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Synchronicity and drivers of river flooding

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When rivers flood, surrounding rivers often flood at the same time. When large precipitation events occur, floods do not always occur. Here we explore the drivers and synchronicity of river flooding. Using flood data from thousands of European and US rivers, we demonstrate that the *flood synchrony scale*—the distance over which multiple rivers flood near synchronously—far exceeds the size of individual drainage basins and varies regionally by more than an order of magnitude. Regions of large flood synchrony scales are mostly uncorrelated with regions of large precipitation synchrony scales; across most of Europe and the US few floods are caused by the biggest rainfall peaks. Instead, most floods are caused by the concurrence of heavy precipitation with high antecedent soil moisture. Risk finance, flood forecasting, and interpretations of flood trends can benefit from accounting for what drives flooding and how flood risks extend beyond the borders of individual drainage basins.