ANALYSIS OF SHEAR LAYER COMPLEX STRUCTURE GROWTH IN THE OMEGA COUNTER-PROPAGATING SHEAR EXPERIMENT

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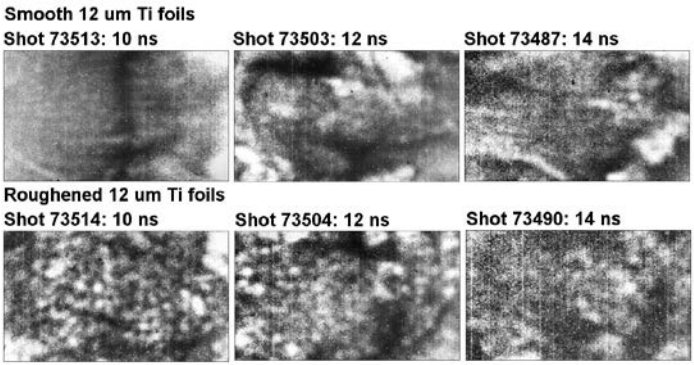
Counter-propagating shear experiments [1] conducted at the OMEGA Laser Facility have been evaluating the effect of target initial conditions, specifically the characteristics of a tracer foil located at the shear boundary, on the system mixing evolution [2]. Experiments are focused on identifying and uncoupling the dependence of the initial turbulent length scale in BHR, a variable-density turbulence model of k-epsilon type, on competing instability scale lengths. Current work uses metal tracer layers (Al or Ti) to observe both the growth of the mix region, i.e. providing a mix width, as well as break-up of the tracer layer surface into multi-dimensional structures (shown below) that are initially quasi-2D due to the target geometry. Recent campaigns have been exploring whether variations in the tracer foil surface roughness can modify the energy coupling balance into both Kelvin-Helmholtz and finer scale instability growth in the experiment.



We are currently developing 2D wavelet based image analysis techniques to describe the emergence of complex structures in the tracer layer. The analysis is focused on quantifying the time dependence and prevalence of the evolving structure scales by incorporating information about both power and localization of the wavelet transform. A specific goal of the analysis is to quantify the layer evolution from early-time, large anisotropic structures to late-time, smaller, and more isotropic structures. Capturing information about structure scale growth during the experiment transition to turbulence may provide tighter constraints on initialization schemes for the BHR model.

[1] F.W. Doss et al., *"Instability, mixing, and transition to turbulence in a laser-driven counterflowing shear experiment"*, Phys. Plasmas **20**, 012707 (2013)
[2] E.C. Merritt et al., *"Modifying mixing and instability growth through the adjustment of initial conditions in a high-energy-density counter-propagating shear experiment on OMEGA"*, submitted to Phys. Plasmas