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Meaningful QQ adjustment of TRMM/GPM daily rainfall estimates.

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In many parts of the world, particularly in Africa, the daily raingauge networks are sparse. It is therefore sensible to use remote sensing estimates of precipitation to fill the gaps, but readily available products like TRMM and it successor GPM are frequently found to be biased. This presentation describes a method of bias adjustment of TRMM using quantile-quantile (QQ) transforms of the probability distributions of TRMM daily rainfall accumulations over its grid of 0.25 degree pixels/blocks. There are 4 main steps in the procedure. The first is to collect the daily gauge readings in those TRMM pixels containing gauges to obtain useful estimates of spatial rainfall for ground referencing. These estimates need to be adjusted from gauge to areal estimates taking the number of gauges in each pixel into account. We found that the distributions of the areal rainfall estimates are influenced by the number of gauges in each block, so we devised a means of transforming point to areal rainfall meaningfully. The second step is to determine the parameters of the probability distributions of the gauge-based block areal rainfall; we found that the Weibull distribution with 2 parameters is a suitable and useful choice. The pairs of Weibull parameters of rainfall on many blocks are correlated. To enable their interpolation, as an intermediate step, they have to be decorrelated using canonical decomposition. These transformed parameter pairs are then separately interpolated to empty blocks over the region of choice. They are then back-transformed at each TRMM pixel to Weibull parameters to provide gauge referenced daily rainfall distributions. The third step is to determine the Weibull distributions of the TRMM daily rainfall estimates in each block, based on their brief 11-year history. The fourth and last step is to QQ transform the individual daily TRMM rainfall estimates via the interpolated gauge-block rainfall distributions. This procedure achieves the desired corrected distribution of the TRMM daily rainfall estimates. These estimates might still be of low to medium quality looking at the individual values, but represent the precipitation variability reasonably well, and can thus be used for design and long term water management purposes.