Comparison of Navier-Stokes solution and lubrication approximation: dewetting of nanoscale liquid rings SHAHRIAR AFKHAMI, LOU KONDIC, NJIT, JAVIER A. DIEZ, Universidad Nacional del Centro de la Provincia de Buenos Aires — We present a combined computational and asymptotic approach to study evolution of liquid rings on partially wetting solids. The work is motivated by recent experiments involving the self-assembly of nanolithographically patterned metal rings into ordered nanoparticle arrays via nanosecond pulsed laser heating above the melt threshold (Langmuir 2010, 26, 11972). Three-dimensional numerical simulations of Navies-Stokes equations are compared with a hydrodynamic model based on lubrication approximation for the dynamics and shape of liquid rings. Good agreement is found for contact angles smaller than approximately 35 degrees. The results are encouraging from two viewpoints: a simple hydrodynamic model can capture the main features of the processes under small slope conditions, and offer the possibilities of further developments of computational approaches for modeling fluid dynamics on nanoscale.

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