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Tensor Geometry in the Turbulent Cascade JOSEPH BALLOUZ, NICHOLAS OUELLETTE, Stanford Univ — The defining characteristic of highly turbulent flows is the net directed transport of energy from the injection scales to the dissipation scales. This cascade is typically described in Fourier space, obscuring its connection to the mechanics of the flow. Here, we recast the energy cascade in mechanical terms, noting that for some scales to transfer energy to others, they must do work on them. This work can be expressed as the inner product of a turbulent stress and a rate of strain. But, as with all inner products, the relative alignment of these two tensors matters, and determines how strong the energy transfer will be. By comparing the observed energy flux to the maximum possible if the tensors were in perfect alignment, we define an efficiency for the energy cascade. Using data from a direct numerical simulation of isotropic turbulence, we show that this efficiency is surprisingly low, with an average value of about 25

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