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## Physical controls on the scale-dependence of ensemble streamflow forecast dispersion

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**Abstract.** The accuracy of ensemble streamflow forecasts (ESFs) is impacted by the propagation of uncertainty associated with quantile precipitation forecasts (QPFs) through the physical processes occurring in the basin. In this study, we consider consistent ESFs (i.e., observed and ensemble members are equally likely) and we study the effect of antecedent rainfall (AR) and basin area ( $A$ ) on the ESF dispersion, a metric of flood forecast skill. Results from a set of numerical experiments indicate that: (i) for small basins ( $\leq 180 \text{ km}^2$ ), ESF dispersion is mainly dominated by the runoff generation process and does not depend on the basin size; (ii) for larger areas, ESF dispersion decreases with  $A$  according to a non-linear relation due to the decreasing variability of ensemble QPFs and, possibly, to the channel routing process. In addition, we found that, regardless the basin size, the ESF dispersion decreases as AR increases and that the influence of AR is larger for basins with fast response time. Physical controls (land cover, soil texture and morphometric features) on the analyzed basin response confirm these interpretations.

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