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Local energy transfers in solar wind turbulence in the incompressible MHD limit

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It is well known that the observed temperature profile within the solar wind indicates the existence of a heating mechanism. However, since collisions are extremely rare, viscosity is ill-defined and does not constitute a likely candidate. The existence of turbulence may, however, be crucial in the understanding of solar wind heating [**?**, **?**] as it is characterized by an energy cascade from large to small scales, where some unknown processes could occur in order to dissipate energy as heat.

Energy dissipation in the limit of very high Reynolds numbers has been extensively studied for fully developed, pure hydrodynamic incompressible turbulence, since the discovery of the zeroth law by Taylor in 1935 [**?**]. In 1949, Onsager was the first to realize that kinetic energy could be dissipated by non viscous means in turbulent flows provided that the velocity field does not remain differentiable at sufficiently small scales [**?**]. Recently, two French mathematicians were able to derive a local energy balance for suitable weak solutions of both Euler and Navier-Stokes equations which formalizes Onsager's ideas [**?**]. This approach can be considered as a modern view of energy transfers, and the energy balance as a local version of Kármán-Howarth-Monin relation, valid for non-isotropic, non-homogeneous flows. It has recently been applied to the study of energy dissipation in von Kármán flows, and has led to new, encouraging results [**?**].

The idea of Duchon and Robert [**?**] can be easily adapted to MHD flows [**?**]. Here, we verify the MHD formulation and we apply the results to the solar wind in-situ measurements. We estimate the local rate of energy transfers within the inertial range of solar wind turbulence and down to the ion characteristic scale, which plays the role, in some sense, of a dissipation scale.

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