Geometric and Dynamic Skewness in Passive Scalar Transport[1]

RICHARD MCLAUGHLIN, MANUCHEHR AMINIAN, FRANCESCA BERNARDI, ROBERTO CAMASSA, UNC Chapel Hill, UNC JOINT FLUIDS GROUP TEAM
— The evolution of a passive scalar in laminar shear flow is revisited in channel, pipe, and box geometries. Exact, explicit closed form, single sum formulae for the evolution of the skewness of a passive scalar along span-wise slices are derived and studied analytically in the case of channel flow. The largest skewness in time is interpreted using a geometric quantity. Surprisingly, the geometric quantity is seen to be absent in the smooth pipe geometries, but present in the box geometry, providing insight into the role of the wall mode versus center mode in assigning the sign to the instantaneous averaged skewness.

Richard McLaughlin
UNC Chapel Hill

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