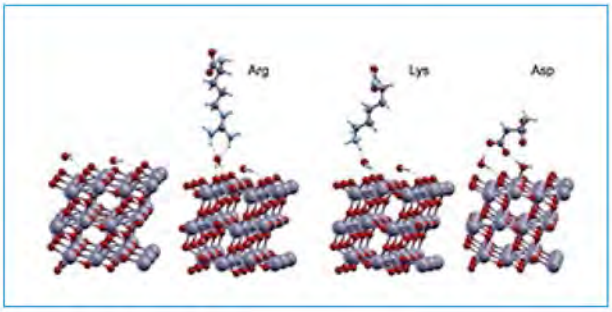
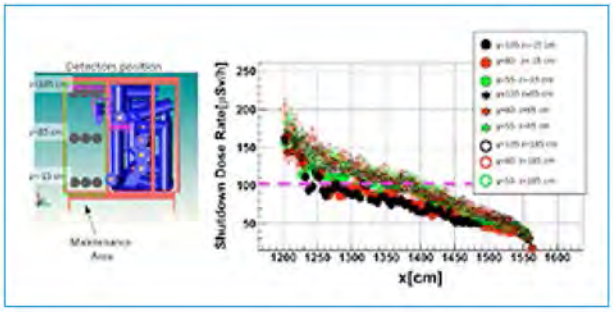
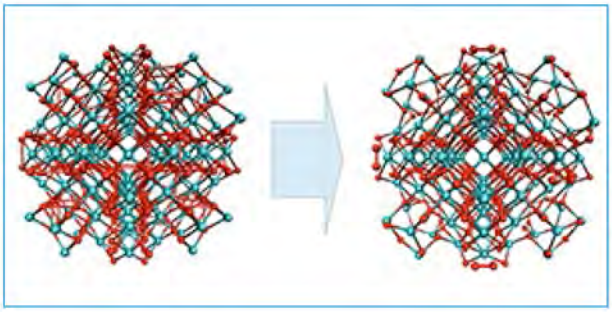
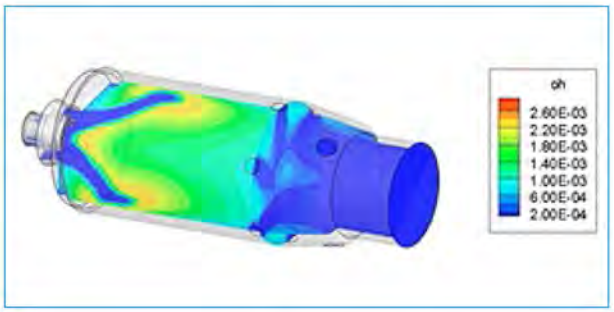
Italian National Agency for New Technologies,
Energy and Sustainable Economic Development

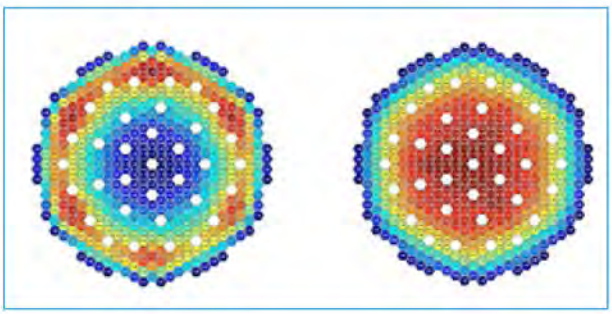
High Performance Computing on CRESCO infrastructure: research activities and results 2013

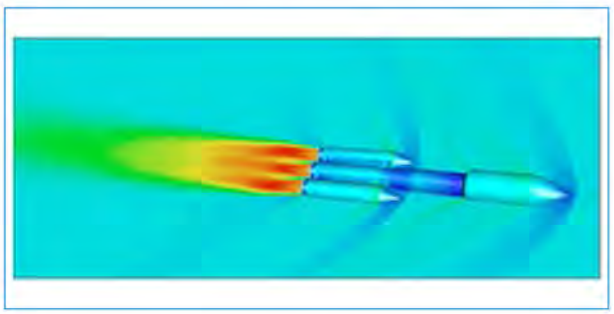












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Contributions provided by a selection of users of the CRESCO infrastructure.

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Foreword

During the year 2013 CRESCO high performance computing clusters have provided more than 27 million hours of "core" computing time, at a high availability rate, to more than one hundred users, supporting ENEA research and development activities in many relevant scientific and technological domains. In the framework of joint programs with ENEA researchers and technologists, computational services have been provided also to academic and industrial communities.

This report, the fifth of a series started in 2008, is a collection of papers illustrating the main results obtained during 2013 using CRESCO HPC facilities in various fields as material science, computational fluid dynamics, climate research, nuclear technology, plasma physics, complex system physics and biophysics. The report shows the variety of the applications of high performance computing, which has become an enabling technology for science and engineering.

ENEA Portici Research Centre near Naples is the location hosting the main ENEA computational resources since 2008. This is a result of the CRESCO Project (Computational Centre for Research on Complex Systems), co-funded, in the framework of the 2001-2006 European Regional Development Funds Program by the Italian Ministry of Education, University and Research (MIUR).

The Project CRESCO provided the resources to set up the first HPC x86_64 Linux cluster in ENEA, achieving a computing power relevant on Italian national scale (it ranked 126 in the HPC Top 500 June 2008 world list, with 17.1 TFlops and 2504 CPU cores). It was later decided to keep CRESCO as the signature name for all the Linux clusters in the ENEAGRID infrastructure which integrates all ENEA scientific computing systems, and is currently distributed in six Italian sites.

In 2013 the ENEAGRID computational resources attained the level of 6000 computing cores (in production) and other 5000 in the final test phase. The raw data storage reached 900 TB. Both values show an increase of factor 3 in respect to the past and the increase was made possible by various projects, LAMRECOR, IT@CHA, TEDAT and VIS4FACTORY - funded by MIUR in the framework of the 2007-2013 European Regional Development Funds Program. More specifically, in 2013 the cluster CRESCO3, 2016 AMD cores, was opened to users and a new cluster CRESCO4, 4864 Intel cores, 100 TFlops peak, was installed and certified, being ready for service in 2014.

The success and the quality of the results produced by CRESCO stress the role that HPC facilities can play in supporting science and technology for all ENEA activities, national and international collaborations, and the ongoing renewal of the infrastructure provides the basis for a similar role in the forthcoming years.

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