Title: Coherent structures and phases synchronization in non linear Burgers equation

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Abstract:
We present a phenomenological study of the phase dynamics of the non-linear stochastically forced Burgers equations, and of the same equations under a Fourier mode reduction on a fractal set. We uncover a connection between coherent structures in real space and the evolution of triads in Fourier space. Real space structures are associated with entangled correlations amongst the phase precession frequencies and the amplitude evolution of triads in Fourier space. As a result, triad precession frequencies show a non-Gaussian distribution with multiple peaks and fat tails, and there is a significant correlation between triad precession frequencies and amplitude growth. On the other hand, by reducing the fractal dimension D of the underlying Fourier set, we observe: i) a tendency toward a more Gaussian statistics, ii) a loss of alignment of triad phases leading to a depletion of the energy flux, and iii) the simultaneous reduction of the correlation between the growth of Fourier mode amplitudes and the precession frequencies of triad phases.