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Jiahong Wu* (jiahong@math.okstate.edu), 401 Mathematical Sciences, Department of Mathematics, Stillwater, OK 74078. *Models generalizing the 2D Euler and the surface quasi-geostrophic equations.*

This talk presents very recent studies on a family of 2D active scalar equations in which the velocity field is divergence free and determined by the scalar through the operator $\nabla^\perp(\sqrt{-\Delta})^{-2+\beta}(\log(1-\Delta))^\gamma$ with $0 \leq \beta \leq 1$ and $\gamma \geq 0$. The 2D Euler vorticity equation corresponds to the special case $\beta = 0$ and $\gamma = 0$ while the surface quasi-geostrophic equation to the case $\beta = 1$ and $\gamma = 0$. We establish the global regularity for the case when $\beta = 0$ and $\gamma \leq 1$, a model that is logarithmically worse than the 2D Euler equation. In addition, several regularity criteria for the model with $0 \leq \beta \leq 1$ and $\gamma = 0$ are obtained. This is a joint work with Dongho Chae and Peter Constantin. (Received August 09, 2010)