

# Sur la performance de la transformation du type racine carrée pour le tenseur de conformation appliquée à des écoulements en canal plan

et

## On the performance of the square-root-conformation representation applied to channel flows

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### Résumé :

Numerical simulations of viscoelastic fluid models with high elasticity may lead to a numerical breakdown which is mainly originated by the loss of positive-definiteness of the conformation tensor. On the other hand, these simulations are very aimed due to several interesting phenomena that may be observed by means of them, such as elastic (or elasto-inertial) turbulence and polymer induced drag reduction. In this context, Sureshkumar and Beris (JNNFM, 1997) presented the first proposition to overcome the loss of positive-definiteness by the addition of an artificial stress diffusivity into the evolution equation of the conformation tensor. Although such approach is widely used, it deals with a non-physical term for the scales simulated even with direct numerical simulations (DNS). Another class of possible solution relies on transformations applied to the conformation tensor aiming to avoid the exponential growth of the polymer stresses. The log-conformation representation (LCR), by Fattal and Kupferman (JNNFM, 2005), and the square-root-conformation representation (SRCR), by Balci *et al.* (JNNFM, 2011), were already applied to several benchmark viscoelastic cases, but, to the best of our knowledge, only a modified version of the LCR has been applied to turbulent drag-reducing channel flows (Housiadas *et al.*, Computers & Fluids, 2010). We present here an evaluation of the SRCR (Balci *et al.*, JNNFM, 2011) applied to Oldroyd-B and the FENE-P fluids. The effects of artificial stress diffusivity is evaluated for both laminar and turbulent channel flows.