1112-35-364 **Alexander Kiselev**, **Lenya Ryzhik**, **Yao Yao** and **Andrej Zlatos*** (az@math.wisc.edu).
Finite time blow-up for the α-patch model.

The global regularity vs finite time blow-up question remains open for many fundamental equations of fluid dynamics. In two dimensions, the solutions to the incompressible Euler equation have been known to be globally regular since the 1930s. On the other hand, this question has not yet been resolved for the less regular (by one derivative) surface quasi-geostrophic (SQG) equation. The latter state of affairs is also true for a natural family of PDE which interpolate between these two equations. They involve a parameter α, which appears as a power in the kernel of their Biot-Savart laws and describes the degree of regularity of the equation, with the values $\alpha = 0$ and $\alpha = \frac{1}{2}$ corresponding to the Euler and SQG cases, respectively.

In this talk I will present two results about the patch dynamics version of these equations in the half-plane. The first is global-in-time regularity for the Euler patch model, even if the patches initially touch the boundary of the half-plane. The second is local regularity and existence of solutions which blow up in finite time for the α-patch model with any small enough $\alpha > 0$. The latter appears to be the first rigorous proof of finite time blow-up in this type of fluid dynamics models. (Received August 09, 2015)