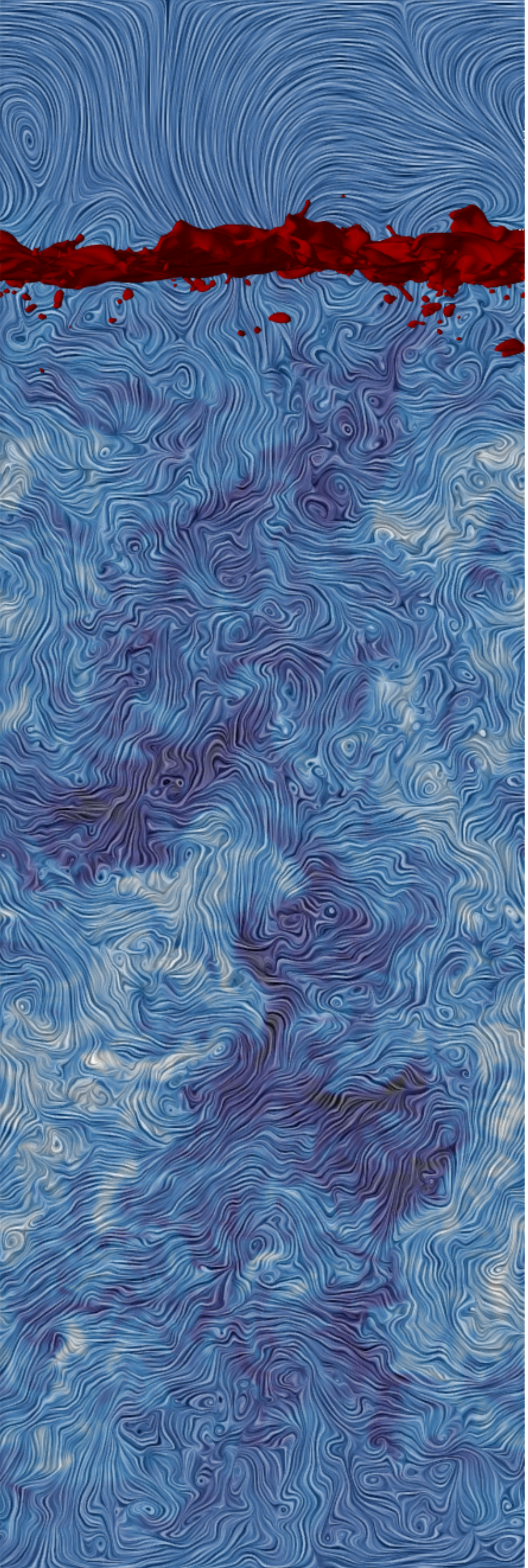
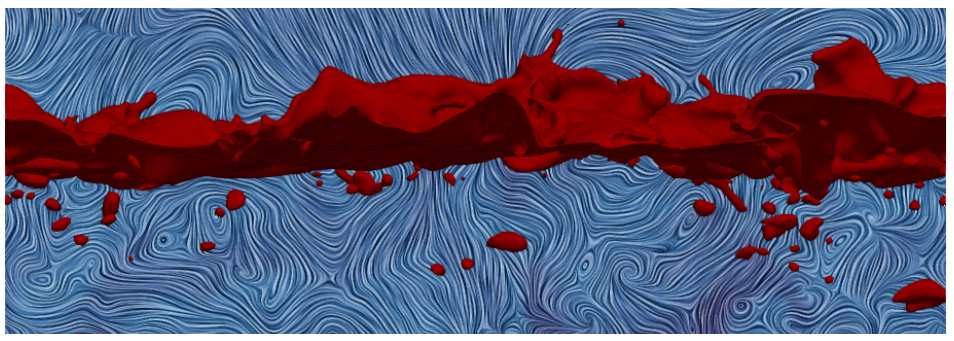


# Submerged Turbulence interaction with a Free-Surface

A. Calado[1], E. Balaras[1]

[1] The George Washington University



Turbulent structures interacting with the free surface play a major role in the process of air entrainment in many practical applications. Evaluation of the bubble entrainment location, intensity and size distribution is of paramount importance to properly predict a ship's wake persistence. Experimental measurements are challenging due to high bubble concentrations and complexity of measuring stresses, pressure and other local variables important in the entrainment mechanisms. DNS of turbulent entrainment, can fill this gap and provide much needed information to illuminate the physics and develop models for lower fidelity approaches. Our in-house developed DNS code is used to simulate high Reynolds turbulent air-water entrainment and provide new insights into the physics. The visualization shows how a forced homogenous isotropic turbulence in water interacts with the air above it. The Taylor microscale Reynolds number is 125. The background contour shows a surface line integral convolution of the instantaneous velocity field. In red we see the 3D interface, which includes the highly deformed free surface, numerous entrained air bubbles below it, and a few water droplets above it.

THE GEORGE WASHINGTON UNIVERSITY

WASHINGTON, DC