

# On the local pressure and local regularity for suitable weak solutions to the Navier-Stokes equations and related systems

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In our talk we deal with the problem of local regularity of suitable weak solutions to the unsteady Navier-Stokes equation and related systems given by the following general form

$$\operatorname{div} \mathbf{u} = 0, \quad \partial_t \mathbf{u} + (\mathbf{u} \cdot \nabla) \mathbf{u} - \operatorname{div} (\mathbf{S} + p\mathbf{I}) = \mathbf{f} \quad \text{in } Q,$$

where  $Q = \Omega \times (0, T)$  is space-time cylinder and  $\Omega$  is a three dimensional domain.

Although there are many important contributions related to local regularity, such as the famous result of partial regularity due to Caffarelli-Kohn-Nirenberg, a general local regularity theory is still missing. The reason for this is that the usual methods rely on the existence of a global pressure, which in general does not exist.

Instead working with the global pressure we will introduce the so called local pressure which allows us to introduce a new notion of generalized suitable weak solutions to the system under consideration, which works for the Navier-Stokes equation in general domains as well for many other models of incompressible viscous fluids. On the basis of such suitable weak solutions and the cancellation of the pressure in the local energy estimate we shall carry out the local regularity theory.

## References

- [1] *L. Caffarelli, R. Kohn, L. Nirenberg*: Partial regularity of suitable weak solutions of the Navier-Stokes equations. *Commun. Pure Appl. Math.* *35* (1982), 771–831.