1063-76-162 **Hui Sun*** (huiprobable@math.ucla.edu), UCLA Math Department, CA 90095, **David Uminsky**, UCLA, Mathematics Department, Los Angeles, CA 90095, and **Andrea Bertozzi**, UCLA Mathematics Department, Los Angeles, CA 90095. *A generalized Birkhoff-Rott equation for the 2D active scalar problems.*

In this talk we derive new evolution equations for the active scalar problem in 2D for the case when all scalars lie on a 1D curve, analogous to the Birkhoff-Rott equation for 2D vorticity. The new equations are Lagrangian and valid for nonlocal kernels K that may include both a gradient and an incompressible term. We develop a numerical method for implementing the model which achieves second order convergence in space and fourth order in time. We simulate classic active scalar problems such as the vortex sheet problem (in the case of purely incompressible flow) and the collapse of delta ring solutions (in the case of pure aggregation) and find excellent agreement. We also include news examples that contain both incompressible and gradient flows. (Received August 15, 2010)