

## Computer Applications in Science & Engineering CASE

### Overview:

**CASE Department Director:** [José María Cela](#)

The mission of the Computer Applications in Science and Engineering (CASE) Department is to develop new computational strategies to simulate complex problems capable of running efficiently on modern supercomputers. The parallel codes resulting of this research activity apply in the realm of Computational Engineering and Physics and Computational Societies. Collaborative projects with industry and scientific groups are the main motivation underlying all development carried out in CASE.

In case you want to visit us, follow [this link](#).

### Objectives:

The research work done in the CASE department is truly multidisciplinary, requiring a deep level of expertise in many fields. In order to successfully develop our applications, the skills of the CASE team in numerical methods and parallel programming must be complemented by experts in the appropriate areas. CASE develops collaborations with other scientific groups in all fields of science and technology, complemented with strong links with Industrial partners who are in need of advanced simulations of complex technology problems. The main objective of the CASE Department is to create new simulation tools with advanced HPC techniques to solve complex problems in science and technology fields.

To achieve its objectives, the CASE team develops and co-develops five main high performance codes, which are used in national/international projects and are the core of the collaborations and contracts with companies:

- [ALYA](#): HPC Multiphysics code. It solves Fluid mechanics, Solid mechanics, Electric propagation, Combustion, etc.
- [FAI3D](#): Volcanos ash transport. Used in production in South American Volcanic Ash Advisory Centres (VAAC).
- [BSIT](#) (Barcelona Seismic Imaging Tools): Acoustic/Elastic waves, Forward Modelling, RTM, FWI. Promoted by Repsol.
- [SIESTA](#): Ab-initio molecular dynamics. CASE is a co-developer of this code.
- [PANDORA](#): An HPC Agent-Based Modelling framework to develop social simulations.

### Research Lines:

Research lines include:

- [Computational Fluid Dynamics](#)
- [Computational Solid Mechanics](#)
- Seismic Imaging
- Social Simulations
- [Geophysical Flows](#)

- Visualization and post-process
- Parallelization
- Optimization

### **Projects/Areas:**

In CASE, applied research is organized in Projects. Each Project involves a combined effort amongst several research lines, computational tools and partnerships. These are CASE projects:

- [The Alya System](#)
- REPSOL - BSC Research Center
- Iberdrola project
- C2CA, W2PLASTICS European projects on recycling
- Environment and Atmospheric Flows
- Alya Red - HPC-based Computational Biomechanics
- Biomechanics
- [Pandora](#)

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