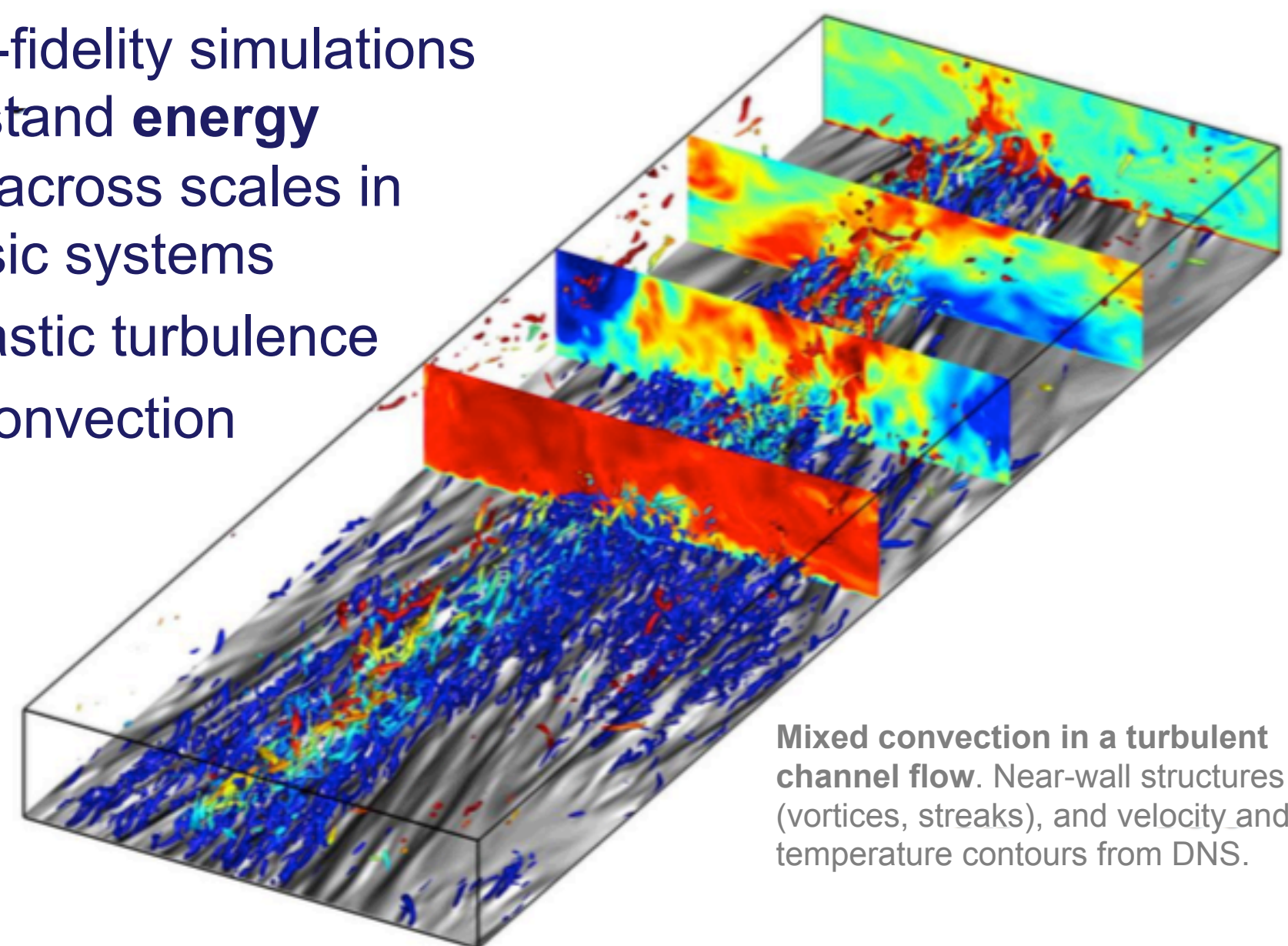


Turbulent energy transfer

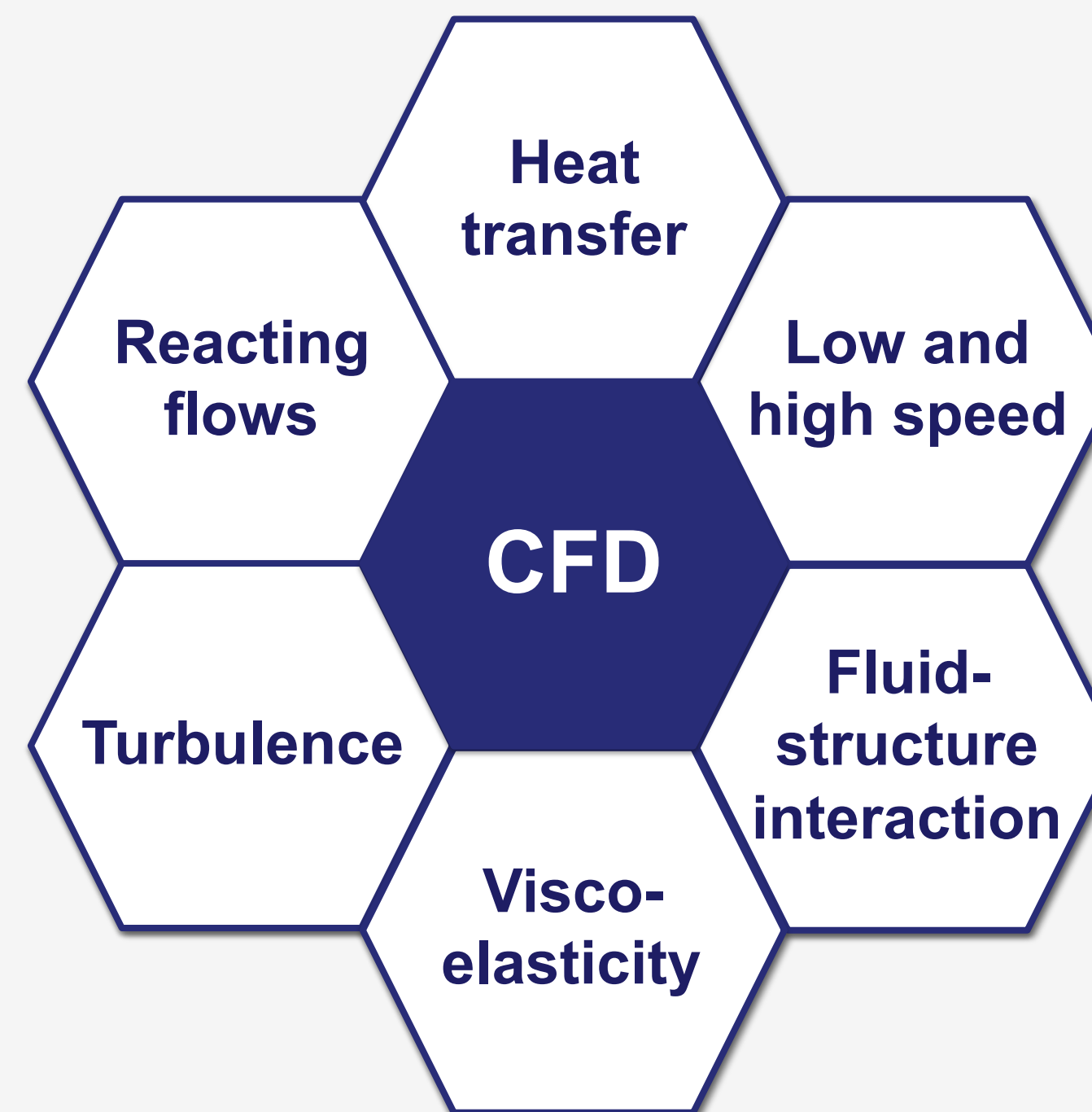
S. Sid

Use high-fidelity simulations to understand **energy transfer** across scales in multiphysic systems

- Viscoelastic turbulence
- Mixed convection



With Y. Dubief (University of Vermont, USA) and J. Soria (Monash Univ., Australia)

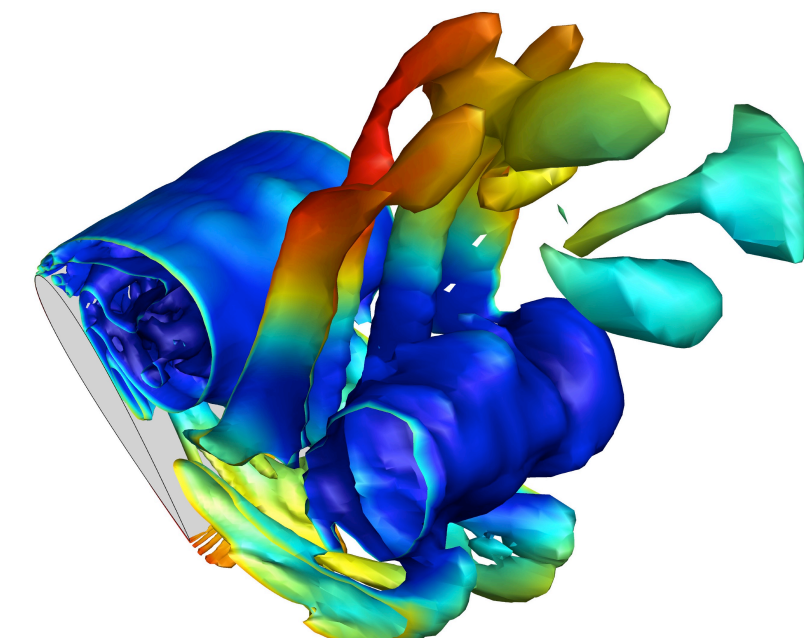


Fluid - structure interaction

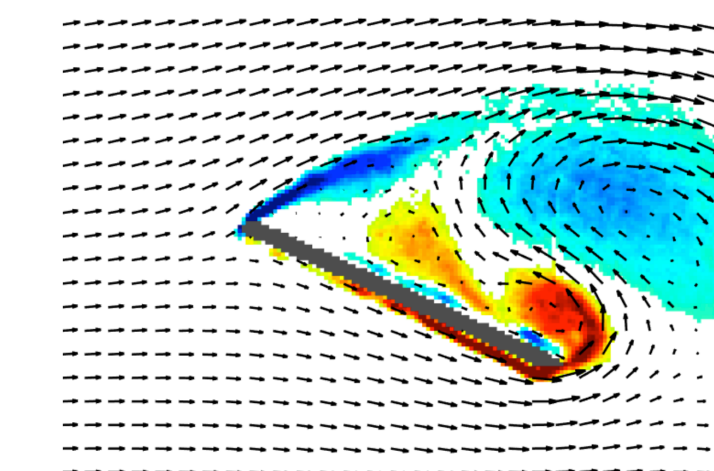
A. Guissart / D. Thomas (with G. Dimitriadis)

Predict **aerodynamic loads** and **structural dynamics**

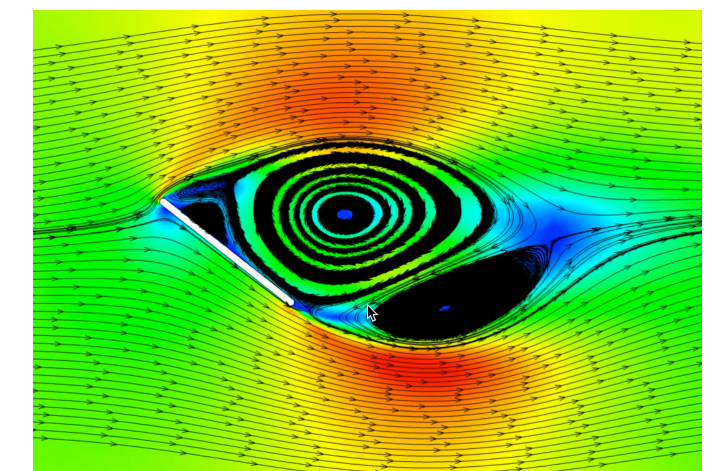
- Reynolds-Averaged Navier-Stokes (RANS) and Detached Eddy Simulations (DES)
- Coupling of “fluid” and “structure” codes (SU2 + Metafor)
- Experimental measurements



Detached flow behind an airfoil at high angle of attack. Vortical structures obtained from DES.



Flat plate undergoing a periodic large-amplitude pitching motion. Vorticity and velocity from PIV data (left); velocity magnitude and streamlines from RANS (right).



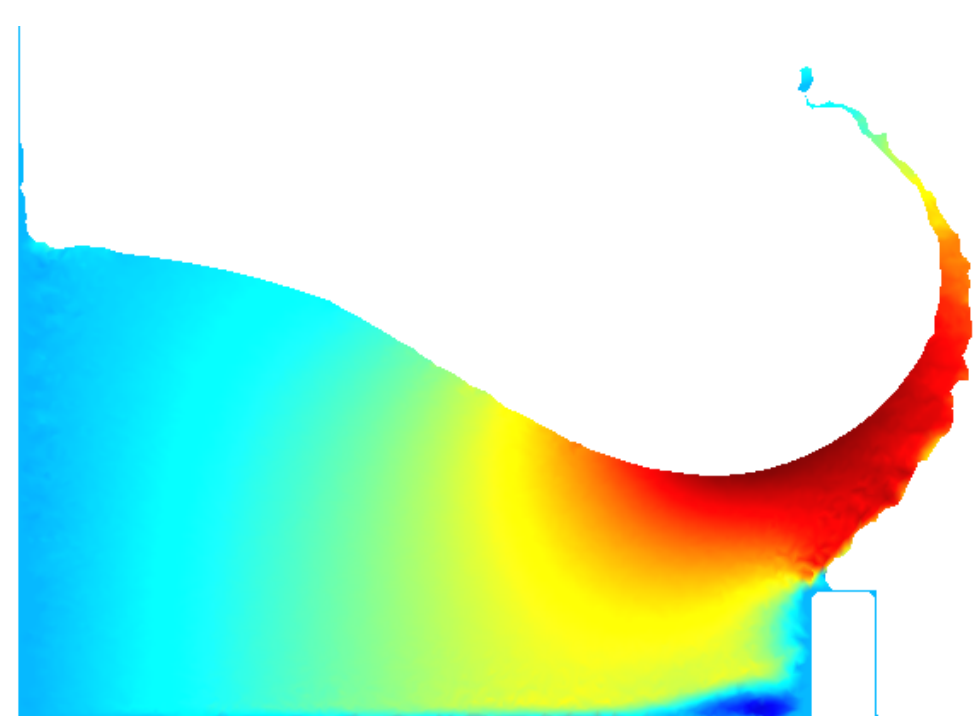
With J. Alonso (Stanford University, USA) and L. Bernal (University of Michigan, USA)

Particle Finite Element Method (PFEM)

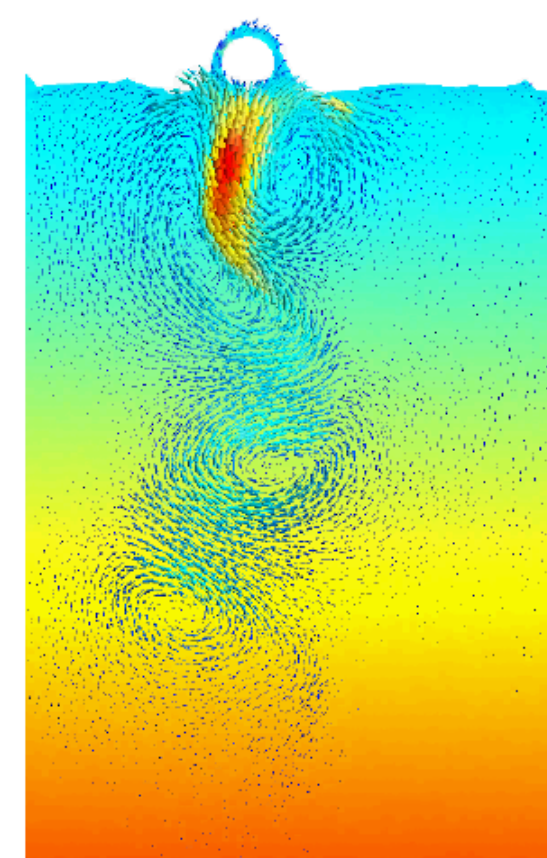
M. Cerquaglia (with J.-P. Ponthot and R. Boman)

Develop PFEM to simulate **free-surface flows** and **fluid-structure interaction**

- Lagrangian (particles) + fast remeshing
- FEM robustness



Dam-break wave over an obstacle. Particle velocity.



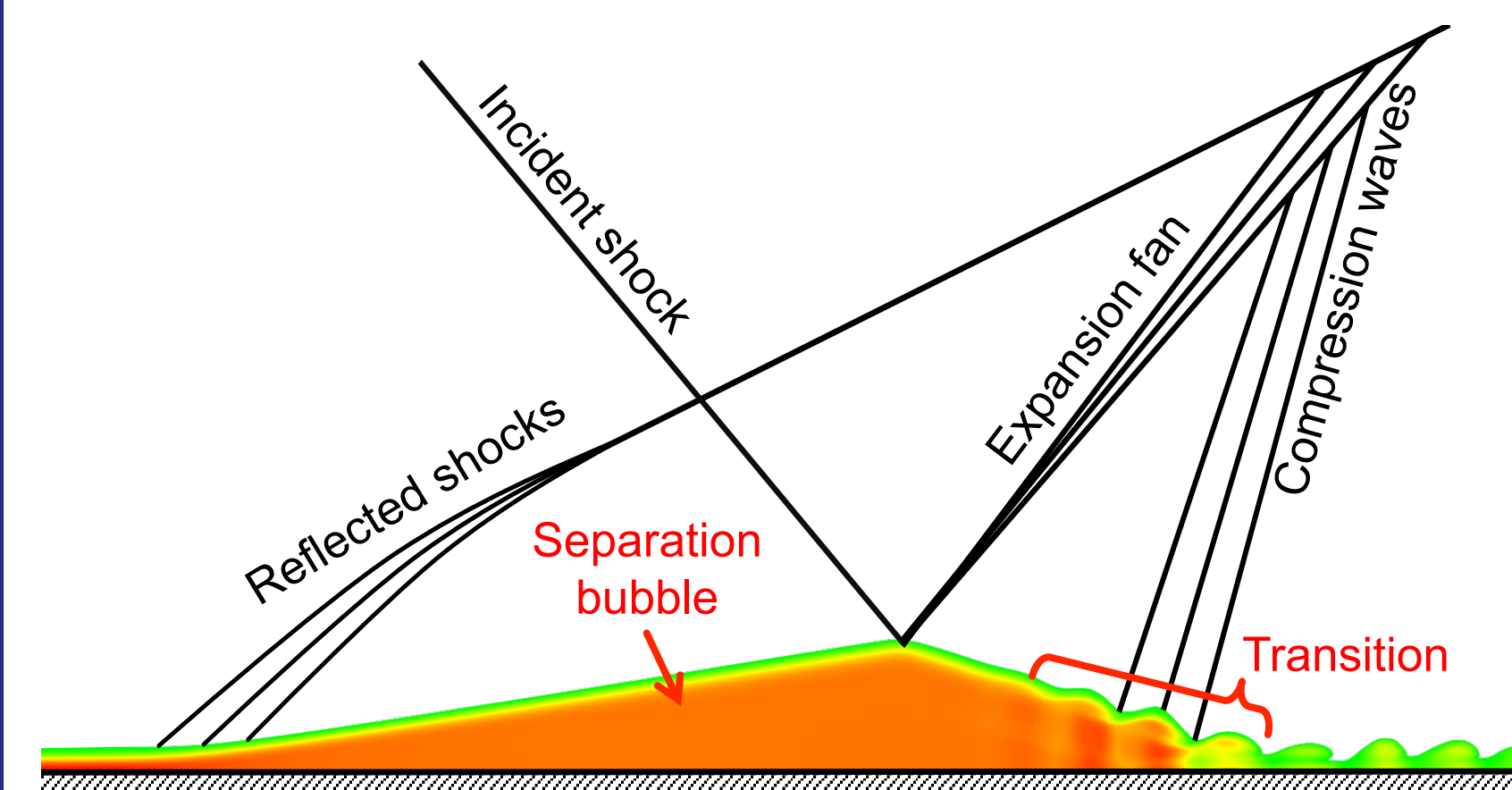
Buoyant rising of a low-density sphere in a liquid. Pressure and velocity.

Shock - boundary layer interaction

S. Niessen (with G. Dimitriadis)

Understand the **transition** and **bubble breathing** induced by SWBLI

- Base flow from direct numerical simulations (DNS)
- Unstable modes from **linear stability theory** (LST)



Laminar shock wave - boundary layer interaction. Density contour in the separation bubble and pressure lines of the shock pattern

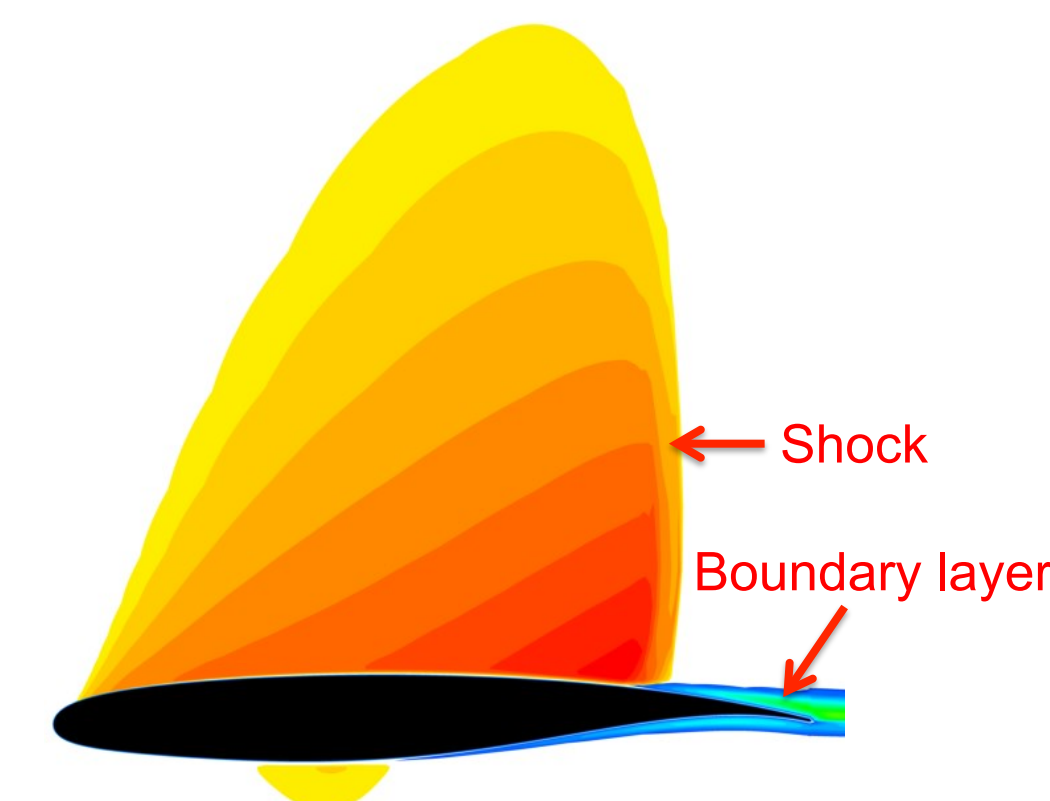
With S. Hickel (TU Delft, The Netherlands)

Aeroelastic tailoring

H. Güner / A. Crovato (with G. Dimitriadis)

Develop a fast and accurate **aeroelastic** modeling methodology for **transonic** flows

- Full potential + boundary layer equations (Field Panel Method)
- Time-linearized transonic small disturbance potential equation



Transonic flow around an airfoil. Mach number in the supersonic region and in the boundary layer from RANS.

With Embraer (Brazil)