An improved lower bound on the length of the longest cycle in random graphs

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Let $L_{c,n}$ denote the length of the longest cycle of the binomial random graph $G(n,p)$, $p = c/n, c > 1$. Anastos and Frieze proved that $L_{c,n}/n$ converges to a limit a.s. and gave a method for calculating this limit within arbitrary accuracy provided $c \geq 20$. Far less is known though when $c < 20$. At this talk we study $L_{c,n}$ when $c = 1 + \epsilon$, $\epsilon = \epsilon(n)$, with $\epsilon^3 n \to \infty$ and ϵ is bounded above by a sufficiently small constant. We show that in this regime $G(n, c/n)$ has a cycle that spans more than 75% of the vertices of its 2-core. This improves upon the current best lower bound known on $L_{c,n}$ of 66.6..% due to Łuczak.