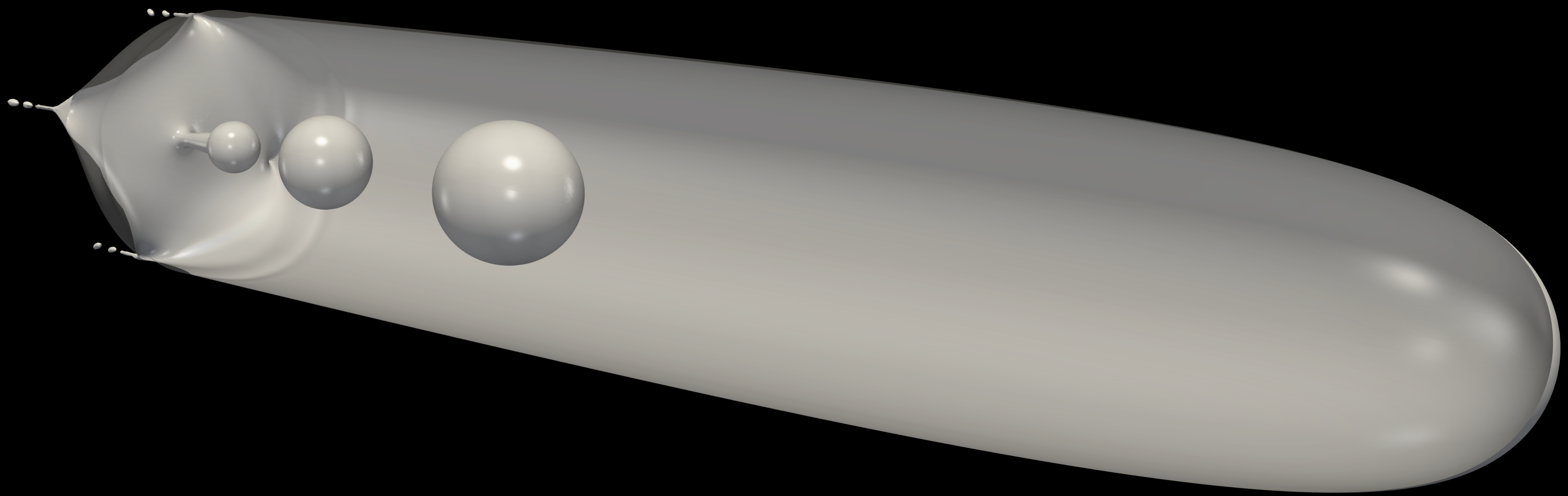


The capillary formation of ‘antidrops’: entrapping drops in bubbles at high We

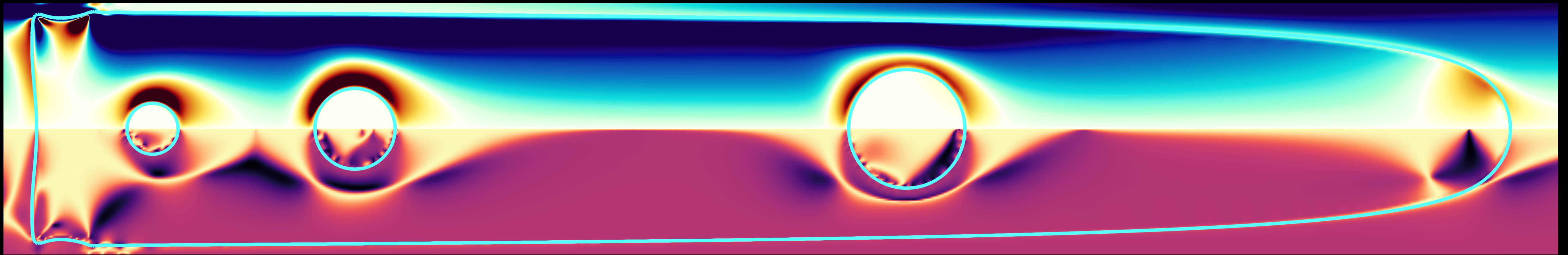
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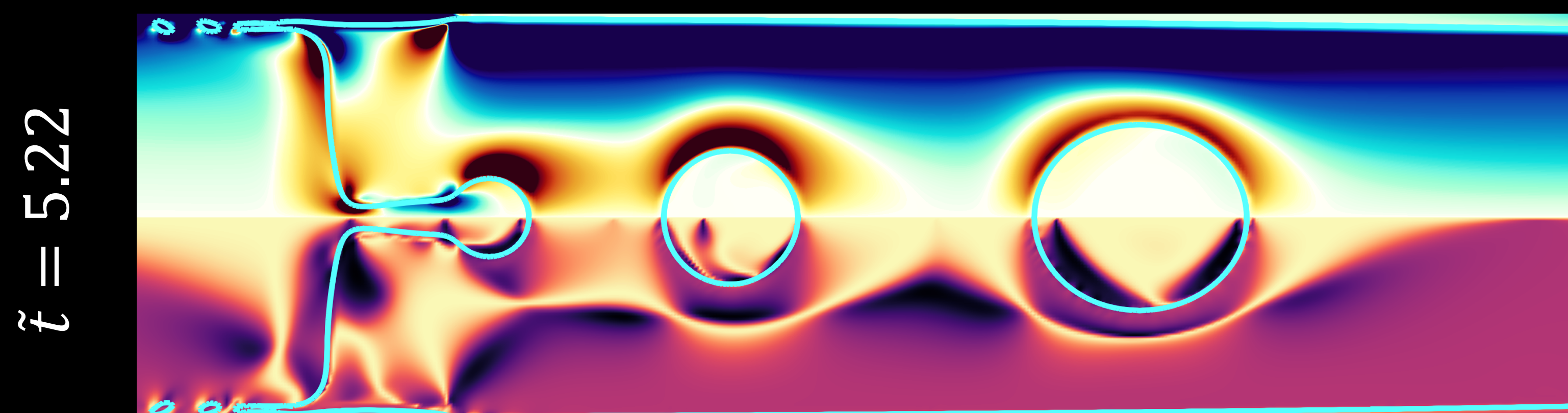
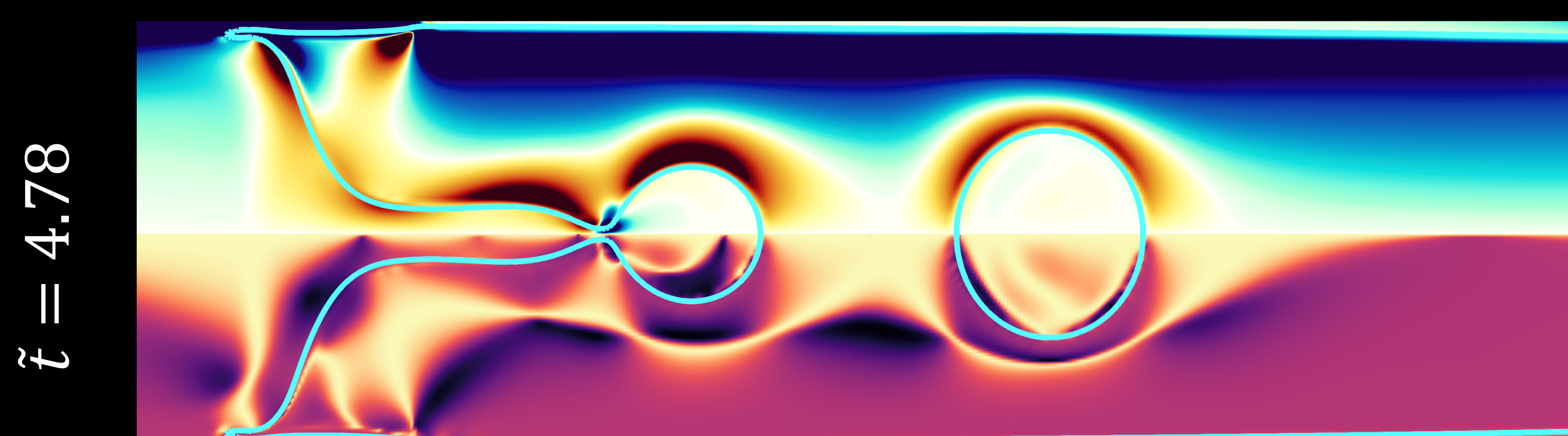
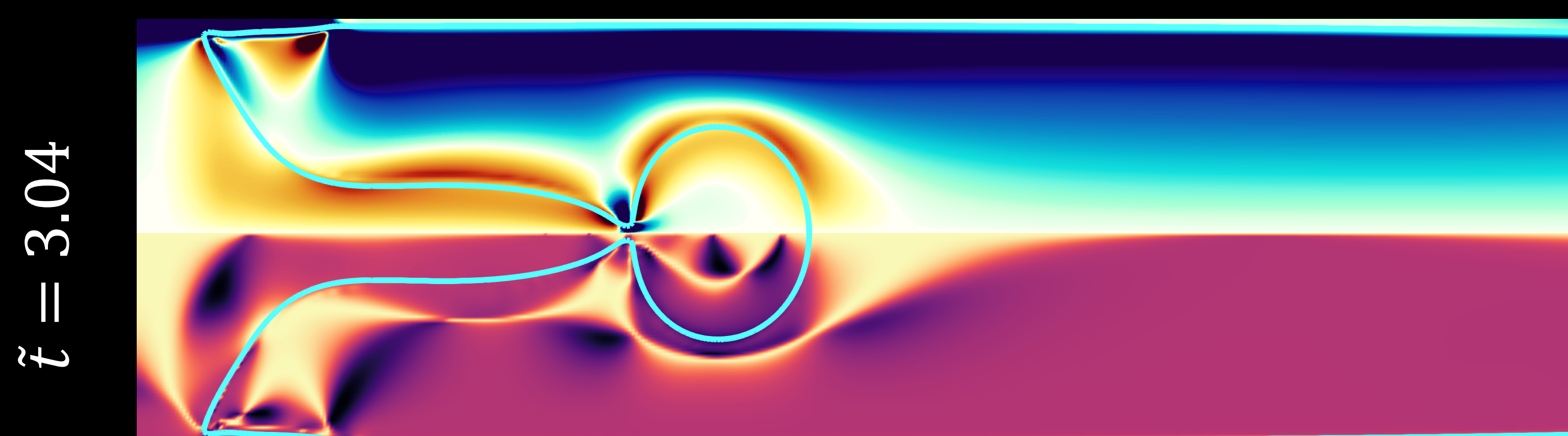
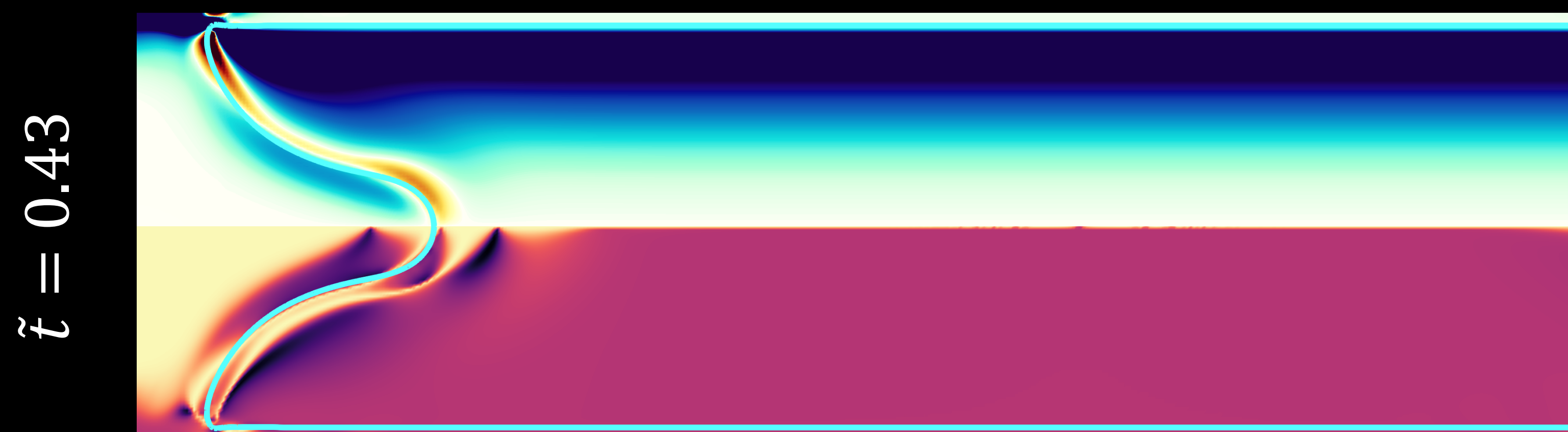
Vorticity:

Clockwise rotation: dark red, counter clockwise rotation: dark blue



Flow topology parameter:

Pure elongation: light yellow, pure shear: light purple, pure rotation: dark purple.



A bubble propagating through a liquid-filled capillary channel and subjected to increasingly dominant inertial and viscous forces over surface tension ($We > O(10)$) develops a liquid cavity at its back end. This cavity collapses thereafter following universal pinch-off scaling laws to induce the engulfment of multiple drops. These may subsequently coalesce with each other, burst the bubble nose, or remain entrapped to form ‘antidrops’.

3D DNS depict the intricate patterns of vorticity and flow topology that arise in the system. Purely rotational flows, manifested in high vorticity areas (dark blue and dark red), emerge nearby the pinch-off and in the vicinity of encapsulated drops, whose presence promotes intriguing sequences of alternating elongation, shear, and rotation.