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Equations aux dérivées partielles non-linéaires, théorie spectrale et applications

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Title : Conservation of energy for various systems of conservation laws. Around Onsager's conjecture

Abstract : A common feature of systems of conservation laws of continuum physics is that they are endowed with natural companion laws which are in such case most often related to the second law of thermodynamics. This observation easily generalizes to any symmetrizable system of conservation laws. They are endowed with nontrivial companion conservation laws, which are immediately satisfied by classical solutions. Not surprisingly, weak solutions may fail to satisfy companion laws, which are then often relaxed from equality to inequality and over take a role of a physical admissibility condition for weak solutions.

We want to discuss what is a critical regularity of weak solutions to a general system of conservation laws to satisfy an associated companion law as an equality. An archetypal example of such result was derived for the incompressible Euler system by Constantin et al. ([1]) in the context of the seminal Onsager's conjecture. This general result can serve as a simple criterion to numerous systems of mathematical physics to prescribe the regularity of solutions needed for an appropriate companion law to be satisfied.

References

- [1] P. Constantin, W. E, and E. S. Titi. Onsager's conjecture on the energy conservation for solutions of Euler's equation. *Comm. Math. Phys.*, 165(1):207{209, 1994.
- [2] Feireisl, Eduard; Gwiazda, Piotr; Swierczewska-Gwiazda, Agnieszka; Wiedemann, Emil; Regularity and Energy Conservation for the Compressible Euler Equations, *Arch. Ration. Mech. Anal.* 223 (2017), no. 3,1375-1395.
- [3] P. Gwiazda, M. Michalek, A. Swierczewska-Gwiazda. A note on weak solutions of conservation laws and energy/entropy conservation, *Arch. Ration. Mech. Anal.*, 229 (2018) 1223-1238