Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Sparsity-Based Classification for Remotely Sensed Subsurface Bubble Saturated Turbulent Flow NICHOLAS SCOTT, Riverside Research, ROBERT HANDLER, George Mason University, SARAH JENSEN, Savor Safe Foods - A Matrix Science Company — Subsurface bubble saturated turbulence is a complex phenomenon possessing imagery signatures which can delineate uniquely important turbulence generation processes. Naval geo-intelligence agencies possess sub-surface turbulence imaging technology supporting a serious need for classification algorithms for turbulent flow state imagery observations. A fluid dynamical and machine learning experiment explored the ability to robustly classify imagery data taken from six different bubble saturated turbulence scenarios using sparsity-based classification. Overcomplete image dictionaries, formed from image sequences acquired using an off-the-shelf underwater high-speed camera, were used to decompose and reconstruct test images to be classified. Groups of image dictionaries for each turbulence scenario were used to estimate the minimum image Euclidean reconstruction error repetitively for single test images. Global minimum reconstruction error provided a test image vote for each turbulence scenario and was used to assign turbulence scenario membership. Preliminary results show robust sparsity-based classification of test images for five of the six scenarios with classification error due to photonic similarity existing in two scenarios.

Nicholas Scott
Riverside Research

Date submitted: 31 Jul 2020 Electronic form version 1.4