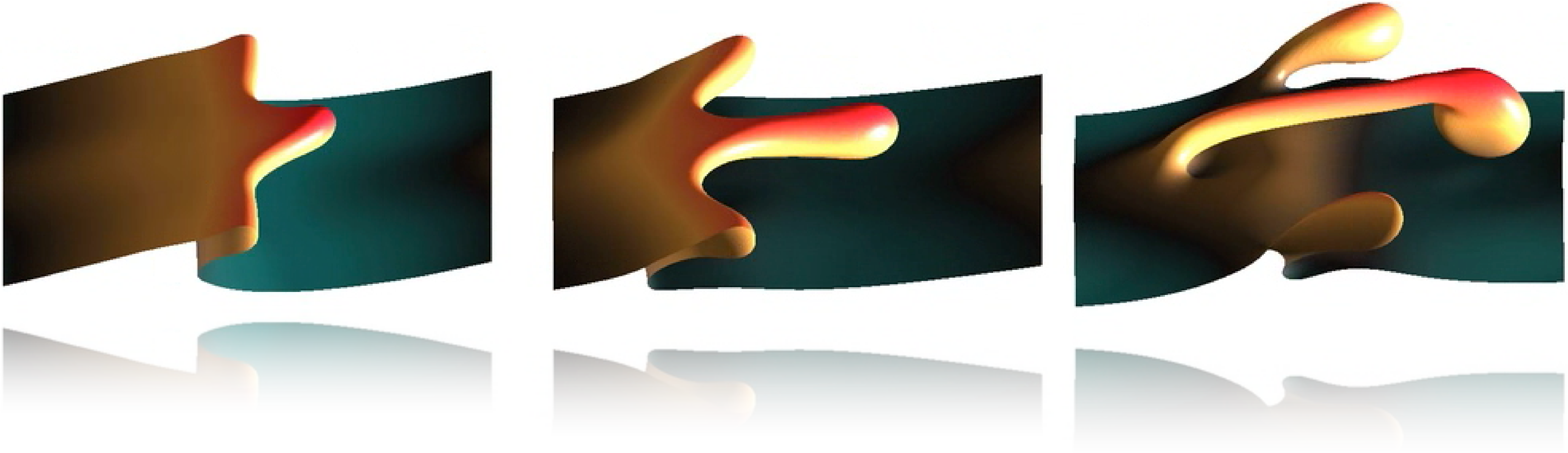
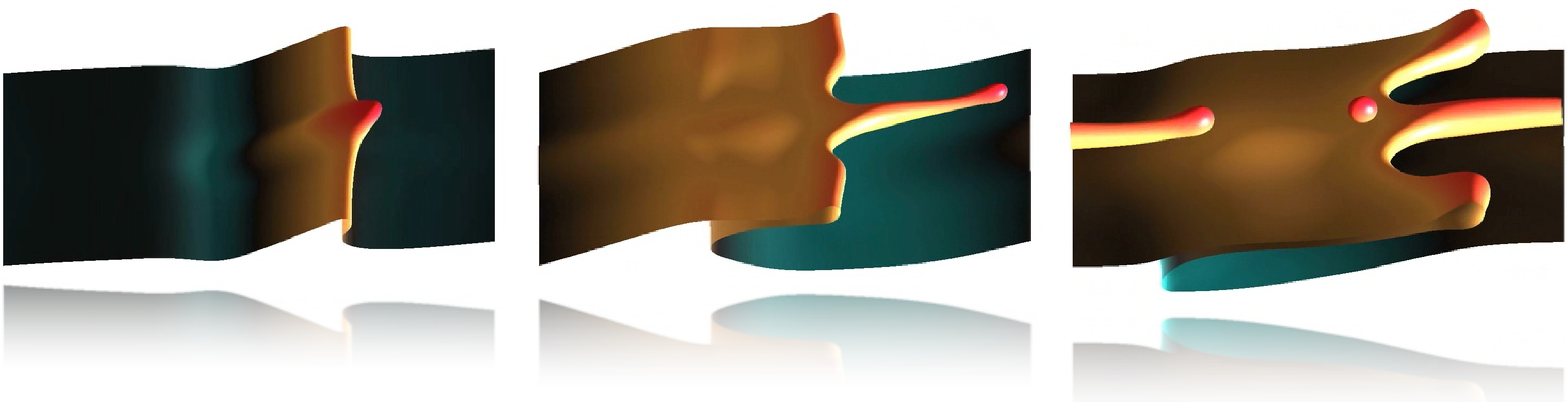
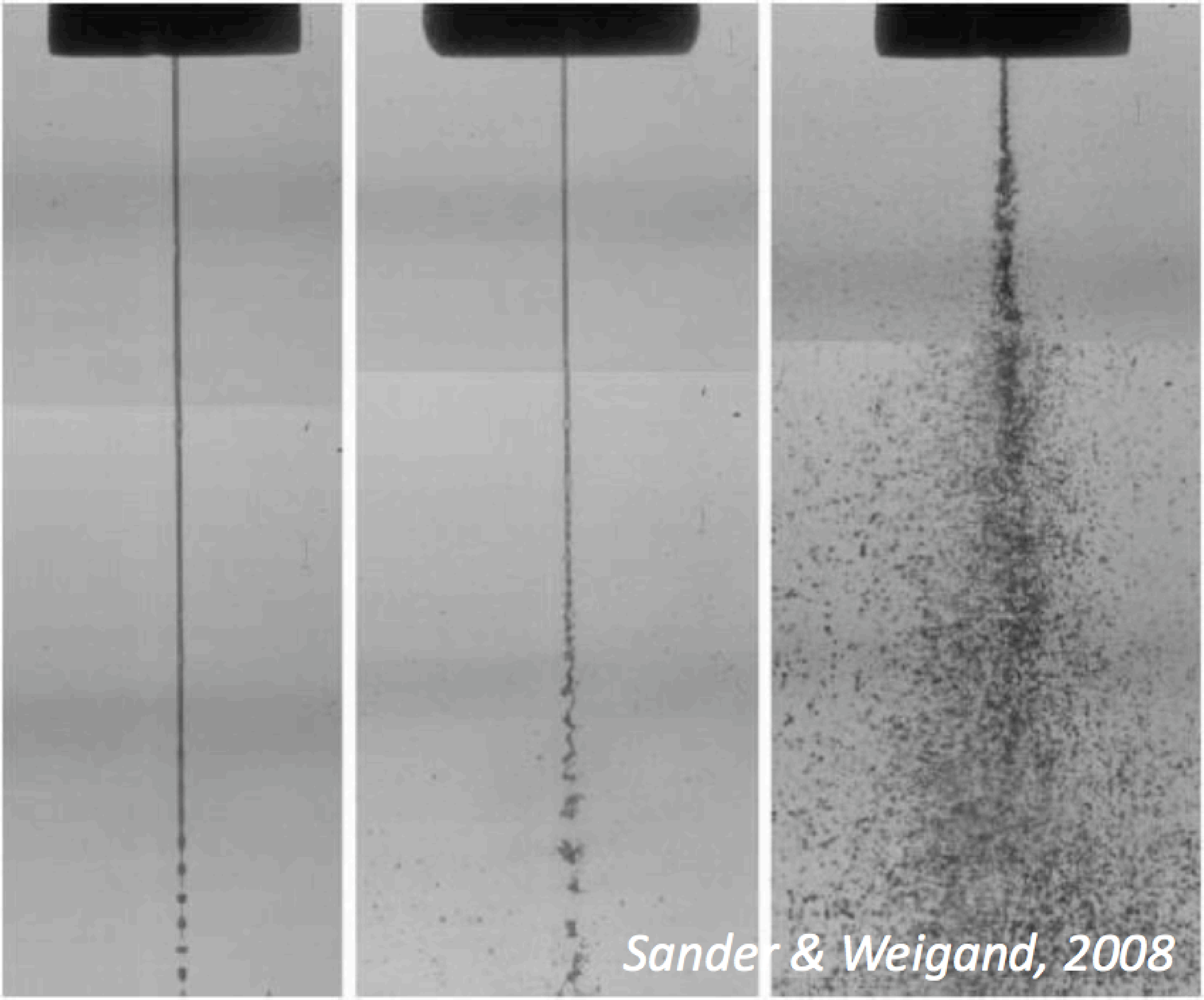


Large perturbations of interfaces for atomization
PhD Thesis project

Jérôme Hœpffner & Stéphane Zaleski
Institut Jean Le Rond D'Alembert



Atomization: how does a jet become drops



Increase speed

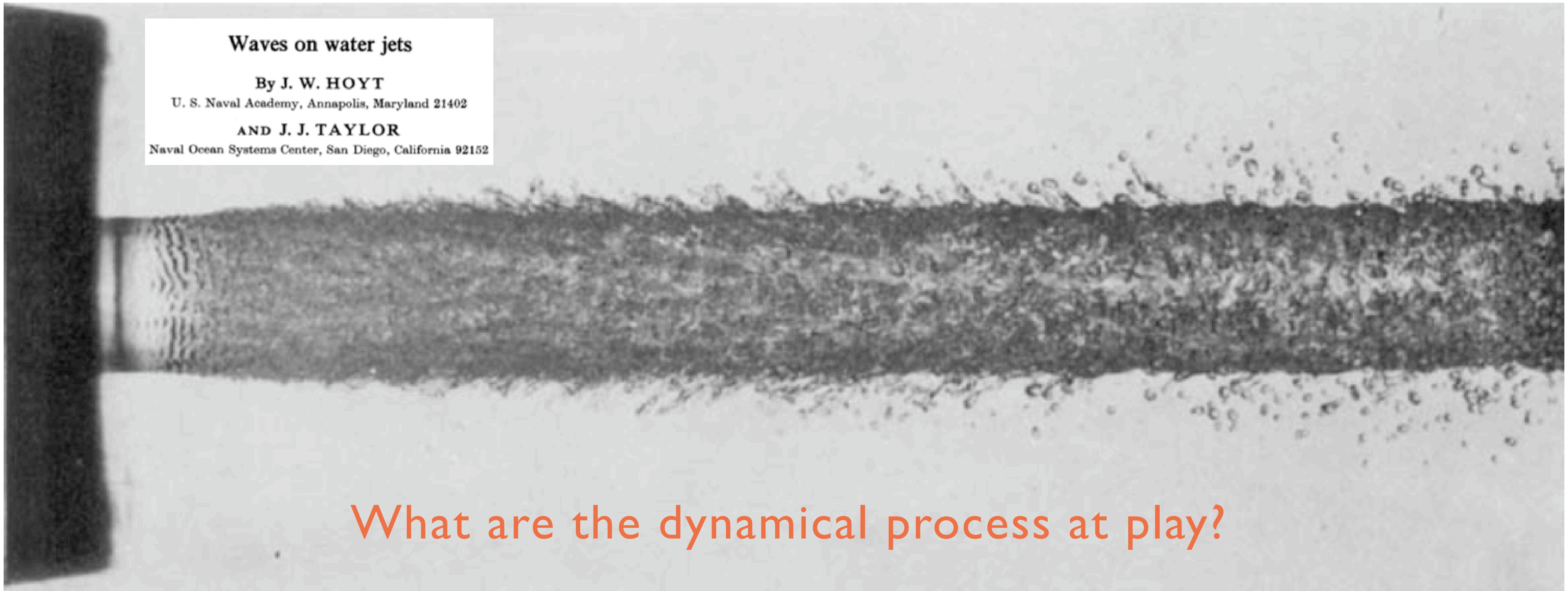


FIGURE 2. Jet emerging from 0·25 in. diameter nozzle into stagnant air. Jet velocity = 83 ft/s.

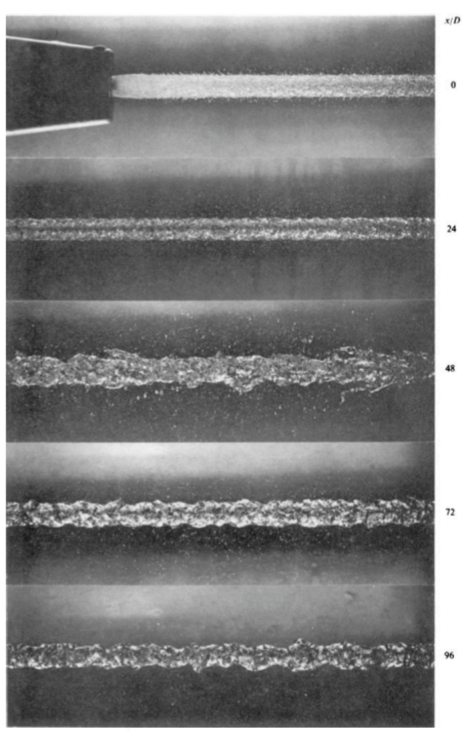


FIGURE 3 (a). For legend see facing page.

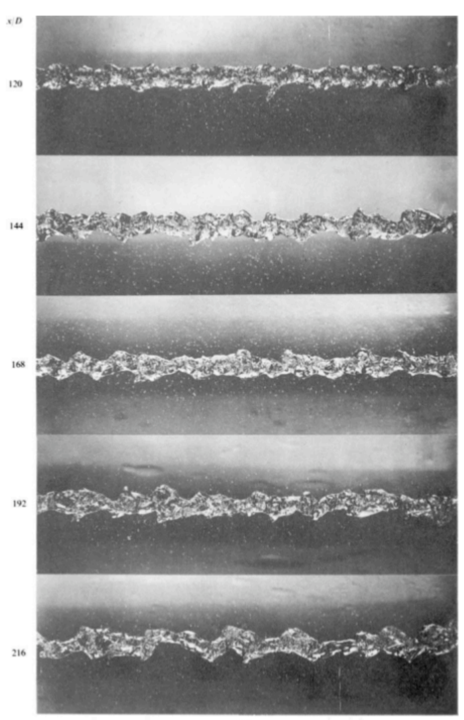


FIGURE 3. Photos of jet from 0·25 in. diameter nozzle in stagnant air; photos were taken 24 nozzle diameters apart.

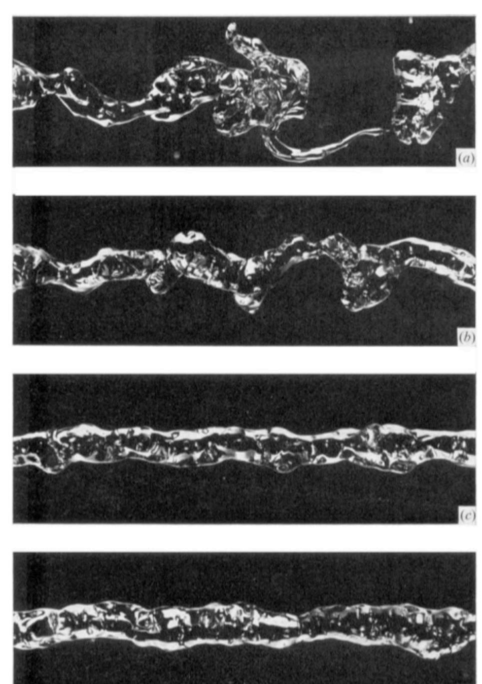
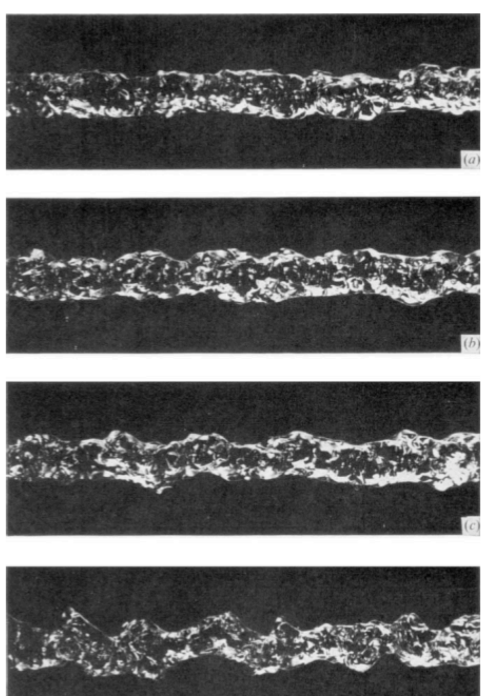


FIGURE 4. Appearance of jet from 0·125 in. diameter nozzle at $x/D = 238$. Air velocity (ft/s): (a) 7; (b) 36; (c) 72; (d) 103. Flow from left to right. Jet velocity at nozzle = 90 ft/s.



FIGURES 5 (a–d). For legend see next page.

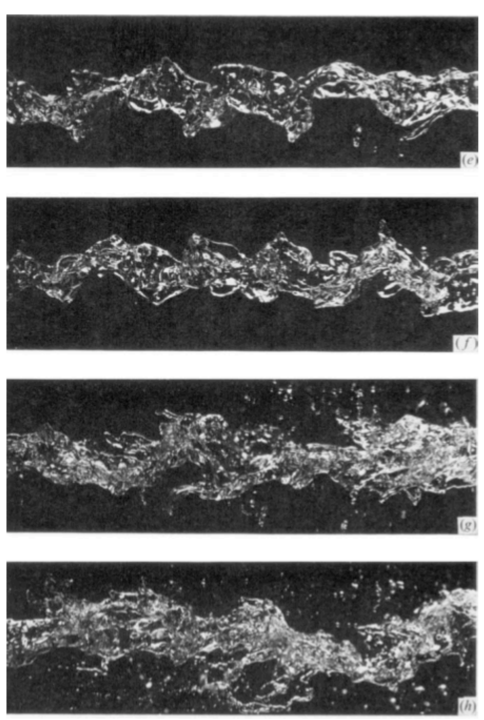
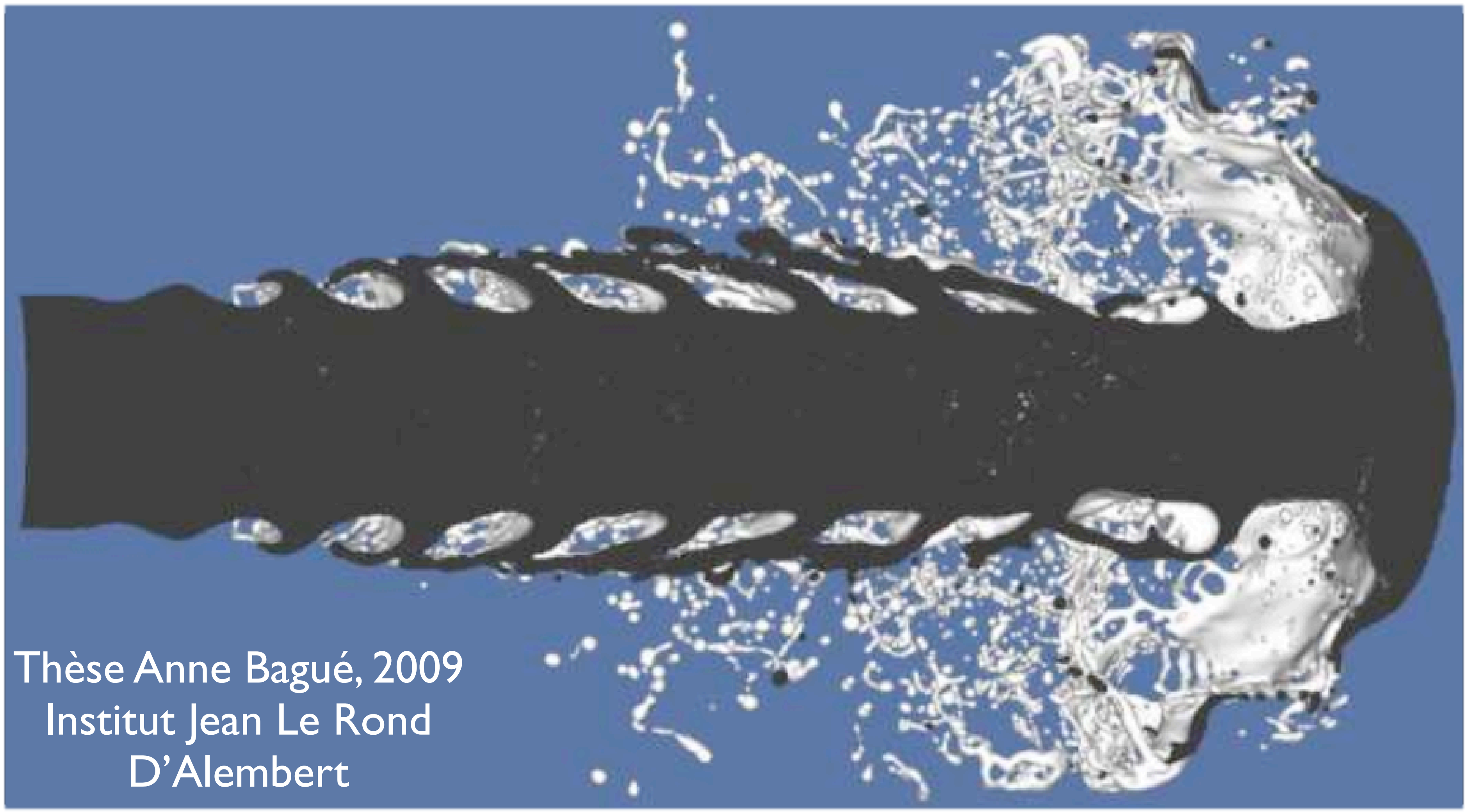


FIGURE 5. Appearance of jet from 0·125 in. diameter nozzle at $x/D = 104$. Air velocity from left to right (ft/s): (a) 116; (b) 80; (c) 40; (d) 4·8; (e) −23; (f) −40; (g) −70; (h) −83. Water flow from left to right. Jet velocity at nozzle = 90 ft/s.

Study of atomization using numerical simulation



$t * U_l^* / d = 18.36$

$t * U_l^* / d = 21.42$

$t * U_l^* / d = 24.48$

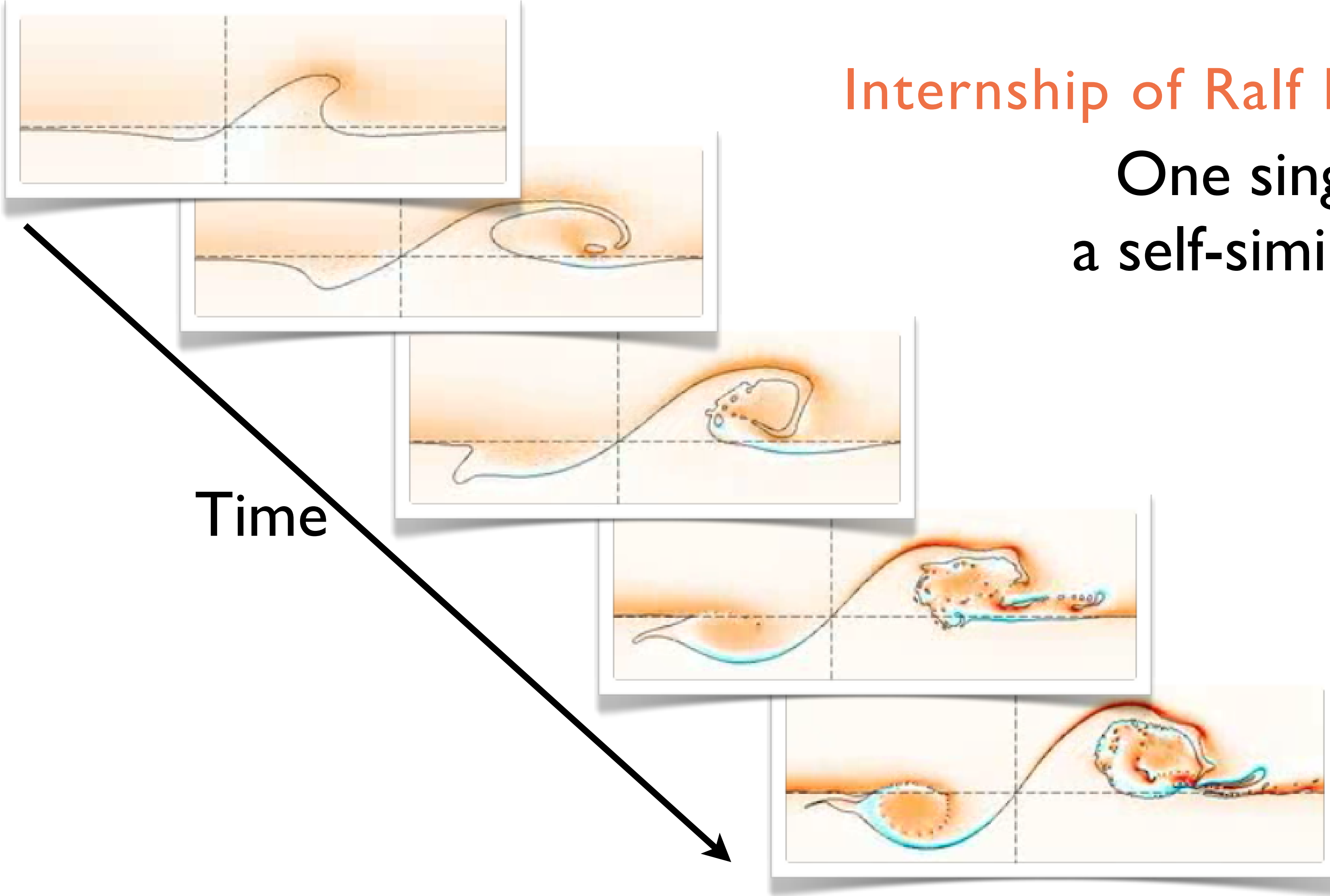
Gerris

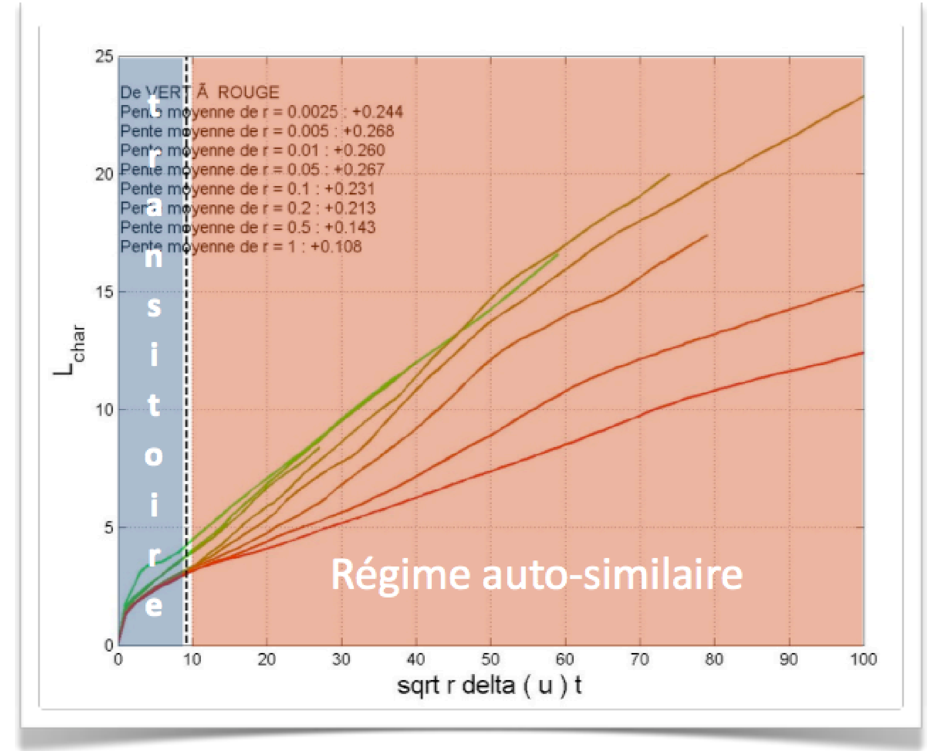
Gerris Flow Solver

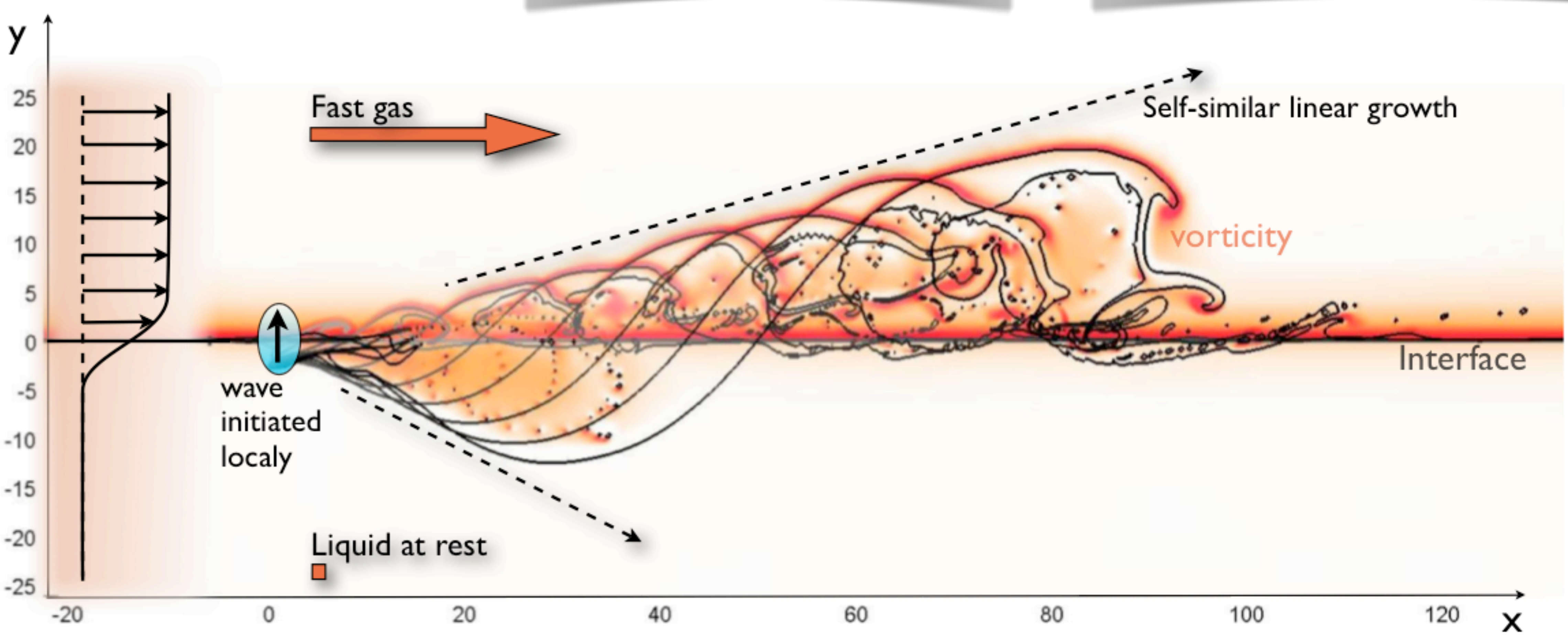
Open source code for Navier-Stokes equation

Internship of Ralf Blumenthal, spring 2009

One single wave has
a self-similar behaviour!







Mechanisms for the création of ligaments

On spray formation

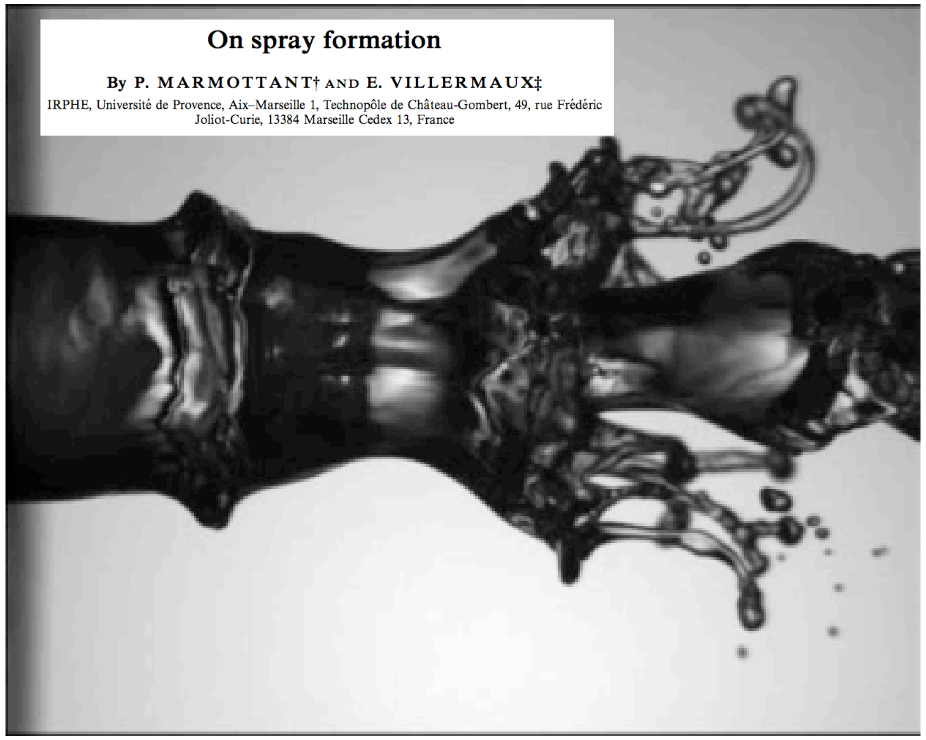


FIGURE 7. Development of digitations ($u_1 = 0.6\,\mathrm{m\,s^{-1}}$, $u_2 = 35\,\mathrm{m\,s^{-1}}$).

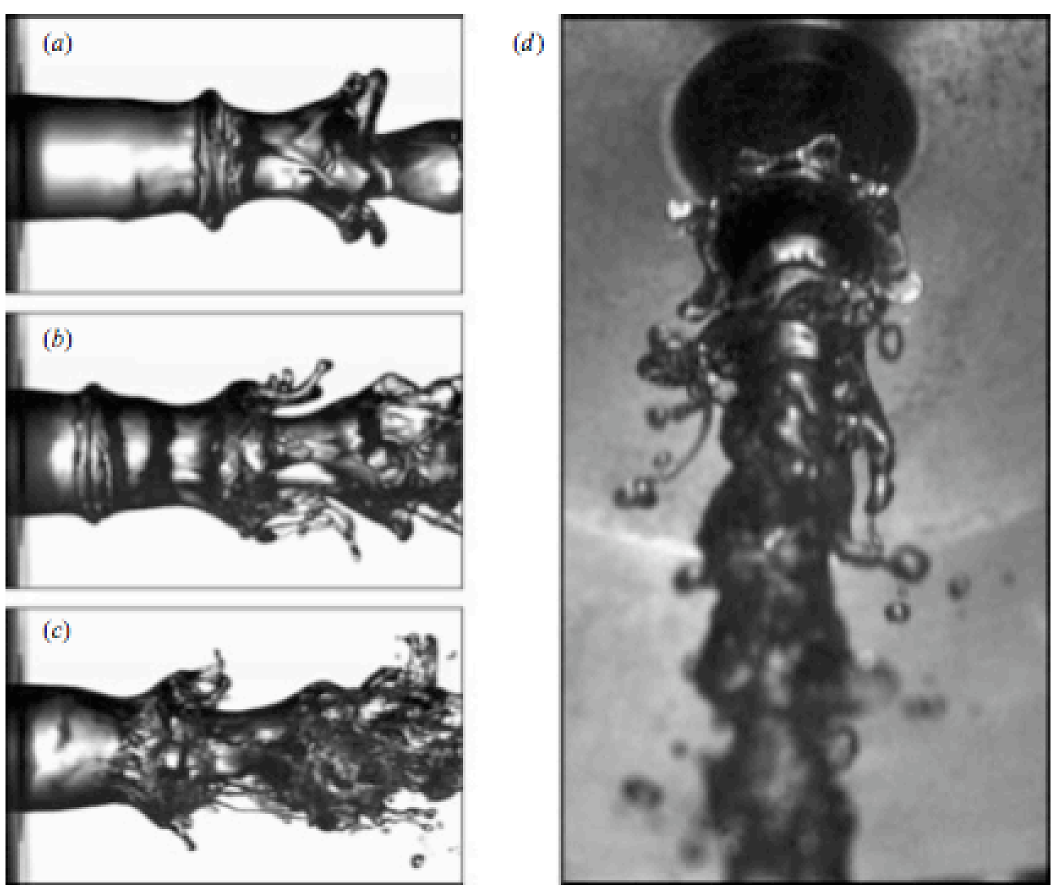
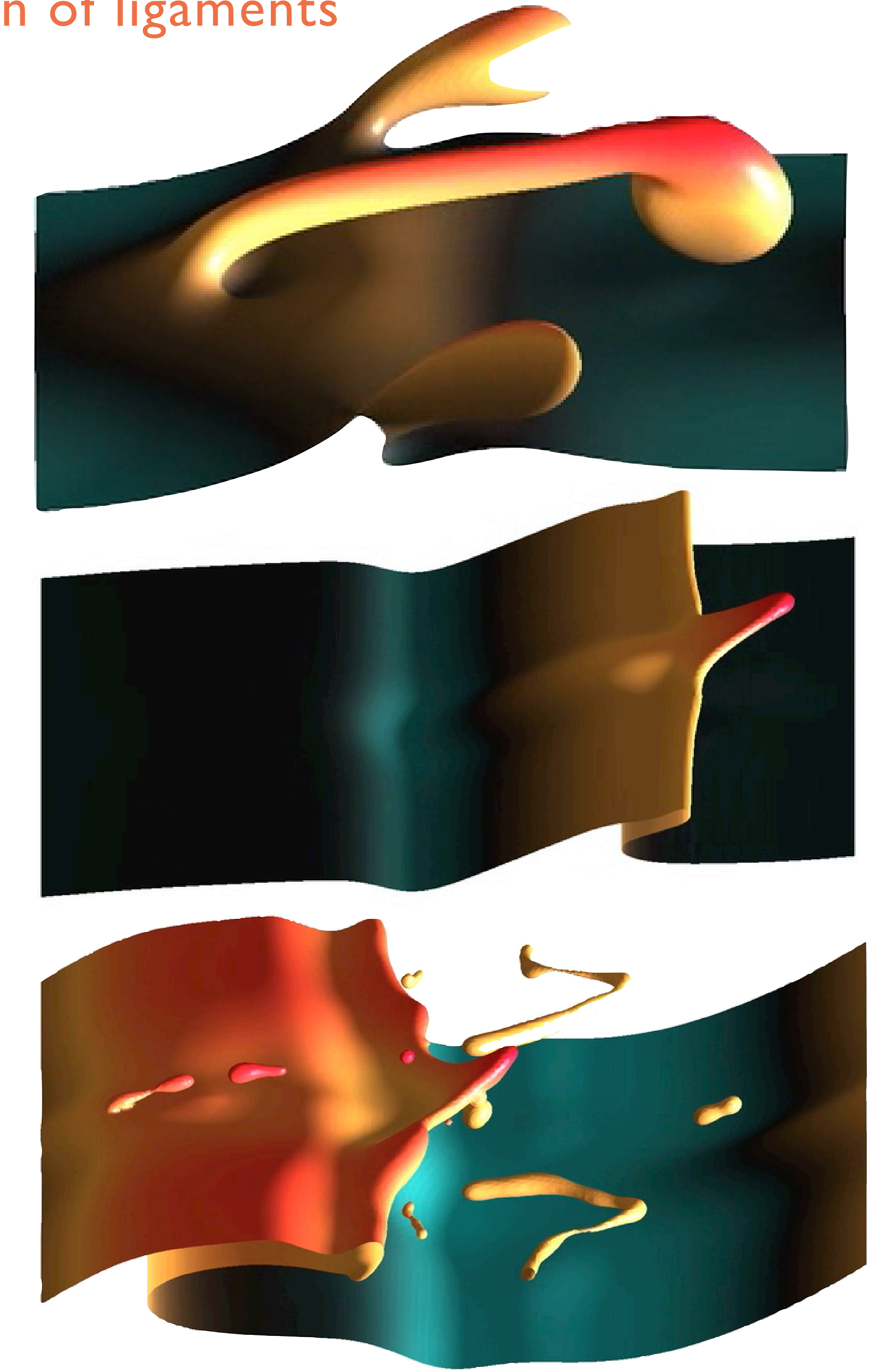


FIGURE 8. Transverse modulation, (a) $u_2 = 24\,\mathrm{m\,s^{-1}}$; (b) $u_2 = 27\,\mathrm{m\,s^{-1}}$; (c) $u_2 = 32\,\mathrm{m\,s^{-1}}$; (d) $u_2 = 24\,\mathrm{m\,s^{-1}}$ in oblique view.



Propositions de Stage suivi d'une thèse de l'Institut Jean-le-Rond D'Alembert

Influence of gas on the dynamics of droplet impact.
Influence du gaz environnant sur les dynamiques d'impact.
Ch.Josserand (FCIH-IJLRA), Pascal Ray ; MAIL : josseran@lmm.jussieu.fr

Modelling dry granular media : from discrete to continuum description.
Modélisation des écoulements granulaires secs : du discret au continu.
Lydie Staron (FCIH-IJLRA), Pierre-Yves Lagrée ; MAIL : staron@lmm.jussieu.fr

Non Invasive characterization of Physiological parameters using Inverse methods.
Caractérisation noninvasive de paramètres physiologiques par Méthodes inverses
Jose-Maria Fullana (FCIH-IJLRA), Patrice Flaud, Maurice Rossi ; MAIL :jose.fullana@upmc.fr

Lake Hydrodynamics and Ecosystems.
Hydrodynamique des lacs et écosystèmes.
Maurice Rossi (FCIH-IJLRA), Jose-Maria Fullana ; MAIL : maurice.rossi@upmc.fr

Large perturbations of interfaces for atomization
Perturbations de grandes amplitudes d' interfaces pour l'atomisation.
Jérôme Hoepffner (FCIH-IJLRA), Stéphane Zaleski ; MAIL : jerome.hoepffner@upmc.fr

Research activities:

- **Numerical simulation** for two-phase flow using open-source solver

- **Comparison with experiment** LEGI: Grenoble & published material.

- **Theory: predict and explain** observed structures: wave lengths, ligaments... self similar growth in nonlinear regime

Jérôme Hoepffner, Jussieu, Bureau 518, Tours 55-65, 01.44.27.72.19

Page web:
www.lmm.jussieu.fr/~hoepffner