Barcelona Supercomputing Center
Centro Nacional de Supercomputación

EXCELENCIA SEVERO OCHOA

BSC and HPC Solutions for companies

Technology Transfer Office

28/11/2017

HPC and **industrial sector**

Many organizations are now using HPC as an essential part of their business strategy. HPC can help them **design new products**, **optimize manufacturing** and delivery processes, solve production problems, mine data, and **simulate processes**, all in an effort to become more competitive, profitable and “green”.

This is done by applying compute cycles in order to **solve problems in the fastest way possible**:

A problem that would take days to solve on a laptop can be solved on a SUPERCOMPUTER in a few minutes

HPC: An enabler for all economic sectors

Advances leading to:

- Improved Healthcare
- Superior Materials
- More Competitive Industry
- Big data an data analytics
- Better Climate Forecasting

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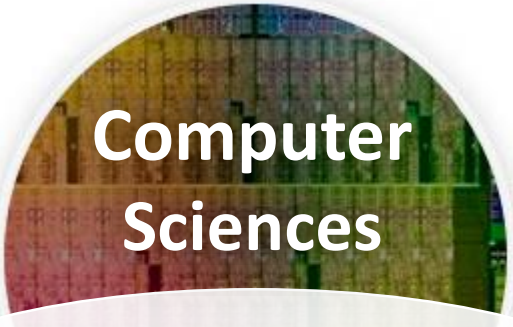
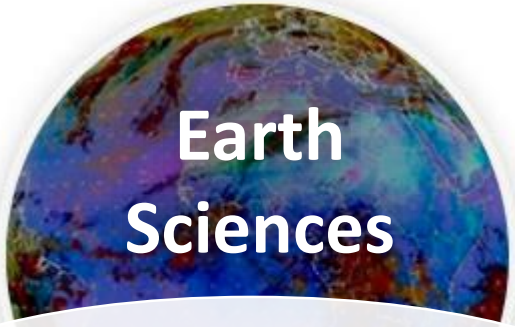
Mission of BSC **Scientific Departments**



To influence the way machines are built, programmed and used: programming models, performance tools, Big Data, computer architecture, energy efficiency

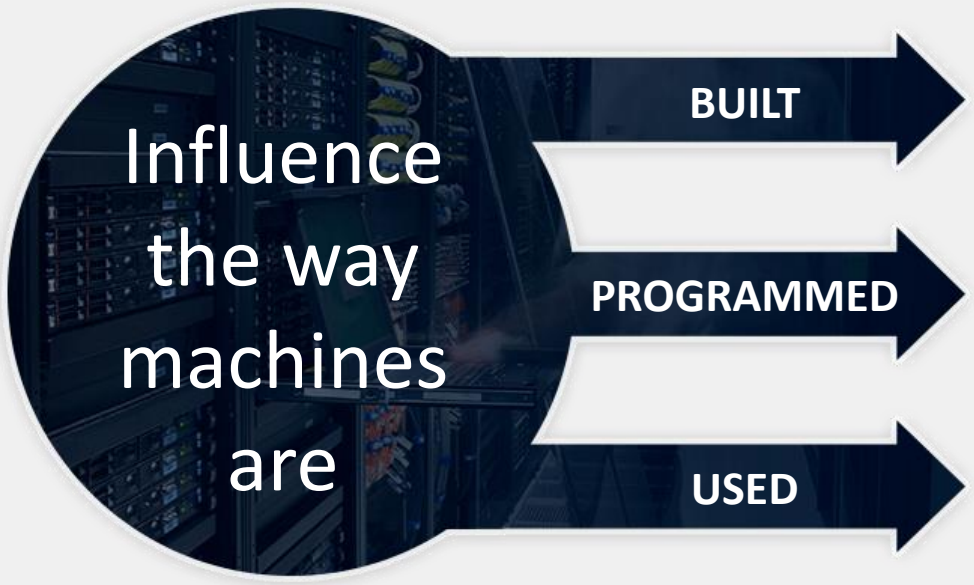


To develop and implement global and regional state-of-the-art models for short-term air quality forecast and long-term climate applications

To understand living organisms by means of theoretical and computational methods (molecular modeling, genomics, proteomics)

To develop scientific and engineering software to efficiently exploit super-computing capabilities (biomedical, geophysics, atmospheric, energy, social and economic simulations)

Computer Sciences



Holistic Computer Architecture Research

20 years innovating in Programming Models

Performance Analytics Tools: From Data to Insight

In the context of

- Race towards Exascale
- HPC and Big Data convergence
- Artificial Intelligence era
- Multiple architectures for different applications domains

Earth Sciences

Environmental modelling and forecasting, with a particular focus on weather, climate and air quality

Modeling **air quality** and **Sand and Dust Storms** Processes from urban to Global and the impacts on weather, health and ecosystems

Research and Forecasts

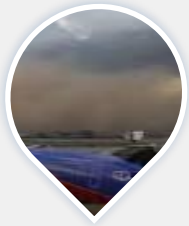
Climate predictions system from subseasonal-to-decadal forecasts

Service Users Sectors

Infrastructures

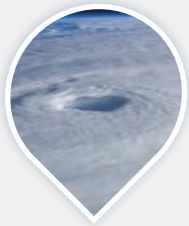
Solar Energy

Urban development


Transport

Wind Energy

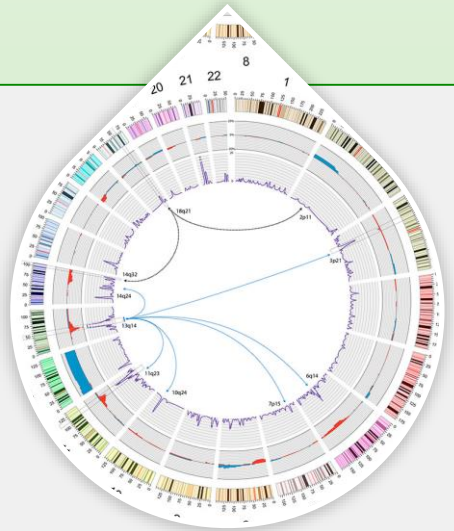
Agriculture


Insurance

Life Sciences

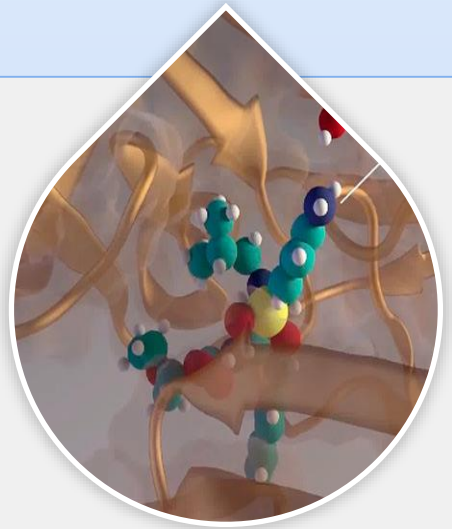
Computational Genomics

Design, development, and use of bioinformatic protocols and tools in the context of comparative genomics and analyses of gene and protein collections.



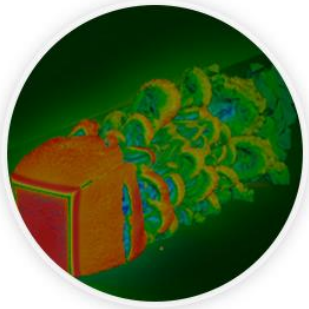
Protein modelling and drug discovery

Theoretical and computational approaches to protein interactions, and study of complex biochemical processes at electronic and atomic theoretical detail.



CASE

Our mission is to develop computational tools to simulate highly complex problems and that exploit efficiently the supercomputing capabilities



Energy Industry

Aeronautic and automotive Industry

Aerodynamics

ATM in dust conditions

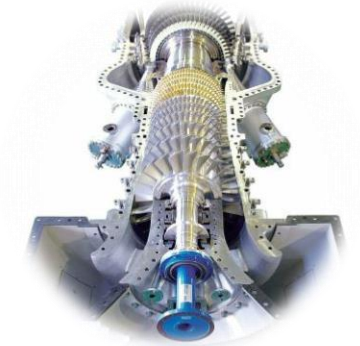
Composite materials

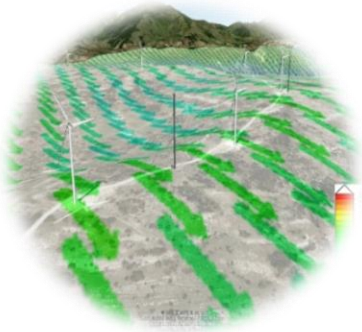
Innovative Manufacturing

Biomechanics (cardiovascular system, respiratory system)

Smart Cities

Agent-based models





BSC TECHNOLOGICAL PORTFOLIO

Pharma

Medical

Bioinformatic tools for target and drug discovery

Programming models, performance tools & energy efficient hardware

Mobile

HPC

Data Centres

Smart cities

Big Data

Weather / Climate Agencies

Renewables

Agriculture

Air quality, weather and climate modelling products

BSC

Middleware, System Software

HPC

Smart Cities

IoT

Cloud

Big Data

Simulations of complex problems

Embedded electronics for improving safety in time-critical applications

Renewables

Oil & Gas

Pharma

Medical

Engineering

Smart Cities

Nautical

Automotive

Aviation

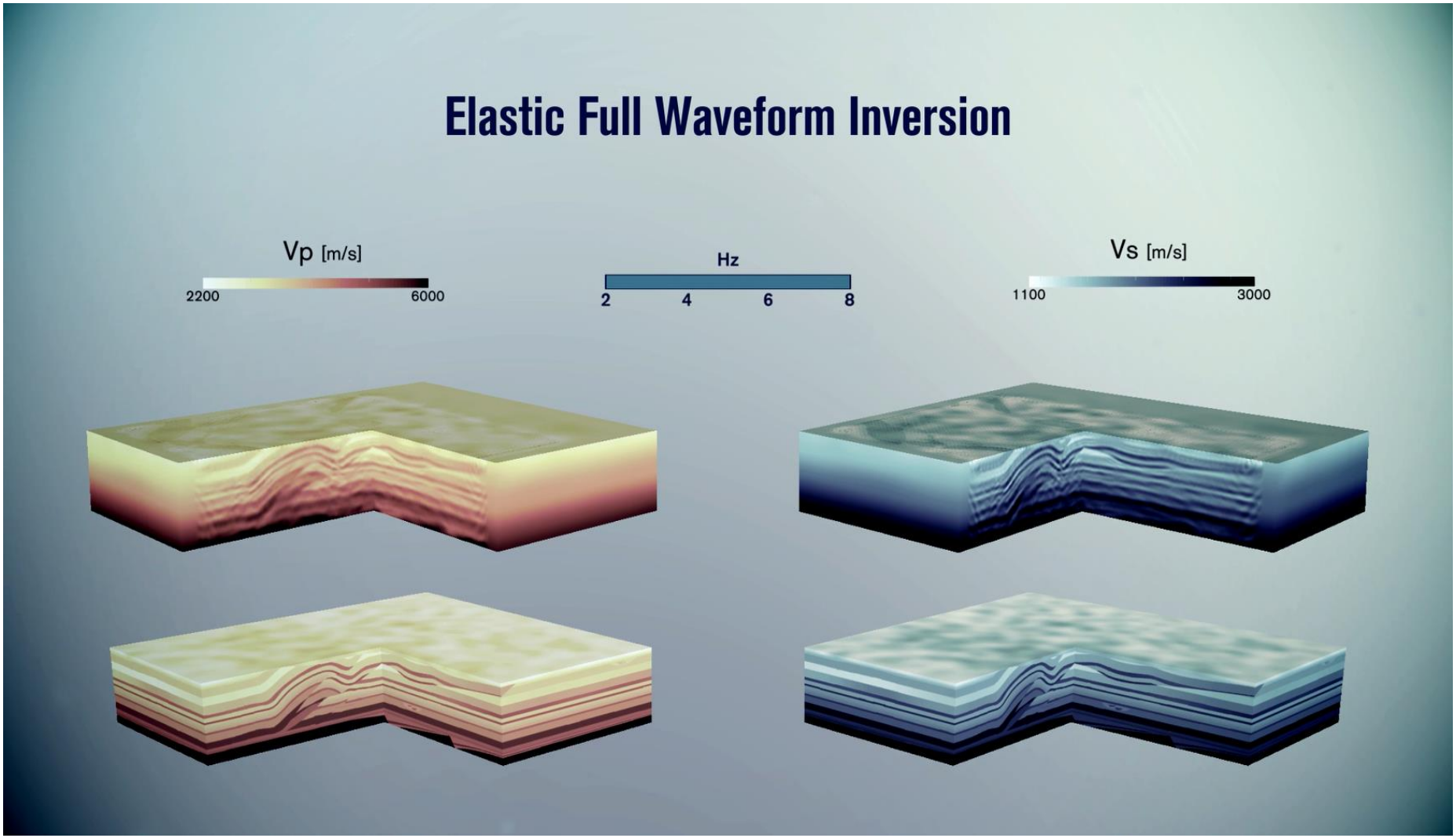
Automotive

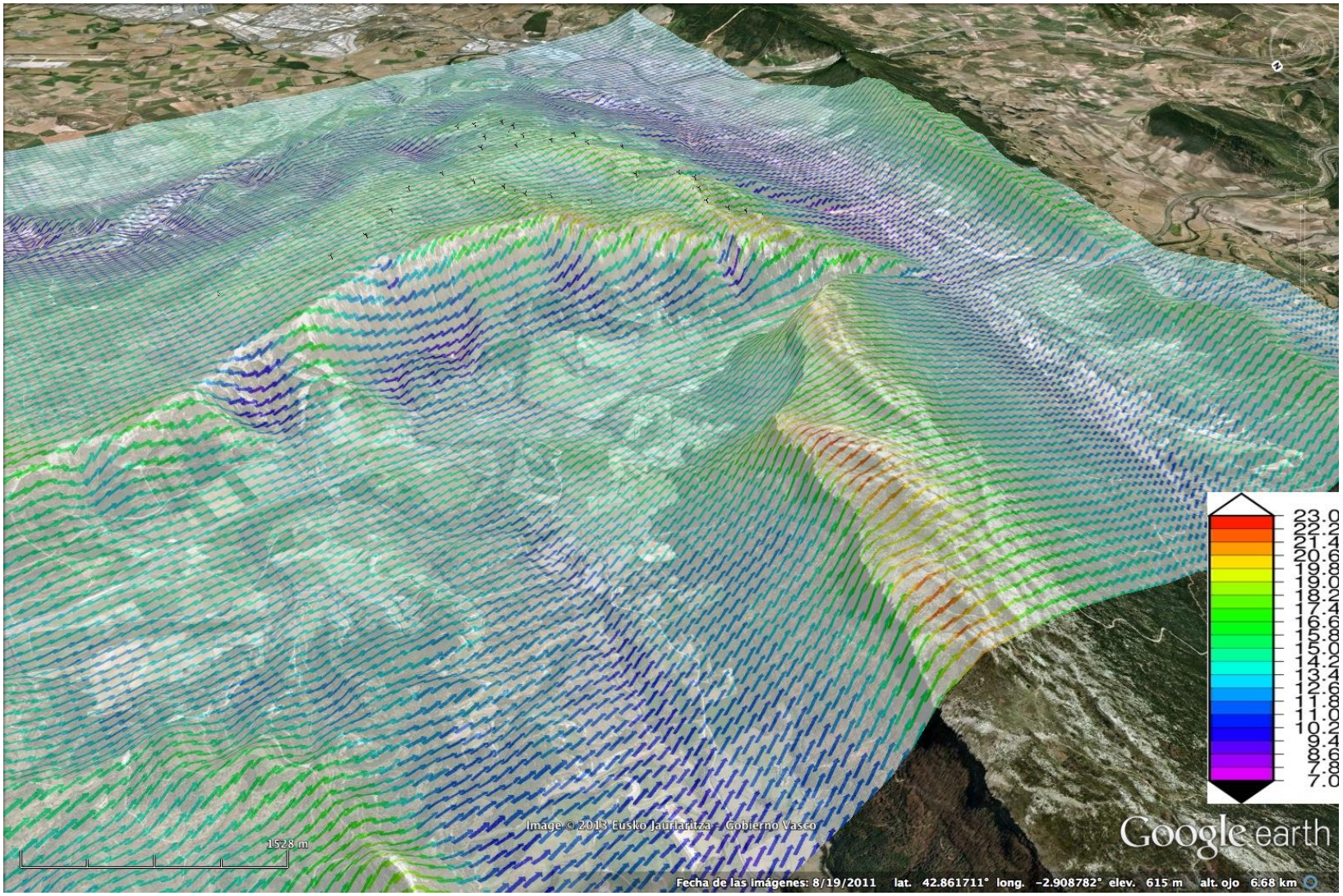
Rail

Aviation

Space

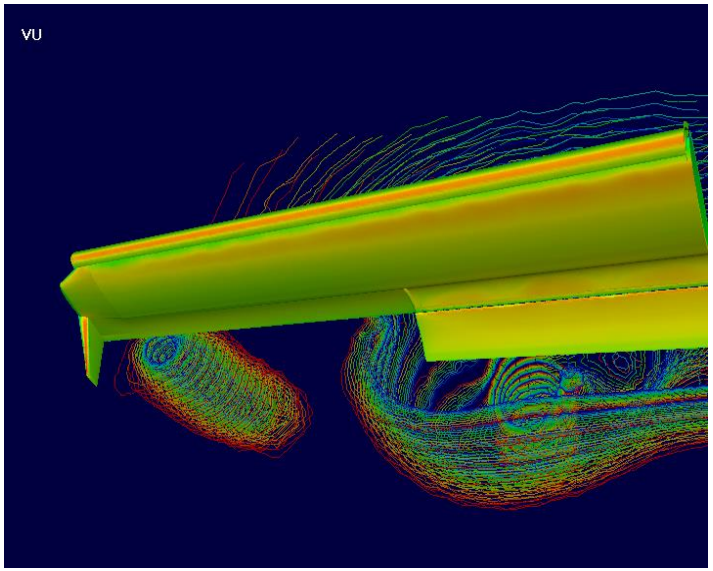
Energy: REPSOL-BSC Research Center

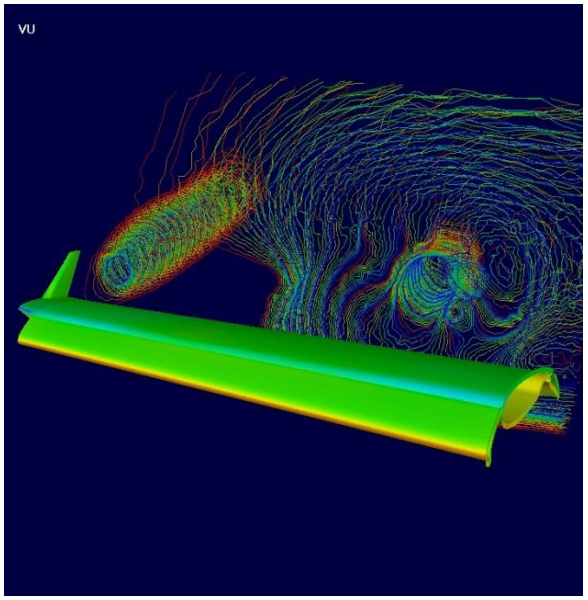




Mean wind speed

IBERDROLA RENOVABLES


VU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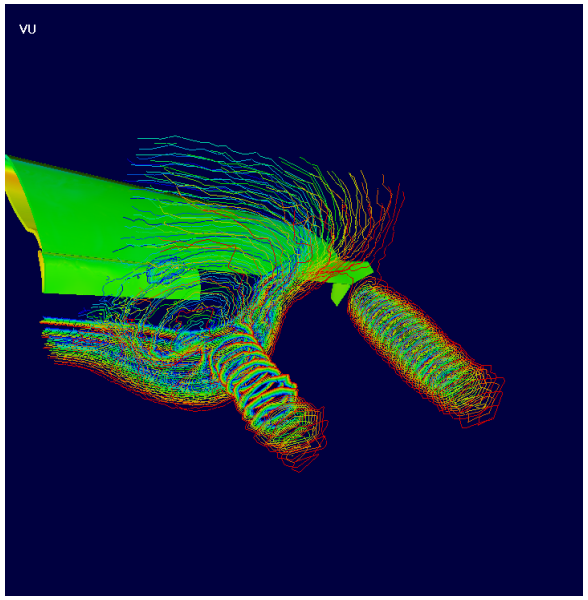
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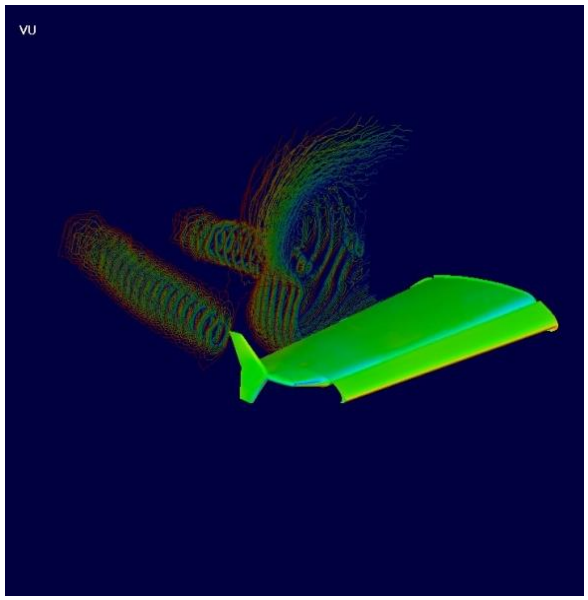
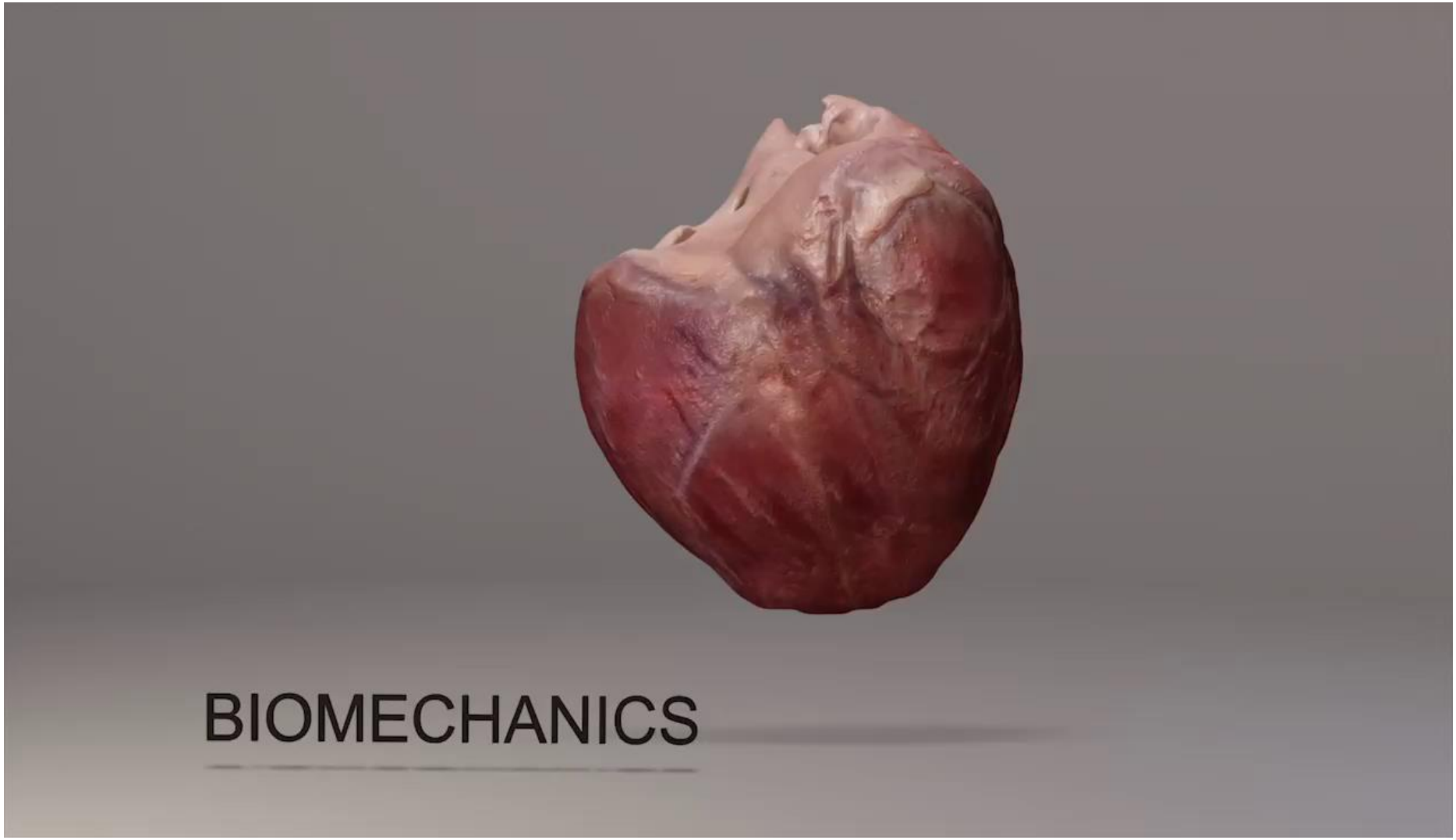
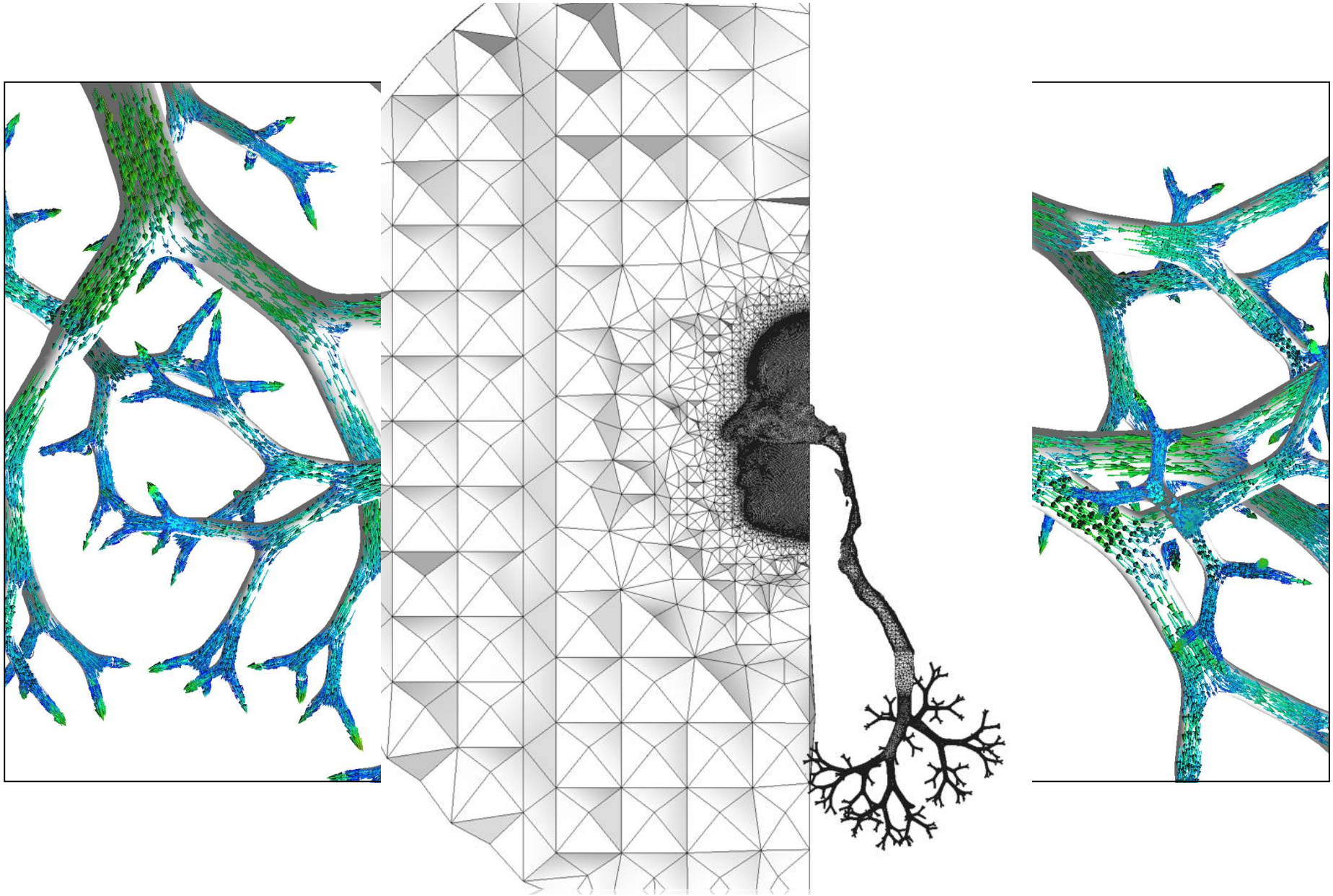

VU

VOLCANIC ASH
DISPERSION
EYJAFJALLAJÖKULL

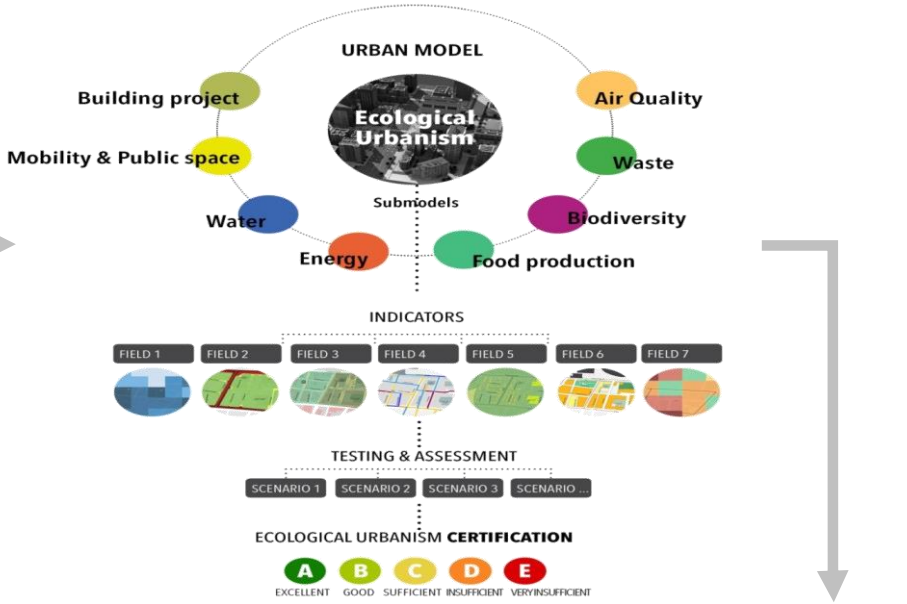

BIOMECHANICS

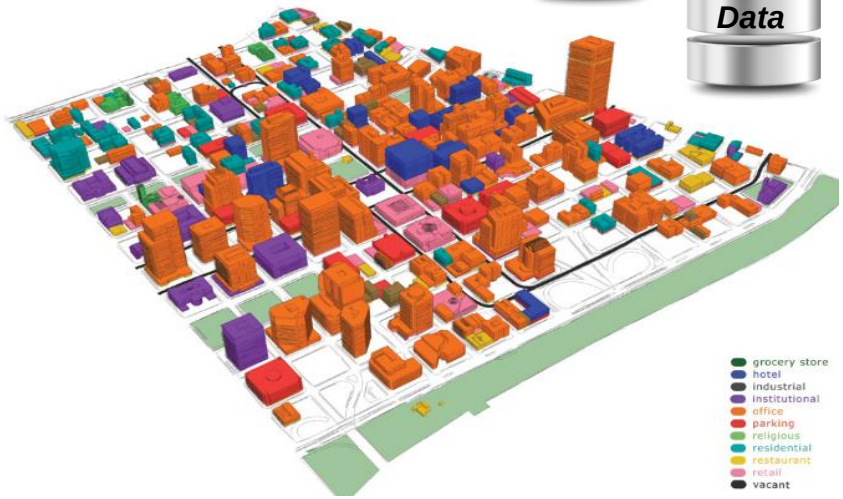


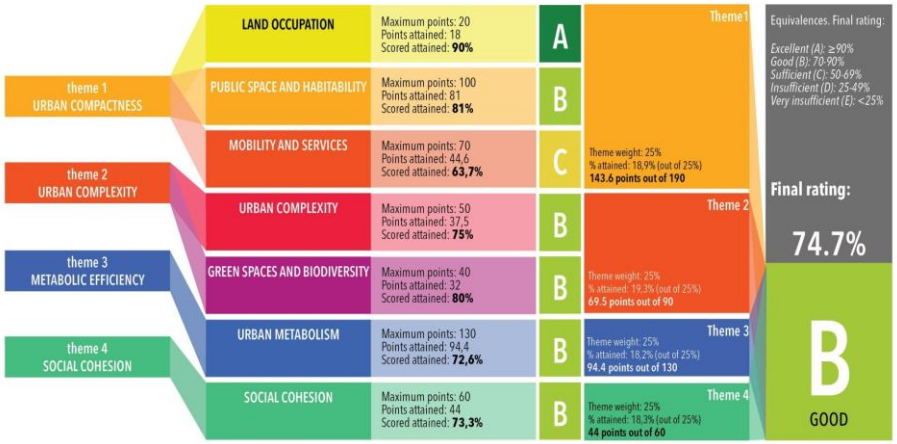
Urban Planning Prototype

Exploration and query tool

Ontologies







IBM

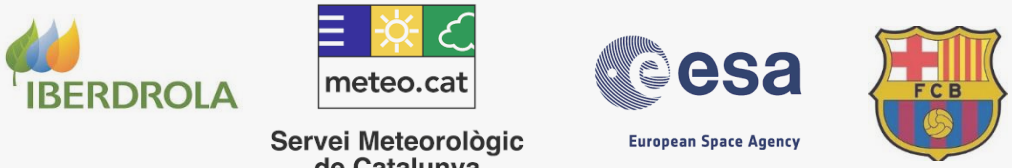
BCN ECOLOGIA Agència d'Ecologia Urbana de Barcelona

Joint Research Centers (JRC)

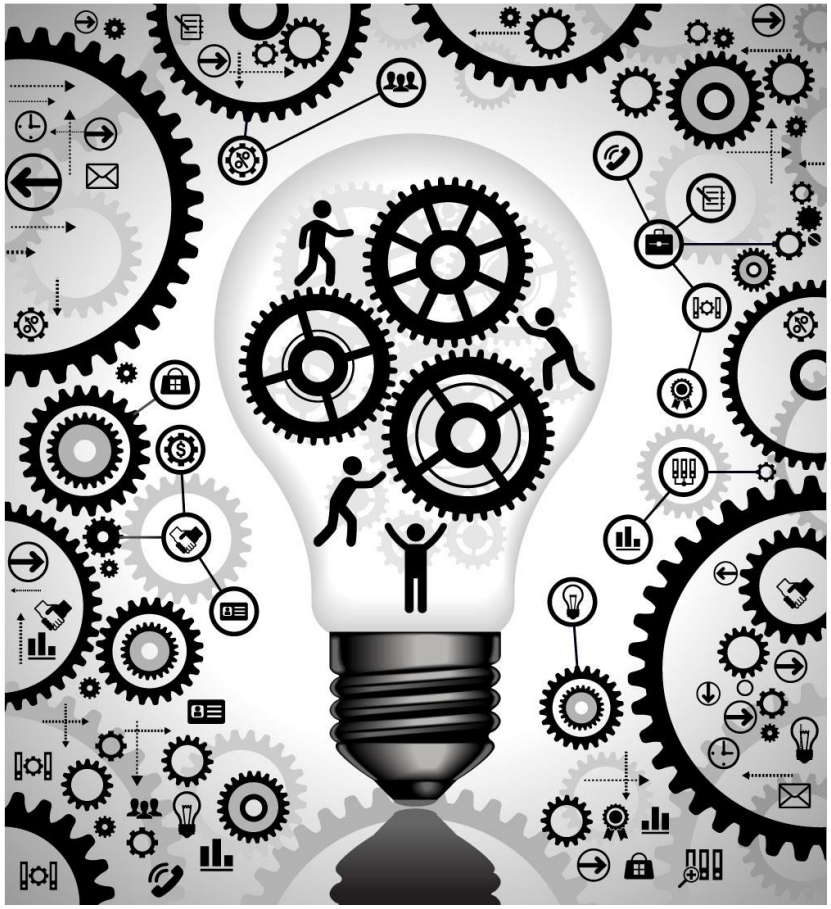
Multi Annual Framework Agreement (MAFA)

Customized R&D Projects

Industrial PhD



How to Collaborate



- Customised R&D projects with companies
  - Joint Research Centers
  - Multi-Annual Framework Agreement
  - Customized R&D projects
  - Industrial PhD
- Accessing BSC technologies through licenses
  - To our Patent Portfolio
  - To our Software Portfolio
- **Service Platform**
  - **Pay per Service (computational genomics, air quality, big data)**
  - **Software as a Service**

Success stories

Climate projection for a Spanish wine Company by Earth Sciences Services

After request of a winemaker interested in identifying potential sites for grape plantation in the South America, we performed an analysis to identify if and where it will be possible to grow grapes in 2050. Six wine indices accounting for climate projections of temperature and precipitation were used in the assessment.

Partners and collaborators

TORRES RAIMAT CODORNÍU SOGRAPE VINHOS SYMINGTON Family Estates VIÑAS DEL VERO

GOBIERNO DE ESPAÑA MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD

JRC EUROPEAN COMMISSION

Agència Catalana de l'Aigua

IRTA RESEARCH & TECHNOLOGY FOOD & AGRICULTURE

Projects

Barcelona Supercomputing Center Centro Nacional de Supercomputación

imprex Learn from today to anticipate tomorrow

MANTEL

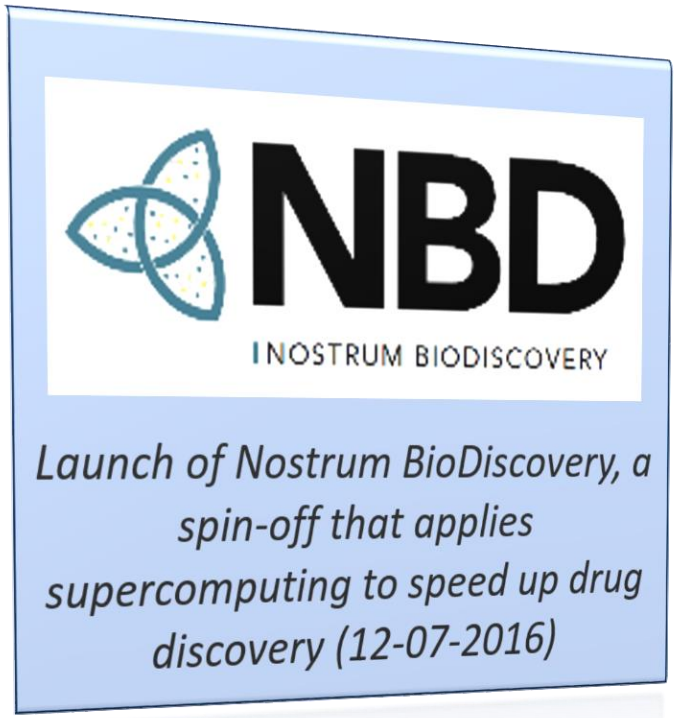
HIATUS SECTEUR

climateurope Linking science and society

First BSC's Spin Off

Nostrum Biodiscovery: How a drug finds its target

PELE transfered to market

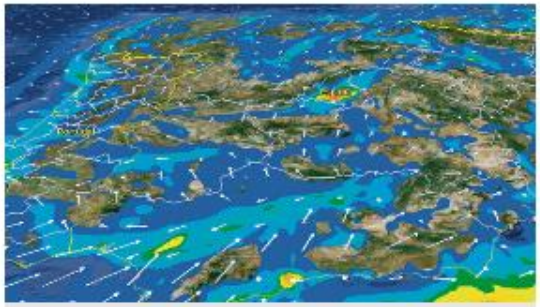


Nostrum Biodiscovery aims to help its clients speed up the first stage of drug development

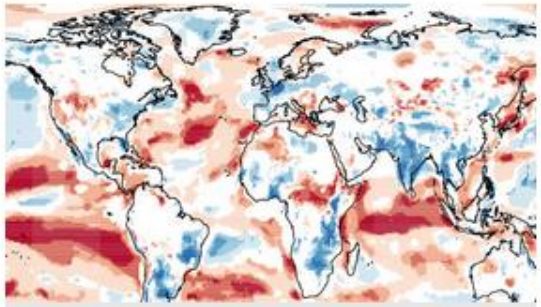
*"it is estimated that the approach used by Nostrum BioDiscovery can reduce the early-stage drug development by up to **two years** (the discovery phase prior to pre-clinical trials) and cut costs by 15-20% in this first phase, **implying an estimated saving on average of 40 million euros**."*

Experience and cutting-edge supercomputational technologies:
PELE, ED/MD, MDWeb, MoDEL

Service Platform



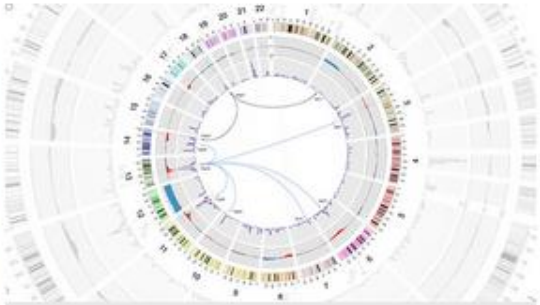
AIR QUALITY



CLIMATE

HPC PERFORMANCE ANALYSIS AND OPTIMIZATION

MINERAL DUST



COMPUTATIONAL GENOMICS

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More info. at:
www.bsc.es

Thanks! ☺

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