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Energy transfer and drag reduction in elasto-inertial turbulence laden with elongated contravariant and covariant polymers KIYOSI HORIUTI, Dept. Mechano-Aerospace Engineering, Tokyo Institute of Technology, Tokyo, Japan — We study elongation and energy-transfer process of polymers released in the homogeneous isotropic turbulence by connecting mesoscopic Brownian description of elastic dumbbells to macroscopic description for the solvent (DNS). The dumbbells are allowed to be advected either affinely with the macroscopically-imposed deformation (contravariant) or completely non-affinely (covariant). We consider the elasto-inertial regime in which the relaxation time of polymer is in the order of the eddy turnover time. Highly-elongated contravariant polymers remove more energy from the large scales than they can dissipate and transfer the excess energy back into the solvent as in P.C. Valente *et al.* (2014). By deriving the approximate solution of the constitutive equation for the polymer stress (Horiuti *et al.* 2013), we identified the term responsible for causing this transfer. The skewness of the strain-rate tensor ($S_{ik}S_{kl}S_{li}$) in the elastic energy production term transfer the elastic energy back into the smallest scale of the solvent and increase the dissipation. In the covariant polymers, this trend is reversed and leads to enhancement of drag reduction, in accordance with the hypothesis that stretched polymers may behave like rods and exhibit rigidity (de Gennes 1986).

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