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Analysing semi-variograms for floodplains to generate candidates of the true DEM for flood inundation studies

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The SRTM (Shuttle Radar Topography Mission) DEM is widely used as the topographic input to flood models, particularly in data-sparse locations. Yet the spatial error structure is not well understood, making it difficult to constrain the impact of topographic uncertainty on flood inundation. Therefore, we calculate the spatial error structure of vertical heights for the SRTM DEM and recently released SRTM error reduced MERIT DEM (Yamazaki et al., 2017) by comparing to near ground truth LIDAR data for various floodplain locations around the world. As a result, we generate semi-variograms for all these locations, showing that the MERIT DEM is more accurate. In turn, we use these error structures to simulate candidates of true DEM to allow modellers to have a catalogue of DEMs to use in their models, helping to constrain the impact of uncertain topography on the flood hazard. This open source tool will allow modellers to generate plausible DEMs for anywhere in the world based on the calculated semi-variograms. However, the question remains how we can relate semi-variograms for the locations used in this study to other locations around the world. We address this question by analysing whether a synthetic semi-variogram can be used to describe all floodplain locations as well as relating semi-variograms to the physical characteristics of the landscapes they describe.