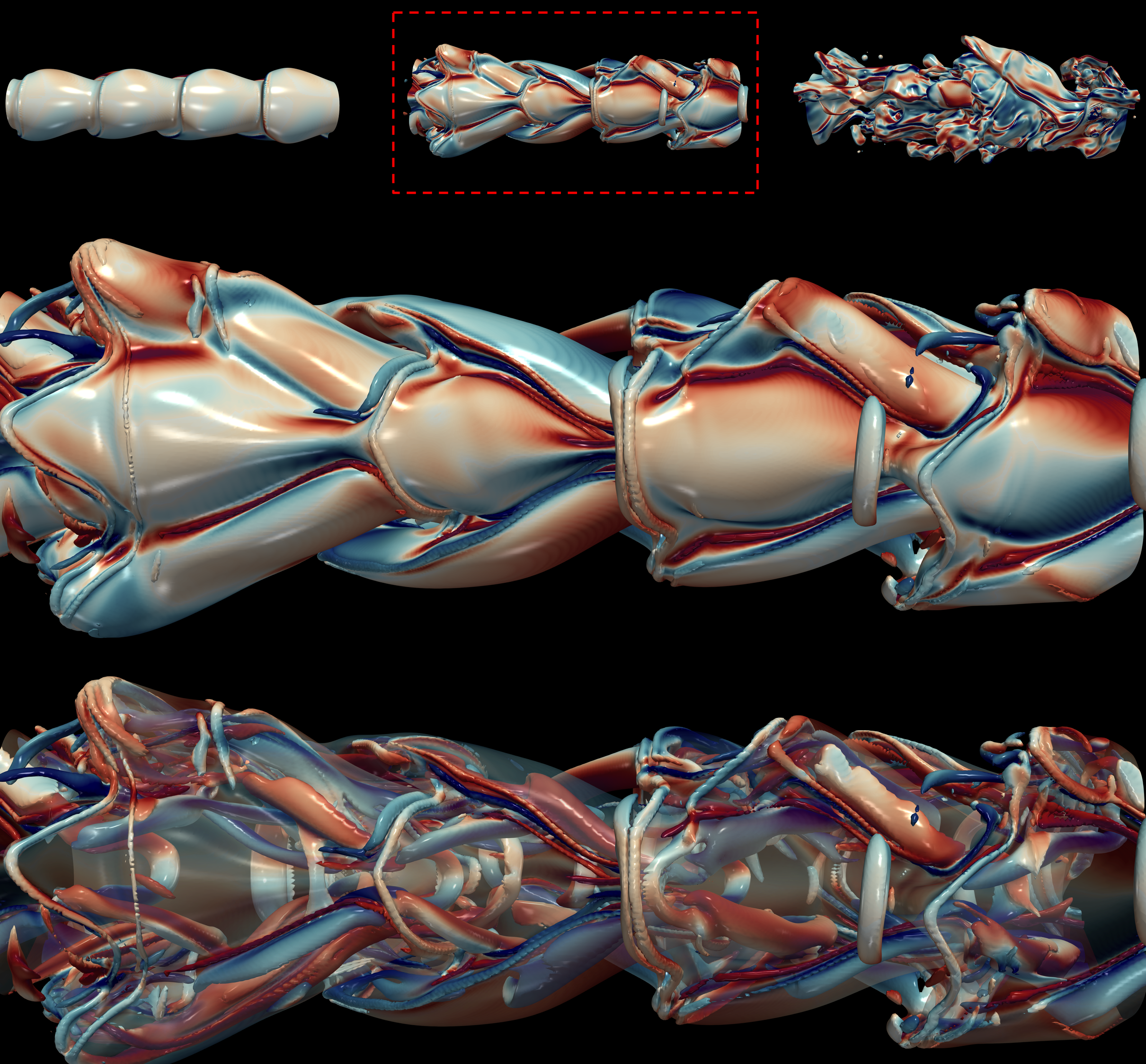
DNS on spray formation

C. R. Constante-Amores[1,2], L. Kahouadji[2], J. Chergui[3], D. Juric[3], A. A. Castrejón-Pita[1] and O. K. Matar[2]
[1]University of Oxford
[2]Imperial College London
[3]CNRS, LISN



$Re = 5000, We = 500, \rho_2/\rho_1 = 1, \mu_2/\mu_1 = 1$

We depict and analyse the successive steps of atomisation via vortex dynamics for a turbulent liquid jet by using Direct Numerical Simulations. The top panels show the spatio-temporal representation of the **interfacial dynamics** coloured by the streamwise vorticity. Magnified views of the interface with the three-dimensional coherent vortical structures visualised by the Q-criterion are shown in the bottom panels.

At early stages of the atomisation, a periodic array of Kelvin-Helmholtz rings are formed. Then, the vortex rings are deformed in the streamwise direction due to a mutual-induction resulting in a **`knitting' between two consecutive vortex rings**. A careful study of the distribution of vortex-signs show the assembling into counter-rotating vortex pairs.