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Coupling Photosphere and Corona: Linear and Turbulent Regimes

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In a recent work Grappin et al. [1] have shown that low- frequency movements can be transmitted from one footpoint to the other along a magnetic loop, thus mimicking a friction effect of the corona on the photosphere, and invalidating the line-tying approximation. We consider here successively the effect of high frequencies and turbulent damping on the process. We use a very simple atmospheric model which allows to study analytically the laminar case, and to study the turbulent case both using simple phenomenological arguments and a more sophisticated turbulence model [2]. We find that, except when turbulent damping is such that all turbulence is damped during loop traversal, coupling still occurs between distant footpoints, and moreover the coronal field induced by photospheric movements saturates at finite values.