



**Barcelona
Supercomputing
Center**

Centro Nacional de Supercomputación

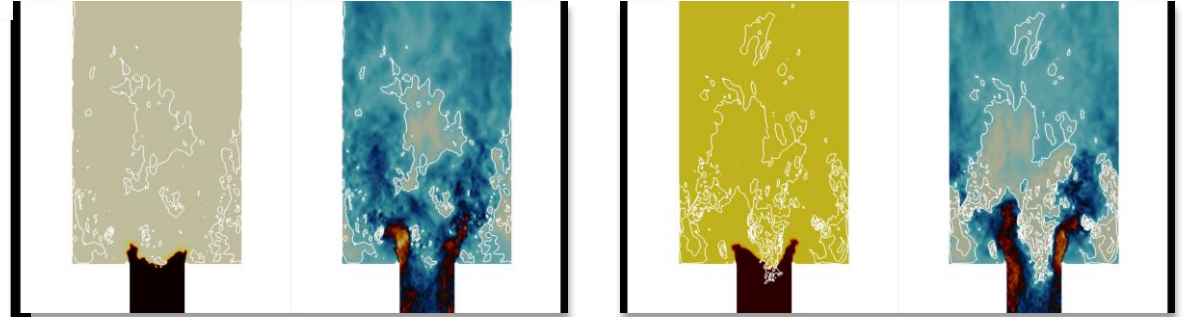
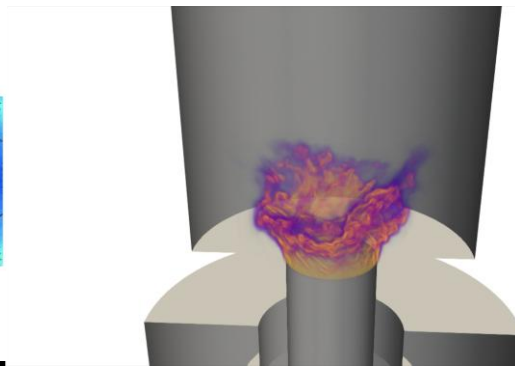
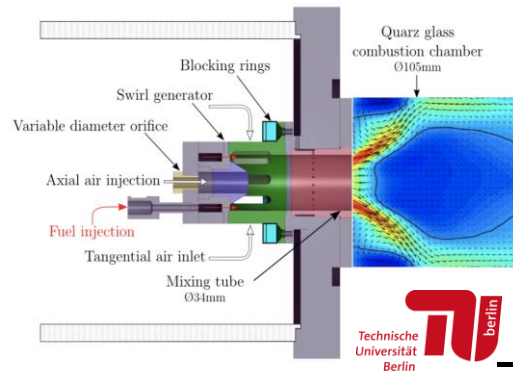
Computer Applications in Science & Engineering (**CASE**)

*We develop HPC software for science
and industry*

Hydrogen-combustion for propulsion and power

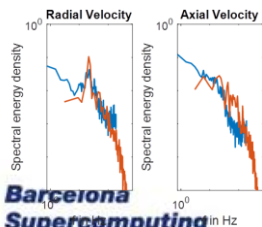
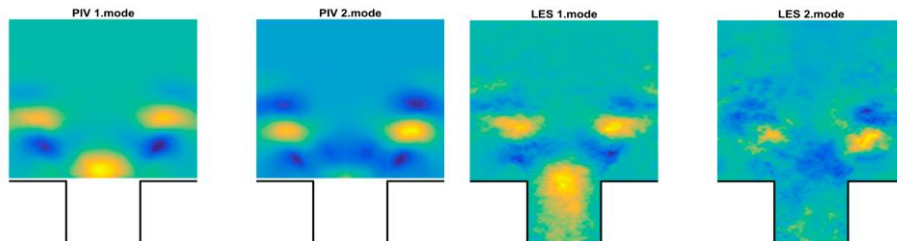
Daniel Mira, daniel.mira@bsc.es

Stable operation



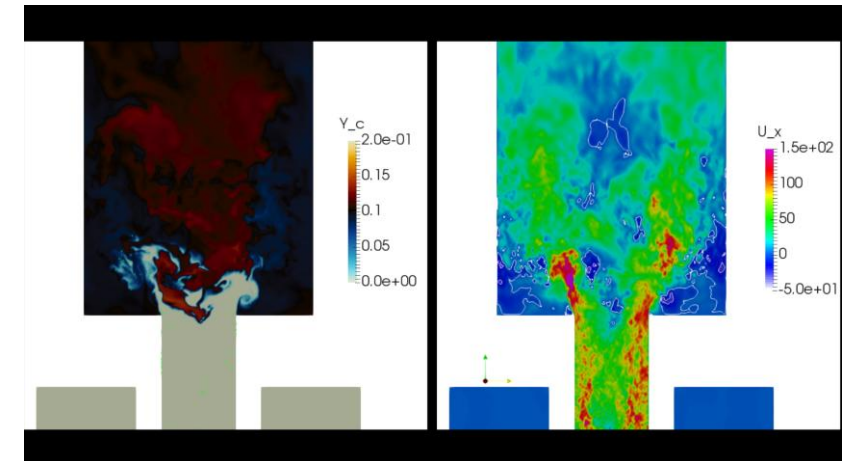
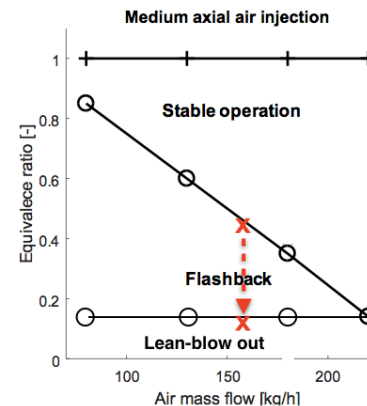
Strong coupled dynamics between vortex breakdown position and flame front as flashback is approached (from $\phi = 0.6$ to $\phi = 0.4$)

Flow instabilities

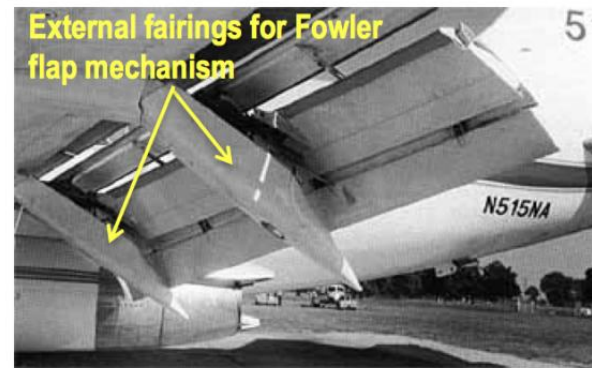


Identification of a self-excited flow oscillation with a characteristic frequency:
Precessing Vortex Core (PVC)

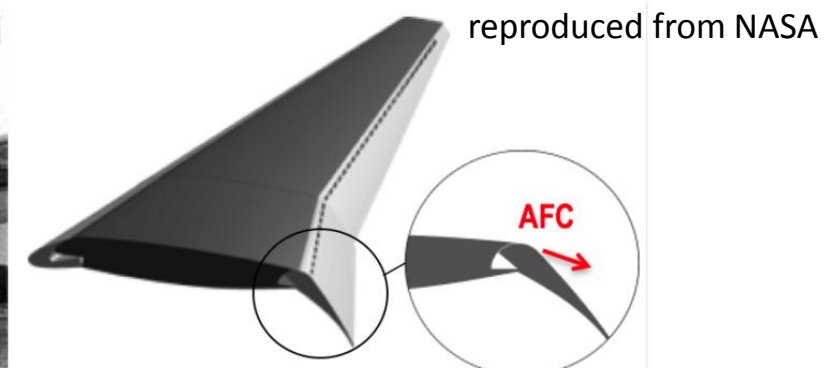
Lean blow-out



- **BSC** is researching in innovative active flow control for more efficient and secure aircrafts.
- JAXA and NASA CRM high lift airplane considered as platforms for the study.
- Typical job **200M** elements and **2000 CPUs**.
- Demonstrated up to **2B** elements and **100k CPUs**.

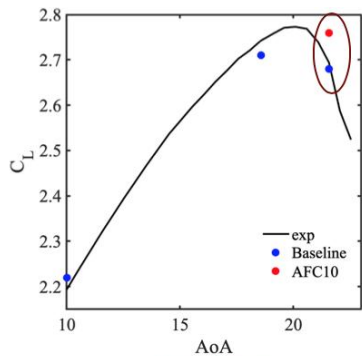


(a) An example of external fairings for Fowler flap mechanism.⁶



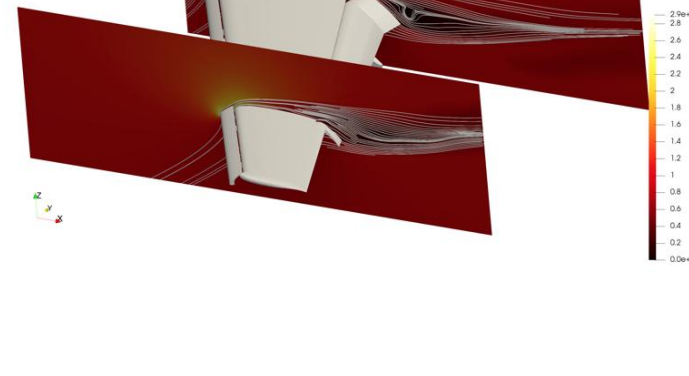
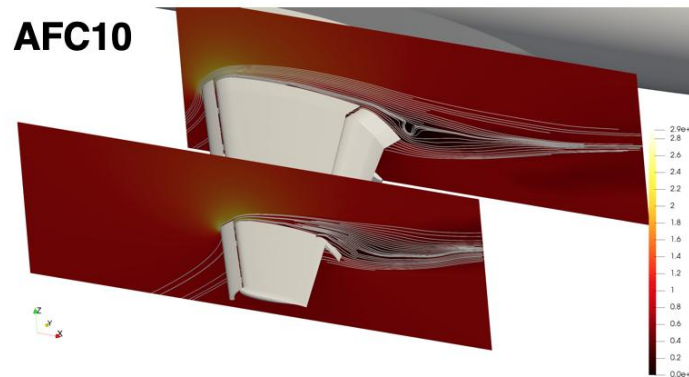
(b) A simple hinged flap high-lift wing with AFC (no external fairings).

Figure 1. Concept of AFC-enabled high-lift system for drag reduction.



	C_L	C_D	C_L/C_D
Baseline	2.685	0.405	6.630
AFC10	2.754 (2.6%)	0.391 (3.5%)	7.040 (6.2%)

AFC10



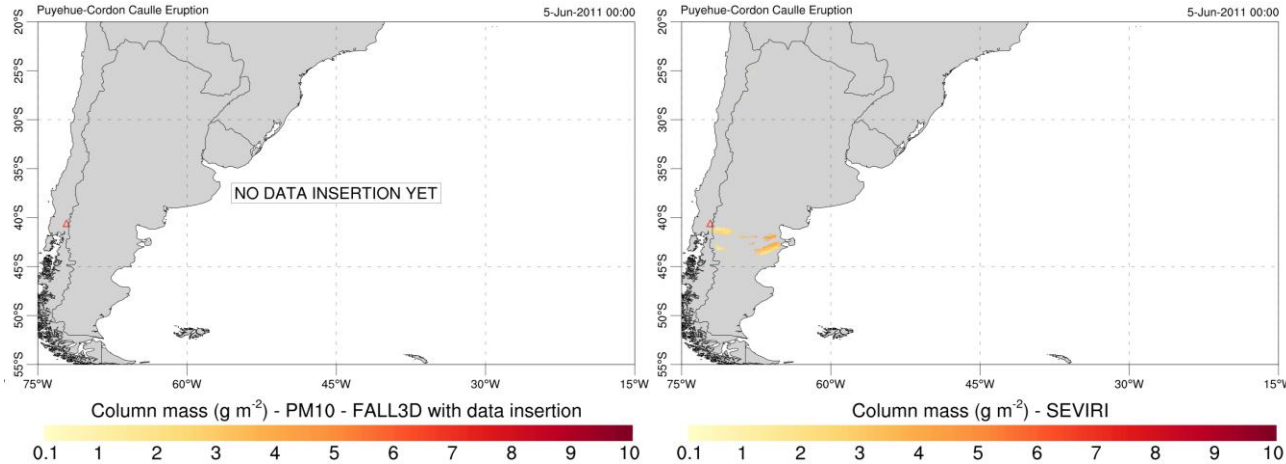
Videos

<https://www.youtube.com/watch?v=1DmomE9GBPQ&feature=youtu.be>

<https://www.youtube.com/watch?v=wYYYJr-ouhE&feature=youtu.be>

https://www.youtube.com/watch?v=DW5_weU0aeU&feature=youtu.be

Center of Excellence for Exascale in Solid Earth (ChEESE)



Exascale for Natural Hazards

10 flagship codes

12 Pilot Demonstrators (PDs)

PD12: high-resolution ensemble-based
volcanic aerosol forecast



www.cheese-coe.eu



cheese_coe



@ChEESE_CoE



**Barcelona
Supercomputing
Center**

Centro Nacional de Supercomputación