Explaining the Schmidt-Kennicutt relation: a multi-scale analytical model

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The Schmidt-Kennicutt relation, which relates the gas column density to the star formation rate in galaxies, is a fundamental relation both regarding star and galaxy formation. Building on an analytical derivation of the star formation rate in a turbulent and self-gravitating gas (Hennebelle et al. 2024, A&A, 690, 43), I will present a model aiming at explaining the star formation rate in galaxies. The model considers turbulent energy injection, both from large scale turbulence and from supernovae, vertical equilibrium between all supports and gravity and obtain the SFR through a multi-scale analysis of the gravitationally unstable clumps. It is able to reproduce the Schmidt-Kennicutt relation and makes specific prediction regarding the dominant sources of turbulent energy injection.