S. Galtier[1,2]

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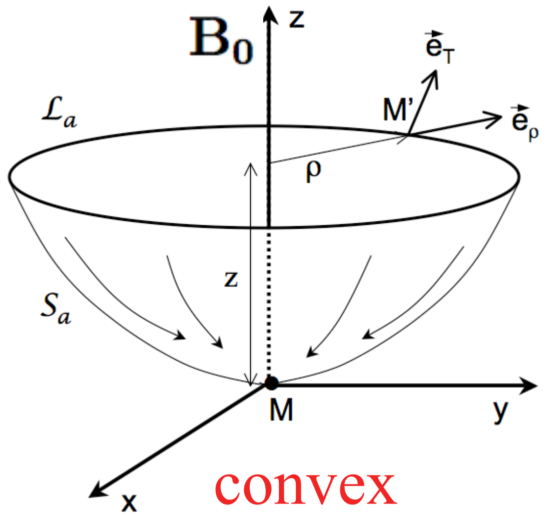
« On the nature of anisotropy in solar wind turbulence »

∃ a scaling relation between ⊥ and // correlation length scales

Is there a Kolmogorov MHD law in space correlation ?

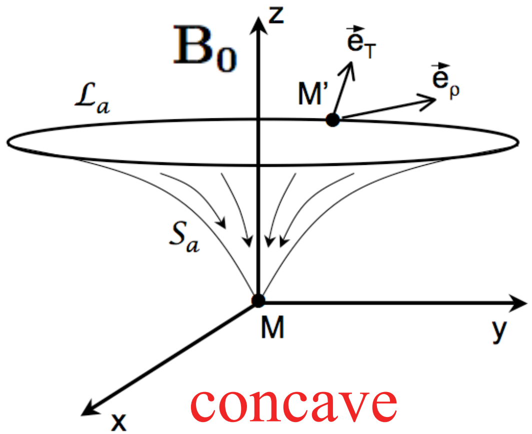
Anisotropic MHD

Let's consider a class of (local) axisymmetric MHD turbulence



convex

a>o



concave

a<o

$$\mathbf{F}^{\pm}(\mathbf{r}) = F_T^{\pm}\mathbf{e_T}$$

$$\mathbf{F}^{\pm}(\mathbf{r}) \;=\; \langle \delta\mathbf{z}^{\mp}(\delta\mathbf{z}^{\pm})^2 \rangle$$

$$z = f_a(\rho) = A\rho^{1+a}$$

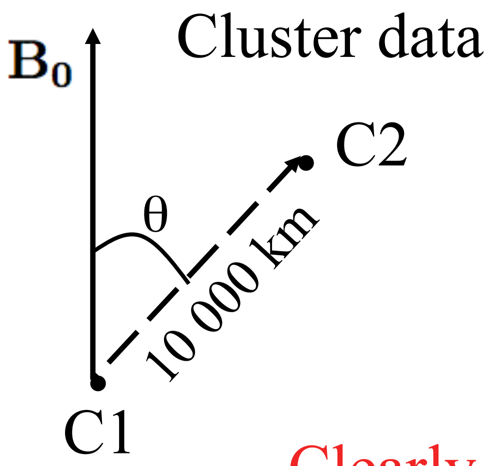
a : degree of anisotropy

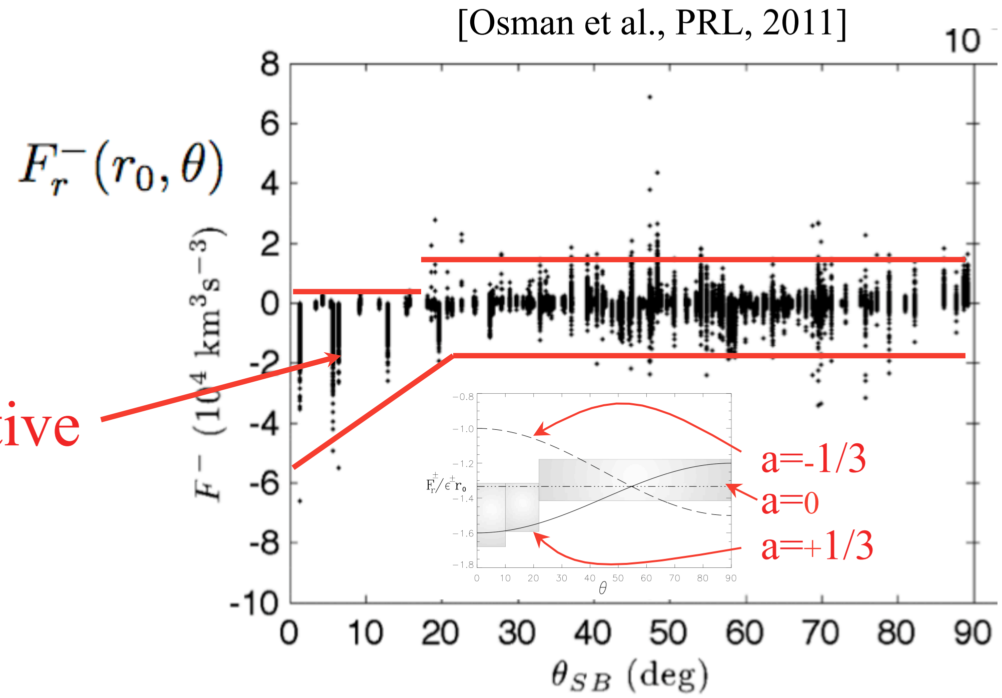
- a=0 : 3D isotropic case
- a=-1: 2D isotropic case

$$-4\varepsilon^{\pm} = \nabla \cdot \mathbf{F}^{\pm}(\mathbf{r}) = \frac{1}{\rho}\frac{\partial(\rho F_\rho^{\pm})}{\rho} + \frac{\partial F_z^{\pm}}{\partial z}$$

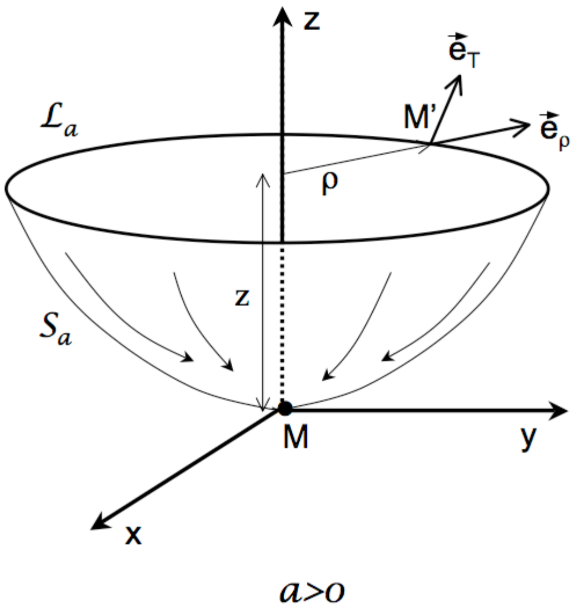
$$\mathbf{F}^{\pm}(r,z) = -\frac{4}{3+a}\varepsilon^{\pm}\Big(\rho\,\mathbf{e}_\rho + (1+a)z\,\mathbf{e_z}\Big)$$

Exact vectorial law for a class of axisymmetric turbulence





Clearly more negative



Theory says: $F_r^{\pm}(r,\theta) = -\frac{4}{3+a}\varepsilon^{\pm} r(1 + a\cos^2\theta)$

Compatible with a convex turbulence

→ *Galtier, ApJ, 2012*