

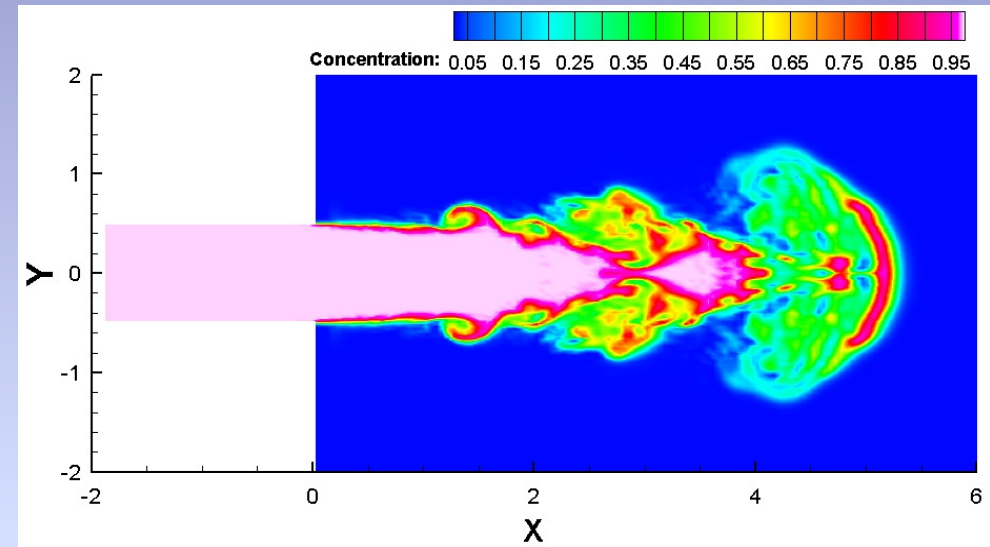
DIRECT NUMERICAL SIMULATION (DNS) OF SCALAR TRANSPORT IN A FREE SURFACE JET

Background

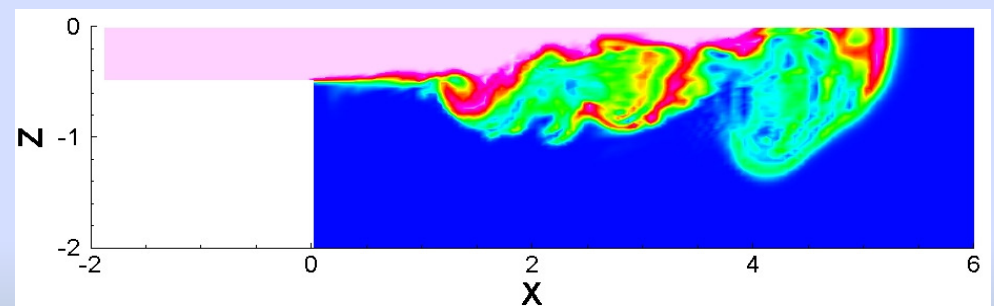
Jets issuing close to, or at, a free surface represent pollutant discharge into large bodies of water or the flow of rivers into the sea.

Objective

To assess the physics of scalar transport in a free surface jet, using DNS, thereby improving RANS turbulence models for scalar transport under the influence of a free surface.



Contours of scalar concentration near the free surface on the X-Y plane



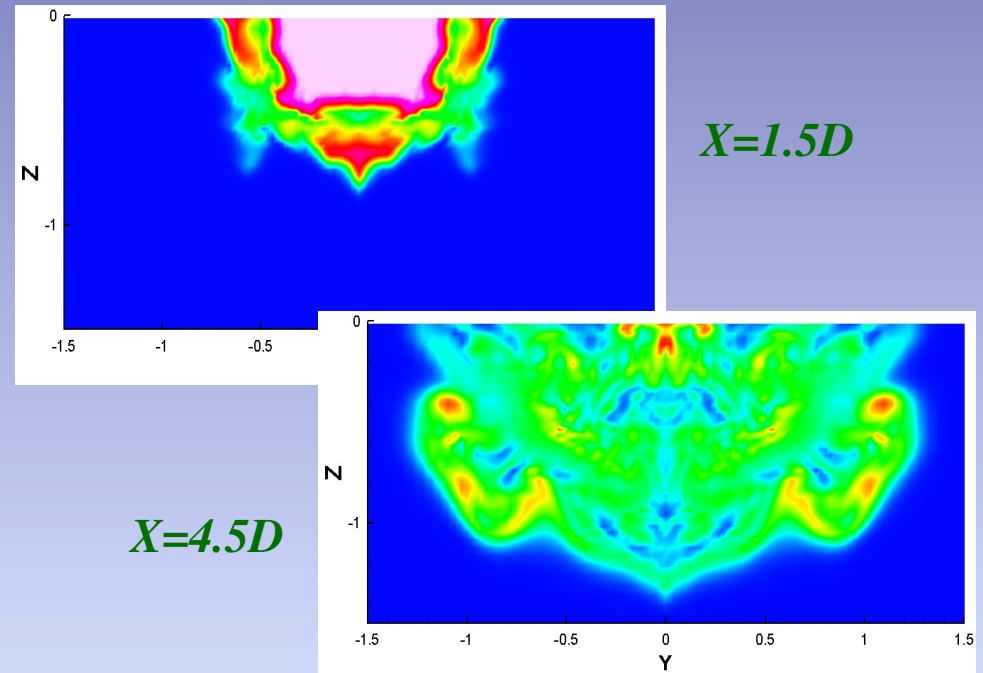
Contours of scalar concentration at the jet plane of symmetry

Research Carried Out

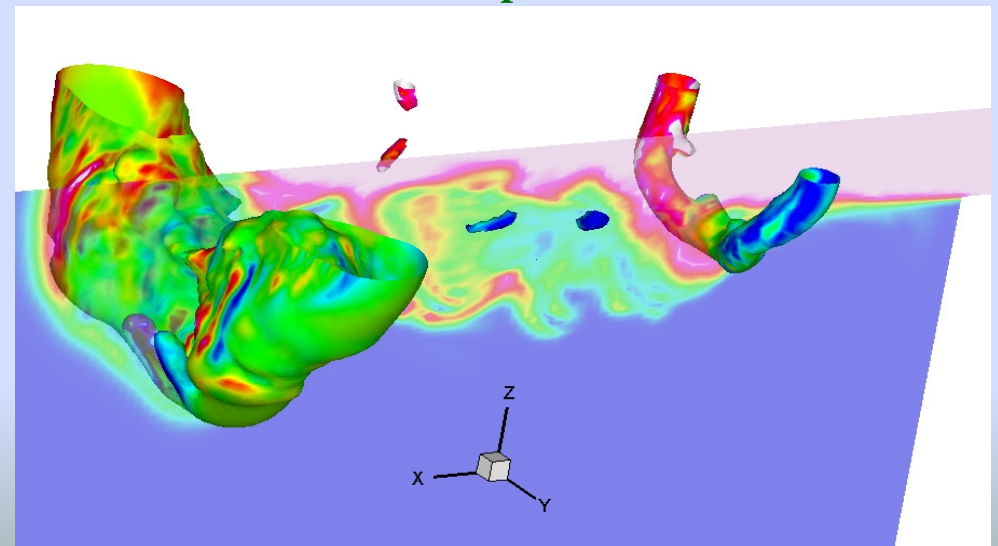
DNS of a rectangular surface jet has been performed at $Re = 4,420$, using 8 million grid points. Results have been validated through grid independence tests and comparison with the experimental data.

Key Findings

Coherent structures form in the transition zone, which give rise to secondary instabilities. It is these instabilities that determine the scalar dispersion.



Contours of scalar concentration on Y-Z planes



Coherent structures in a surface jet