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**Kazuo Yamazaki\*** ([kyamazaki@math.okstate.edu](mailto:kyamazaki@math.okstate.edu)), Oklahoma State University, Dept. Mathematics, 401 Mathematical Sciences Building, Stillwater, OK 74078. *Regularity criteria of active scalars in terms of partial derivatives.*

Active scalars play important roles in understanding fluid mechanics. Recently while their global regularity issue has received much attention from many mathematicians, it remains to be a challenging topic in the supercritical case.

We obtain new regularity criteria and smallness condition for the global regularity of the solution to the N-dimensional active scalars convected by incompressible fluid. In particular, it is shown that in order to obtain global regularity results, one only needs to bound its partial derivatives, dropping the condition on one direction. The results may be applied to the surface quasi-geostrophic equation in case  $N = 2$  and furthermore porous media equation governed by Darcy's law in case  $N = 2$  or  $3$ . Further extension will also be shown in the case of porous media equation. (Received September 09, 2012)