1146-60-336 **Takashi Owada*** (owada@purdue.edu), Purdue University, Department of Statistics, West Lafayette, IN 47907, and **Andrew Thomas**. *Limit theorems for Process-level Betti numbers for Sparse, Critical, and Poisson regimes.*

The objective of this study is to examine the asymptotic behavior of Betti numbers of Čech complexes treated as stochastic processes and formed from random points in $\mathbb{R}^d$. We consider the case where the points of the Čech complex are generated by a Poisson process with intensity nf for a probability density f. We look at the cases where the behavior of the connectivity radius of Čech complex causes simplices of dimension greater than $k+1$ to vanish in probability, the so-called sparse and Poisson regimes, as well when the connectivity radius is on the order of $n^{-1/d}$, the critical regime. We establish limit theorems in all of the aforementioned regimes, a central limit theorem for the sparse and critical regimes, and a Poisson limit theorem for the Poisson regime. When the connectivity radius of the Čech complex is $o(n^{-1/d})$, i.e., the sparse and Poisson regimes, we can decompose the limiting processes into a time-changed Brownian motion and a time-changed homogeneous Poisson process respectively. In the critical regime, the limiting process is a centered Gaussian process but has much more complicated representation, because the Čech complex becomes highly connected with many topological holes of any dimension. (Received January 26, 2019)