimated from meteorological radar to point measurements of precipitation such as are provided by a network of rain-gauges. The theoretical development is followed by a numerical example, in which an error field with a large bias and a noise to signal ratio of 30% is added to a known random field, to demonstrate the potentiality of the proposed algorithm. The results analysed on a sample of 1000 realisations, show that the final estimates are totally unbiased and the noise variance reduced substantially. Moreover, a case study on the upper Reno river in Italy demonstrates the improvements in rainfall spatial distribution obtainable by means of the proposed radar conditioning technique.

Keywords: Rainfall, meteorological radar, Bayesian technique, block-Kriging, Kalman filtering

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