EUROCHAMP2: Integration of European Simulation Chambers for Investigating Atmospheric Processes

To understand climate change and related problems such as atmospheric composition change, scientists need to study the chemistry of the atmosphere. One way to do this is through controlled experiments, by fitting analytical instruments to large boxes, cylinders or air balloons – 'simulation chambers'. Europe has more than 20 of these atmospheric test chambers. The EU-funded EUROCHAMP2 project – the continuation of EUROCHAMP – aims to integrate European experimental facilities so that researchers make better use of them.

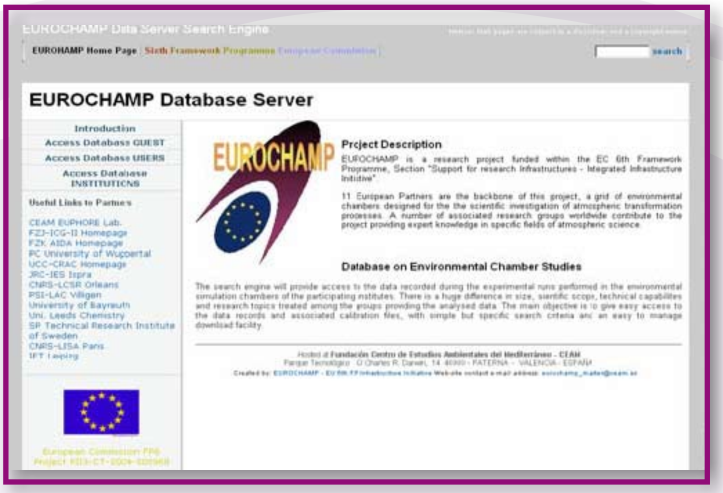
SCIENTIFIC ENLIGHTENMENT FROM THIN AIR

As climate change has moved up the political agenda, the topic of atmospheric chemistry has taken on new urgency. The bulk constituents of air – oxygen and nitrogen – were central to the work of pioneering scientists including Priestley, Lavoisier and Cavendish. In the last few decades, however, the focus has been on scarcer gases that control acid rain, smog and the effects of radiation from the sun. These include sulphur dioxide, nitrogen oxides, carbon dioxide, water vapour, methane, ozone, fluorocarbons and volatile organic compounds (VOCs).

Atmospheric chemistry is a complex subject that draws on chemistry, physics, meteorology, computer modelling, oceanography, geology and volcanology. Like many other fields of natural science, it is studied in three main ways: by observing the natural world, by carrying out controlled experiments, and through mathematical simulation.

Controlled experiments are essential in helping to understand real-world observations and calibrate computer models. But how can a box of air accurately mimic what goes on in the vast atmosphere, especially the freezing temperatures and intense radiation that characterise its upper regions? A particular problem is the tendency of gas molecules to stick to the walls of the box.

Given a big enough box, most of the molecules zooming around inside will rarely hit the walls, so experimental observations reflect fairly accurately the open conditions of the real atmosphere. Europe has more than 20 of these boxes



– otherwise known as 'atmospheric reaction chambers' – and many of them are certainly big. They range from cylinders and spheres of a few hundred litres in volume to a massive cube measuring more than six metres on each side.

The chambers fall into three basic types: outdoor and indoor photoreactors, plus 'dark chambers'. Photoreactors, illuminated by the sun or artificial ultraviolet lights, are especially important in the study of ozone and smog formation, while dark chambers reveal how atmospheric chemistry changes at night or during the polar winter. The EUROCHAMP project brought together the most important atmospheric reaction chambers in Europe to create an integrated, international infrastructure.

THINKING OUTSIDE THE BOX

Of course, there is more to the average atmospheric reaction chamber than a box of air. The box itself is generally made of inert materials such as glass, stainless steel, Polytetrafluoroethylene (PTFE) or other fluorocarbon polymers. It may have lamps, temperature control and vacuum pumps for simulating conditions above sea level. Most importantly, it typically has a large array of spectrometers, particle counters and other sensitive instruments.

Currently, Europe is the world leader in large-scale atmospheric modelling and EUROCHAMP2 aims to reinforce this position. With additional partners, EUROCHAMP2 is bringing together more research facilities to boost transnational access. This will open up the doors to Europe's cutting-edge atmospheric research facilities to even more researchers from across the globe.

Moreover, EUROCHAMP shed light on knowledge gaps in the field of atmospheric chemistry and physics that EUROCHAMP2 is trying to reduce. Bringing together more partners from diverse fields will allow the project to bridge these gaps and make the infrastructure more useful across a greater number of research areas.

In order to make better use of the data generated by the project, attention is being given to EUROCHAMP2's analytical techniques. Efforts are being undertaken to opitimise existing techniques as well as create new analytical devices designed specifically to be used with environmental chambers.

Project acronym: EUROCHAMP2

Funding scheme (FP7): Integrated Activities (IA)

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EU project officer: Brigitte Weiss

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Partners:
Bergische Universität Wuppertal (DE)
Forschungszentrum Jülich, GmbH (DE)
Fundación Centro de Estudios Ambientales del Mediterráneo (ES)
Universität Bayreuth (DE)
University College Cork - National University of Ireland (IE)
Centre National de la Rechèrche Scientifique Orleans (FR)
Paul Scherrer Institut (CH)
Karlsruhe Institute of Technology (DE)
University of Leeds (UK)
SP Sveriges Tekniska Forskningsinstitut AB (SE)
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Project webpage: www.eurochamp.org/

EUROPEAN COMMISSION