Abstract. Let $d \geq 2$ and $n$ be positive integers, and $\lambda > 0$ a real number. Let $V_n$ be a set of $n$ points in the unit ball in $\mathbb{R}^d$ selected uniformly and independently at random. Define $G = G(\lambda, n)$ to be the graph with vertex set $V_n$, in which two vertices are adjacent provided their Euclidean distance is at most $\lambda$. $G$ is an example of a random geometric graph, currently of great interest in modelling properties of wireless ad hoc networks and sensor networks. We compare the random geometric graph to its cousin, the Erdős-Rényi graph, in which each of $\binom{n}{2}$ possible edges is present independently with probability $p \in [0, 1]$.

The threshold for $G$ to be connected is known to be $\lambda \sim \left(\frac{2(d-1)}{d} \frac{\ln n}{n}\right)^{1/d}$. Many problems for networks, such as routing, broadcasting or throughput optimization, require connectivity. However, due to the difficulty of analyzing $G$ in the supercritical region, often results are either not tight or leave a gap above the threshold. Using a blend of stochastic geometry and probabilistic combinatorics, we prove that the graph diameter of $G$ is asymptotically $2/\lambda$ as soon as $G$ is connected. We discuss implications for routing in wireless ad hoc networks.