1084-60-223 **Omer Bobrowski***, omer@math.duke.edu. *How Noise Crackles.*

We study the topology of random Čech complexes with a fixed parameter, generated by $n \to \infty$ iid samples from distributions with unbounded supports in Euclidean space. We observe that there exists a 'core', i.e., a region where the random samples are very dense, so that placing unit balls around the individual points completely covers the region. Consequently, the Čech complex inside the core is contractible. The size of the core obviously grows as $n \to \infty$. Outside the core there may be additional isolated points, but not enough for the associated balls to cover the entire area. Thus, in this region, the topology of the Čech complex is nontrivial, and many holes of different dimensions might show up. We call this phenomenon 'crackling'. In this talk we compare the crackling behavior of three representative distributions - the power law, exponential and Gaussian.

The motivation for this study comes from topological manifold learning problems. The results we present suggest in the presence of noise, increasing the number of samples does not necessarily guarantee increased accuracy of homology recovery.

This is joint work with Robert Adler and Shmuel Weinberger. (Received September 02, 2012)