Geometry of excursion sets: computing the surface area from discretized points

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Abstract. The excursion sets of a smooth random field carries relevant information in its various geometric measures. After an introduction of these geometrical quantities showing how they are related to the parameters of the field, we focus on the problem of discretization. From a computational viewpoint, one never has access to the continuous observation of the excursion set, but rather to observations at discrete points in space. It has been reported that for specific regular lattices of points in dimensions 2 and 3, the usual estimate of the surface area of the excursions remains biased even when the lattice becomes dense in the domain of observation. We show that this limiting bias is invariant to the locations of the observation points and that it only depends on the ambiant dimension. (based on joint works with H. Biermé, R. Cotsakis, E. Di Bernardino and A. Estrade)