Surface Superconductivity in the ‘Partial’ Superconductor BaFe$_2$As$_2$\footnote{Work at Florida supported by the US DOE, contract no. DE-FG02-86ER45268 and the NSF REU program, contract no. NSF DMR-0851707.} T. D. BLASIUS, Physics/University of Michigan, J. S. KIM, E. G. KIM, G. R. STEWART, Physics/University of Florida, T. VOJTA, Physics/Missouri University of Science and Technology — The partial superconductivity (resistive transition to $\rho=0$, but no bulk anomalies) in undoped BaFe$_2$As$_2$, as well as in other MFe$_2$As$_2$ compounds, has been a puzzle. Sample dependence plays a large role in the superconductivity, and hints have been found for a sensitivity of the surface to exposure to air. Based on a fairly reliable ability to produce such superconducting samples (with a yield of $\sim 50\%$), and the clue from a previous work \cite{Kim2009} that the critical current of the superconductivity is abnormally low, we show here that the superconductivity is a 2-dimensional affect — presumably on the surface. \cite{Kim2009} J. S. Kim, et al., J. Phys.: Condens. Matter \textbf{21}, 342201 (2009).