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- Recent Papers
- Volumes
- Library Search
- Title and Author Search

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Submission

Review

Production

Subscription



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## Intensity-dependent parameterization of elevation effects in precipitation analysis

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**Abstract.** Elevation effects in long-term (monthly to inter-annual) precipitation data have been widely studied and are taken into account in the regionalization of point-like precipitation amounts by using methods like external drift kriging and cokriging. On the daily or hourly time scale, precipitation-elevation gradients are more variable, and difficult to parameterize. For example, application of the annual relative precipitation-elevation gradient to each 12-h sub-period reproduces the annual total, but at the cost of a large root-mean-square error. If the precipitation-elevation gradient is parameterized as a function of precipitation rate, the error can be substantially reduced. It is shown that the form of the parameterization suggested by the observations conforms to what one would expect based on the physics of the orographic precipitation process (the seeder-feeder mechanism). At low precipitation rates, orographic precipitation is "conversion-limited", thus increasing roughly linearly with precipitation rate. At higher rates, orographic precipitation becomes "condensation-limited" thus leading to an additive rather than multiplicative orographic precipitation enhancement. Also it is found that for large elevation differences it becomes increasingly important to take into account those events where the mountain station receives precipitation but the valley station remains dry.

Full Article in PDF (PDF, 592 KB)

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