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Barcelona Supercomputing Center
Centro Nacional de Supercomputación

Presentació projecte APPRAISAL. Model per avaluació de mesures

José Mª Baldasano y Santiago Gassó

Barcelona, 31 octubre 2013

International Agency for Research on Cancer

World Health Organization

PRESS RELEASE
N° 213

12 June 2012

IARC: DIESEL ENGINE EXHAUST CARCINOGENIC

Lyon, France, June 12, 2012 -- After a week-long meeting of international experts, the International Agency for Research on Cancer (IARC), which is part of the World Health Organization (WHO), today classified diesel engine exhaust as **carcinogenic to humans (Group 1)**, based on sufficient evidence that exposure is associated with an increased risk for lung cancer.

International Agency for Research on Cancer

World Health Organization

A major environmental health problem

Air pollution is already known to increase risks for a wide range of diseases, such as respiratory and heart diseases. Studies indicate that in recent years exposure levels have increased significantly in some parts of the world, particularly in rapidly industrializing countries with large populations. The most recent data indicate that in 2010, 223 000 deaths from lung cancer worldwide resulted from air pollution. [2]

The most widespread environmental carcinogen

"The air we breathe has become polluted with a mixture of cancer-causing substances," says Dr Kurt Straif, Head of the IARC Monographs Section. "We now know that outdoor air pollution is not only a major risk to health in general, but also a leading environmental cause of cancer deaths."

The IARC Monographs Programme, dubbed the "encyclopaedia of carcinogens", provides an authoritative source of scientific evidence on cancer-causing substances and exposures. In the past, the Programme evaluated many individual chemicals and specific mixtures that occur in outdoor air pollution. These included diesel engine exhaust, solvents, metals, and dusts. But this is the first time that experts have classified outdoor air pollution as a cause of cancer.

"Our task was to evaluate the air everyone breathes rather than focus on specific air pollutants," explains Dr Dana Loomis, Deputy Head of the Monographs Section. "The results from the reviewed studies point in the same direction: the risk of developing lung cancer is significantly increased in people exposed to air pollution."

The Challenge

Appraisal project

THE CHALLENGE

Air quality in Europe is still facing a continued wide-spread of exceedances, particularly regarding PM, NOx and O3. In case of non-compliance the 2008 Air Quality Directive requests Member States (MS) to design local and regional plans and assess their impacts on air quality and human health. MS have therefore developed and applied a wide range of modelling methods to cope with these obligations. Today, with the revision of the EU air quality policy pending, there is a need to consolidate and assess the research results in the field of Air Quality and health Impact Integrated Assessment and make them accessible to policy makers.

Potential modifications of the Ambient Air Quality Directives

Project objectives

Appraisal project

- 1- To perform an overall review of the AQ and health assessment methodologies
- 2- To analyze the limitations of the currently available assessment methods
- 3- To evaluate the possibility of implementing integrated assessment (IA) modelling tools
- 4- To communicate with key stake-holders, and in particular to policy-makers
- 5- To identify key areas to be addressed by research and innovation

Results

Appraisal project

1. To provide insight on existing IA Modelling within the EU.

2. To support the implementation of local/regional IA methodologies.

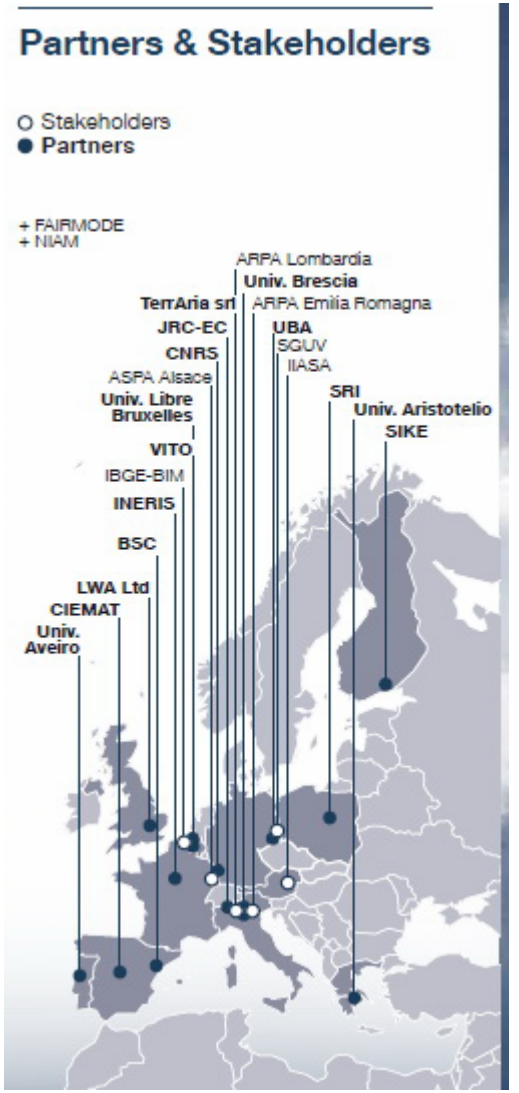
3. To assess current research findings and future research needs.

4. To support the EU Air policy review.

Partners

Appraisal project

PROJECT PARTNERS	COUNTRY
UNIVERSITA DEGLI STUDI DI BRESCIA	Italy
JRC -JOINT RESEARCH CENTRE- EUROPEAN COMMISSION	Italy
VLAAMSE INSTELLING VOOR TECHNOLOGISCH ONDERZOEK N.V.	Belgium
SUOMEN YMPARISTOKESKUS	Finland
INSTITUT NATIONAL DE L ENVIRONNEMENT ET DES RISQUES	France
ARISTOTELIO PANEPISTIMIO THESSALONIKIS	Greece
UNIVERSIDADE DE AVEIRO	Portugal
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	France
SYSTEMS RESEARCH INSTITUTE OF THE POLISH ACADEMY OF SCIENCES IBS PAN	Poland
TERRARIA SRL	Italy
CENTRO DE INVESTIGACIONES ENERGETICAS, MEDIOAMBIENTALES Y TECNOLOGICAS-CIEMAT	Spain
UNIVERSITE LIBRE DE BRUXELLES	Belgium
BARCELONA SUPERCOMPUTING CENTER - CENTRO NACIONAL DE SUPERCOMPUTACION	Spain
UMWELTBUNDESAMT	Germany
Les White Associates Limited	United Kingdom



Metodologia – Revisió Sistemàtica

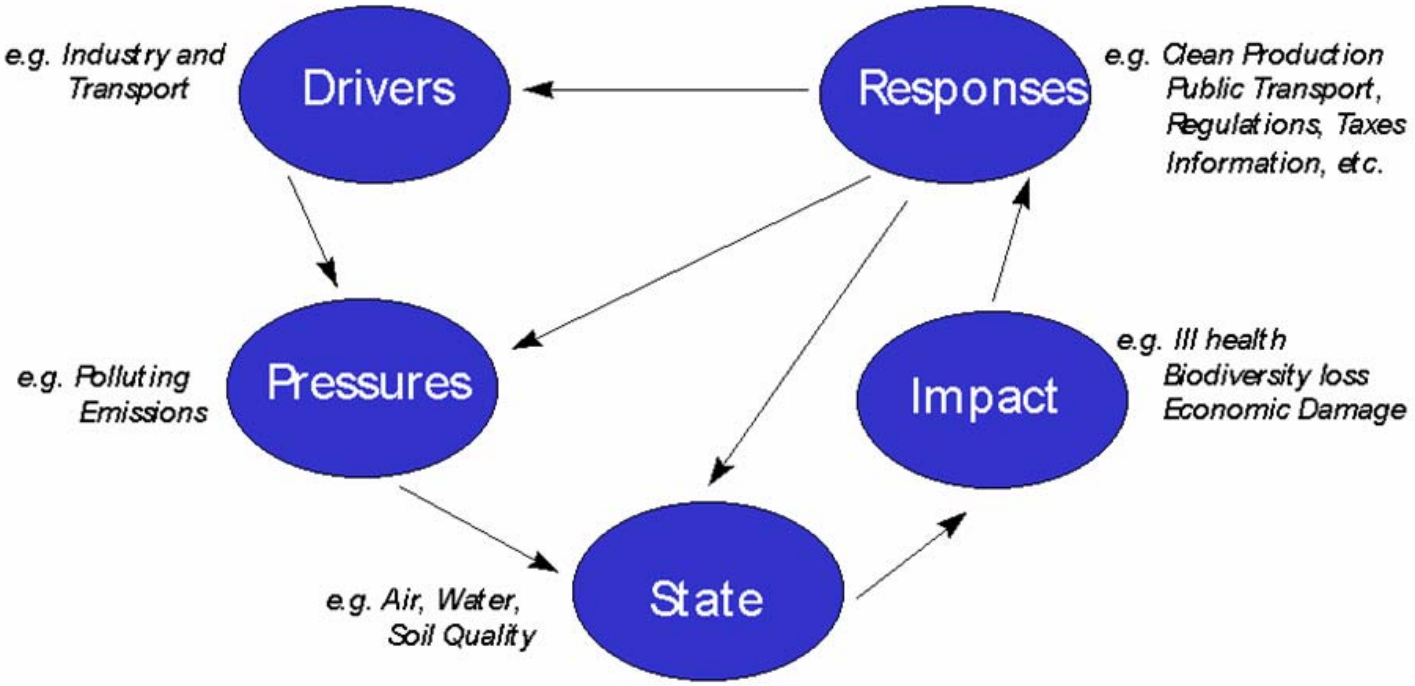
Appraisal project

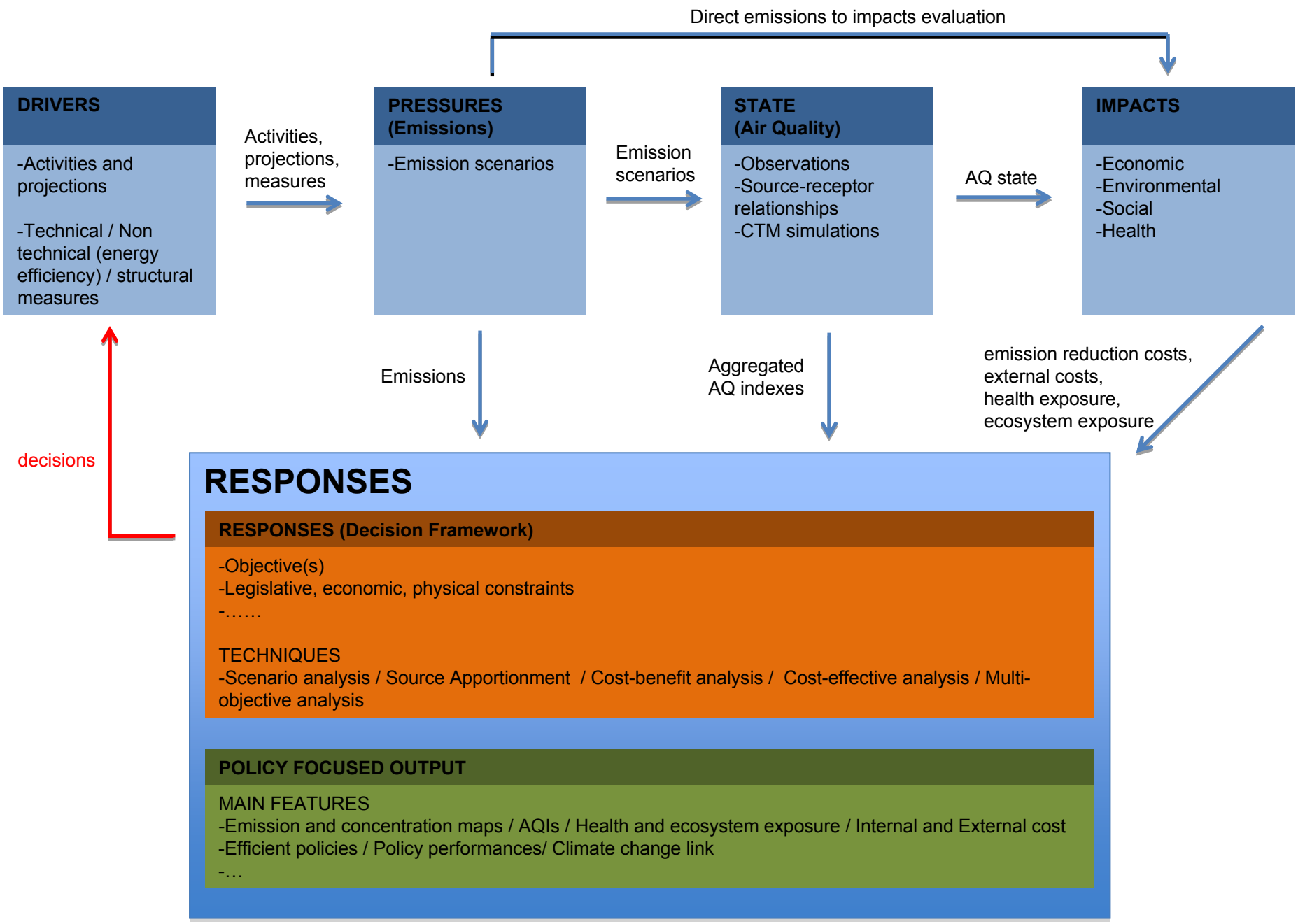
METHODOLOGY

The proposed methodology to achieve a systematic review includes the following steps:

- Defining a *common and structured format/language* (design of a database) in which the main characteristics as well as strengths and weaknesses of the different methodologies can be classified. This database will be organized around 4 main themes:
  - Synergies among National, regional and local approaches, including emission abatement policies;
  - Air quality assessment methodologies, (e.g. modeling, scenario assessment, cost-effective methods, source apportionment ...);
  - Health impact assessment approaches;
  - Uncertainty and robustness, including Quality Assurance / Quality Control (QAQC).
- Collecting and classifying the available information according to the defined common format (data entry).
- Generating a state-of-the-art database of Integrated Assessment systems.
- Comparing existing Integrated Assessment systems on the basis of the defined common format (systematic review) and identifying their strengths and limitations.
- Granting access to the database and consulting stakeholders and policy makers.
- Establishing direct links to EU projects related to air quality policy, exposure analysis and health impact assessment.

DPSIR as a pillar for the IAS design





“Synergies among scales” / “uncertainties” are additional dimensions of the scheme

DataBase Objectives

Appraisal project

BRING TOGETHER ALL MAJOR ACTIVIT… …TY AND

- C…
  m…
- I…
  po…
- Anal… …ble assessm… …of key areas to be addr…

to support the coming revision of EU air quality policy

Partner	Stakeholder	Pilot experiment
UNIBS		- RIAT
JRC		- POMI
VITO		
SYKE		
INERIS		IEC scenario on pollutant ver France
AUTH	D	yprus (2007)
UAVR		eration
CNRS		on Alsace
SRI		
TERRARIA		
CIEMAT		
ULB		nate-energy plan
BSC-CNS	Directorate General of Envir Ministry of Territory and Sustainability. Generalitat de Catalunya	- Pla de millora de la qualitat de l'aire a l'àrea de Barcelona (2011-2015)
UBA	Berlin Senate Department of Urban Development and Environment	- Air Quality Plan 2011-2017 for Berlin
LWA		

5 stakeholders + 4 partners: the pilot experiment involved 10 activities

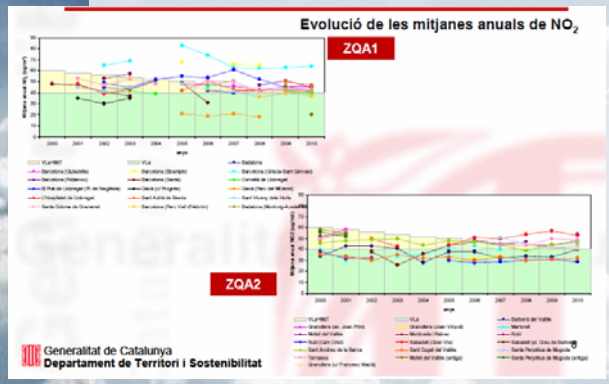
Appraisal project
www.appraisal-fp7.eu

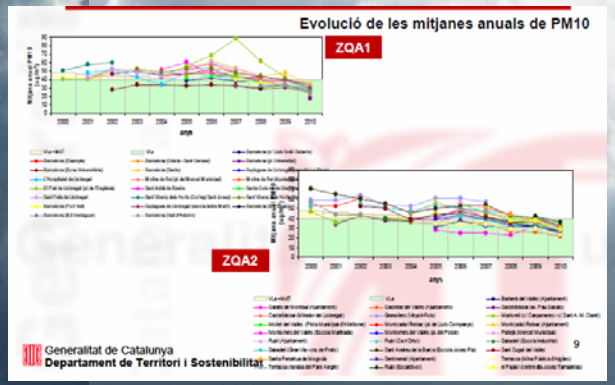
General info

- How many questionnaires did you collect?
  - **1**
- Which Stakeholders did you interview?
  - **Government Agency**: Directorate General of Environmental Quality. Ministry of Territory and Sustainability. Generalitat de Catalunya (Government of Catalonia)

Appraisal project
www.appraisal-fp7.eu

Activity information





	Type	Objective	area
Q1	Air quality plan	AQ planning: improvement air quality (2011-2015)	AM Barcelona, Catalonia (Spain) 3.5
Q2			
Q3			
Q4			

Reference:
http://www20.gencat.cat/portal/site/mediambient/menuitem.8f64ca3109a92b904e9cac3bb0c0e1a0/?vgnextoid=e82448d456e63310VgnVCM1000008d0c1e0aRCRD&vgnextchannel=e82448d456e63310VgnVCM1000008d0c1e0aRCRD&vgnextfmt=default

CALIOPE Air Quality Forecasting System (www.bsc.es/caliope)

Spain: 4 km (399x399 grid cells), Europe: 12 km (480x400 grid cells)

Modules

Meteorology: WRF-ARW
- Version 3.5
- IBC: GFS (NCEP)
- SST: SST MODEL (NCEP)
- 38 sigma levels
- Top of the atmosphere 50 hPa

Emissions: HERMES v2

Chemistry: CMAQ-CTM
- Version 5.0
- Carbon Bond V
- Cloud chem. (aqu.)
- Aerosol module (AERO5)
- BC: NCAR MOZART4 model
- 15 sigma levels

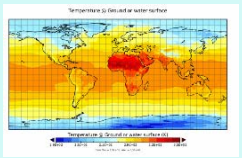
Mineral dust: BSC-DREAM8b v2

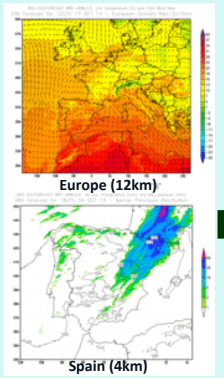
Post-processes by Kalman filter

Evaluation:
- NRT-ground level observations
- Satellite
- Ozone sounds

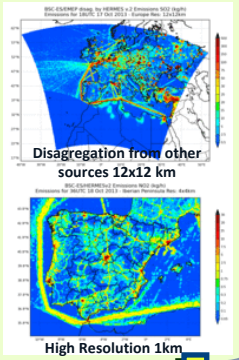
METEOROLOGICAL FORECAST WRF-ARW

GLOBAL SIMULATIONS
Initial and boundary conditions



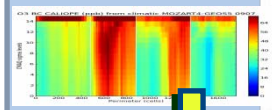


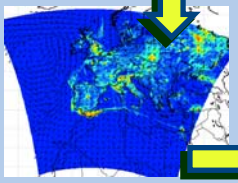
EMISSION MODELLING
HERMES v2 developped at BSC-CNS



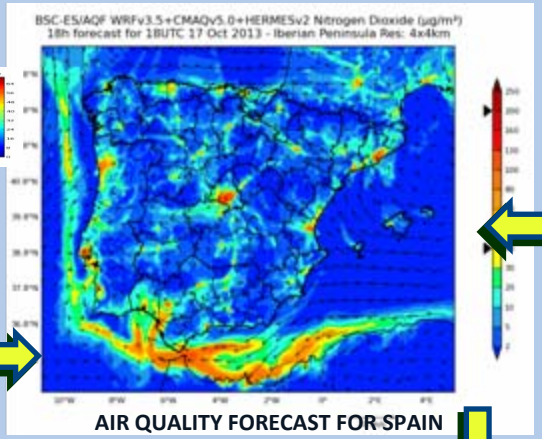
AIR QUALITY FORECAST CMAQ

NCAR MOZART4
Boundary Conditions



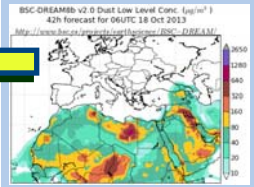


EUROPEAN AIR QUALITY FORECAST (12km)



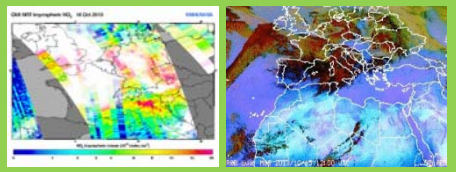
AIR QUALITY FORECAST FOR SPAIN
High resolution (4km)

SAHARAN DUST OUTBREAKS
Dust Regional Atmosferic Model (BSC-DREAM8b v2)



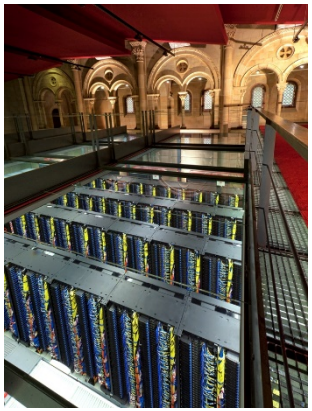
AQFS EVALUATION

METEOROLOGICAL OBSERVATIONS
Dynamics and model evaluation



SATELLITE OBSERVATIONS
Surveillance and model verification

GAS AND PARTICLE MATTER OBSERVATIONS
Dynamics and model evaluation



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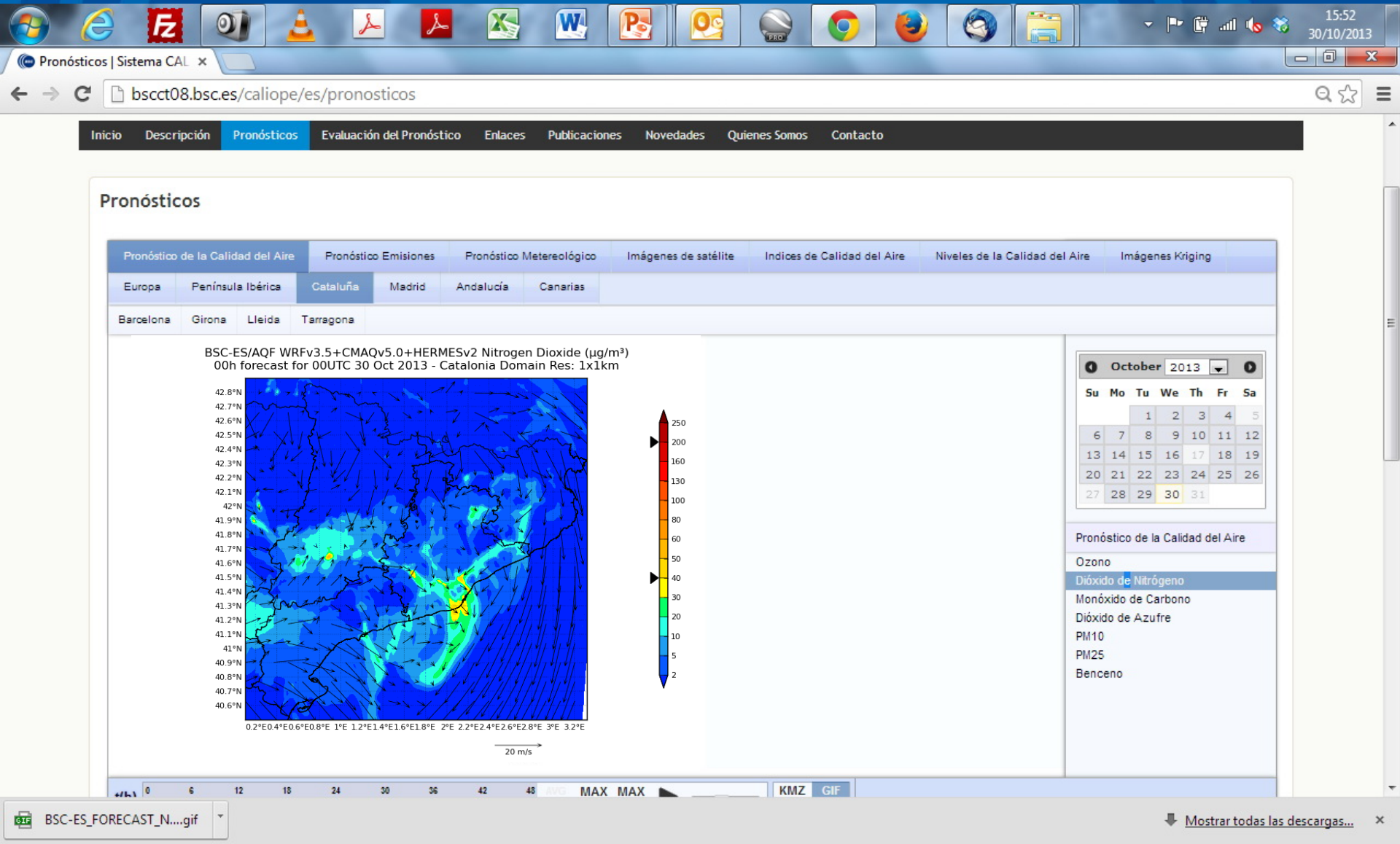
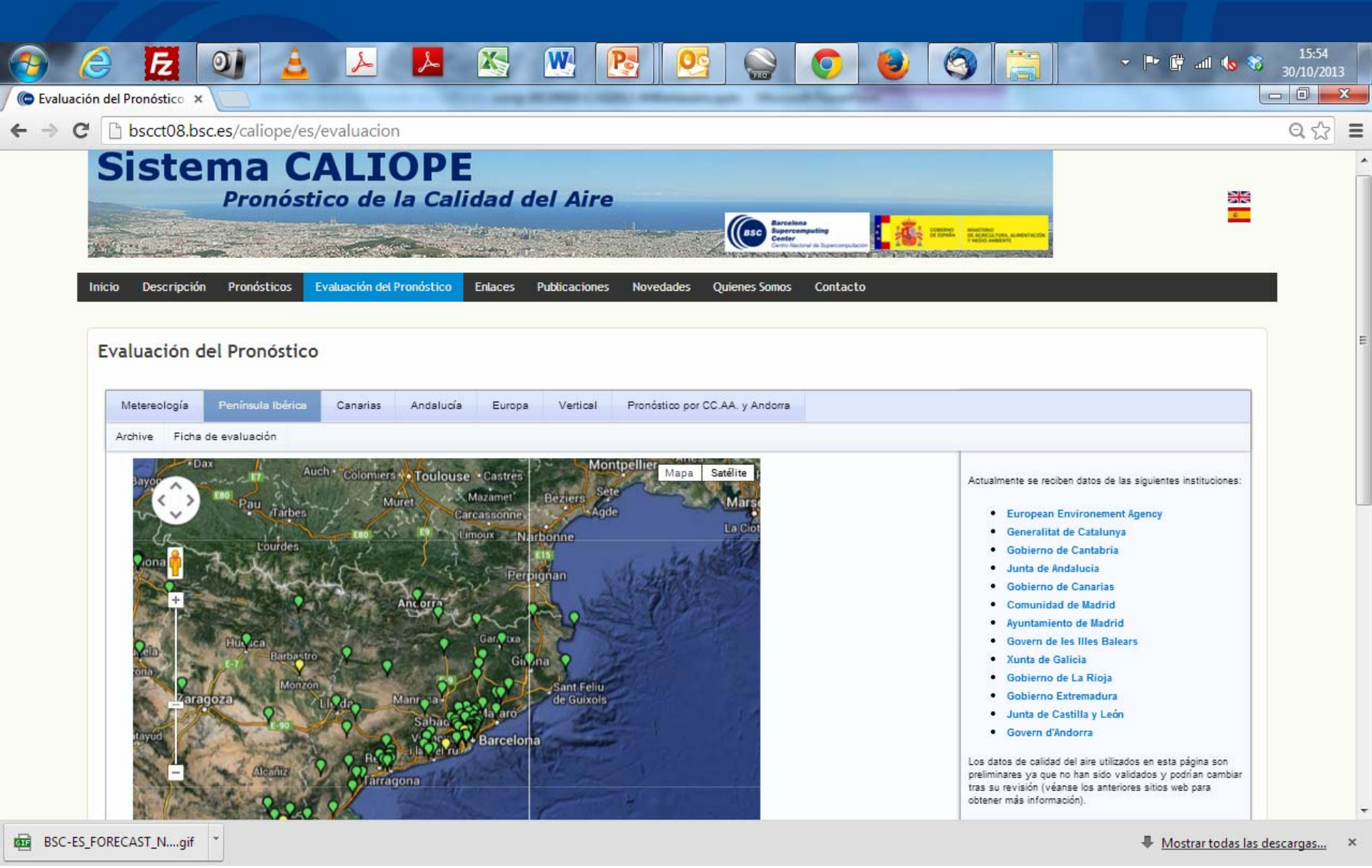

Pronósticos | Sistema CAL
bscct08.bsc.es/caliope/es/pronosticos
Inicio
Descripción
Pronósticos
Evaluación del Pronóstico
Enlaces
Publicaciones
Novedades
Quienes Somos
Contacto
Pronósticos
Pronóstico de la Calidad del Aire
Pronóstico Emisiones
Pronóstico Metereológico
Imágenes de satélite
Indices de Calidad del Aire
Niveles de la Calidad del Aire
Imágenes Kriging
Europa
Península Ibérica
Cataluña
Madrid
Andalucía
Canarias
Barcelona
Girona
Lleida
Tarragona
BSC-ES/AQF WRFv3.5+CMAQv5.0+HERMESv2 Nitrogen Dioxide (µg/m³)
00h forecast for 00UTC 30 Oct 2013 - Catalonia Domain Res: 1x1km
20 m/s
October 2013
Pronóstico de la Calidad del Aire
Ozono
Dióxido de Nitrógeno
Monóxido de Carbono
Dióxido de Azufre
PM10
PM25
Benceno
KMZ
GIF
BSC-ES_FORECAST_N....gif
Mostrar todas las descargas...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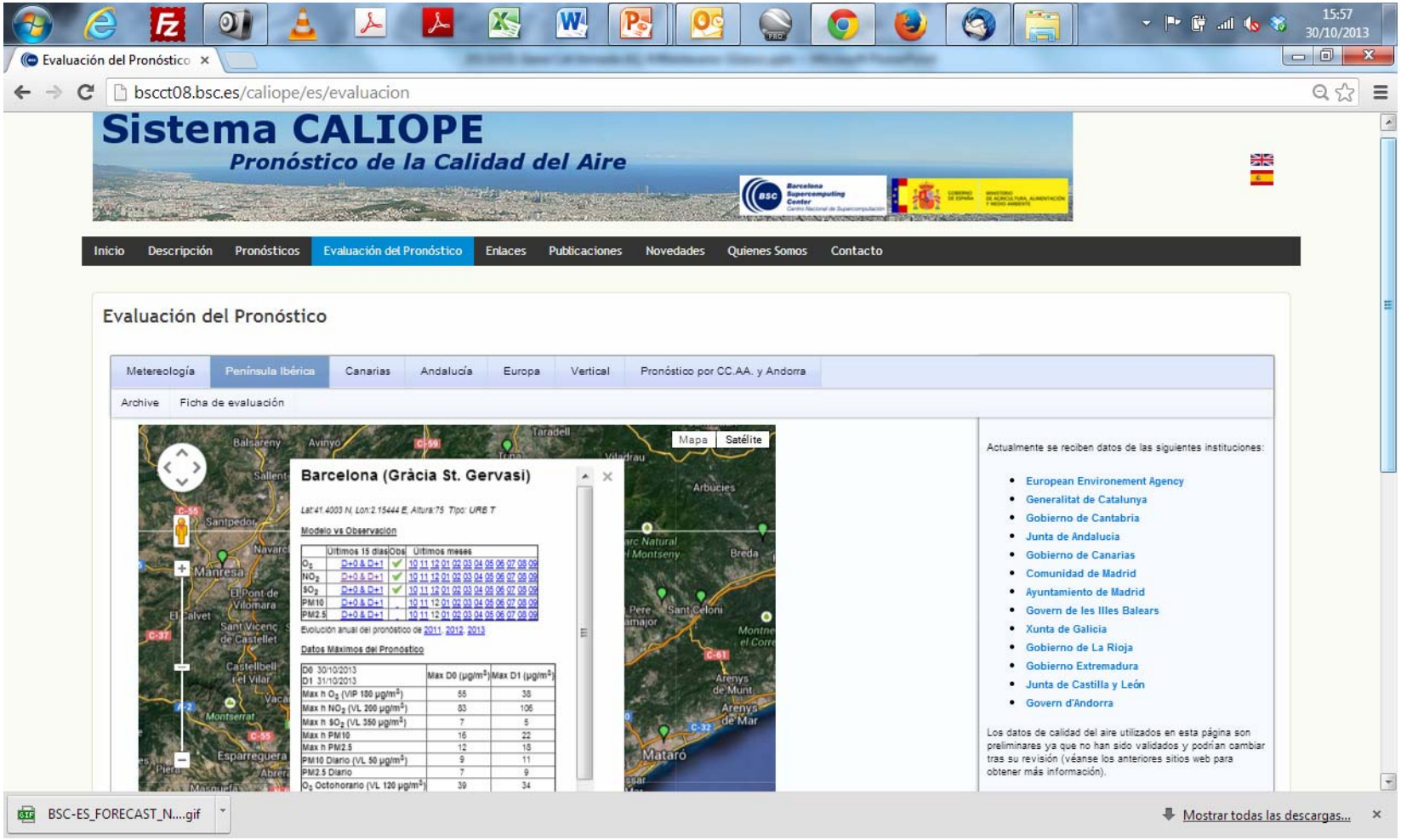
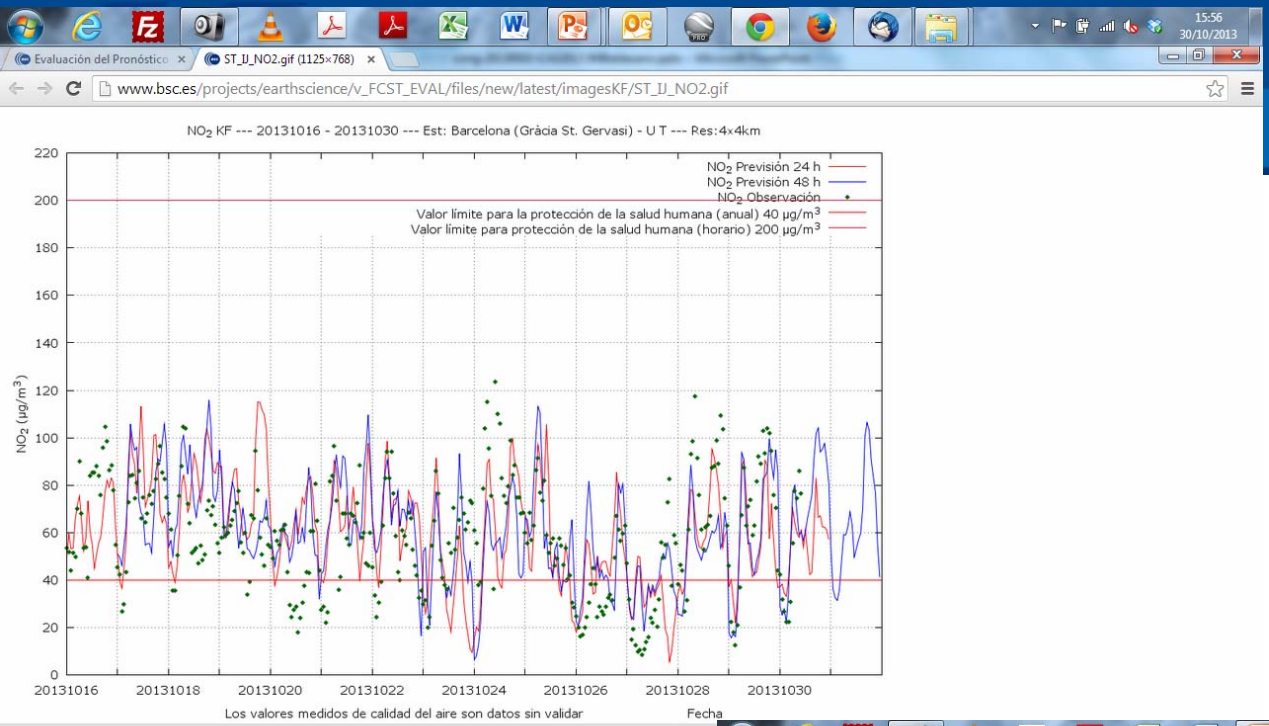
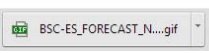
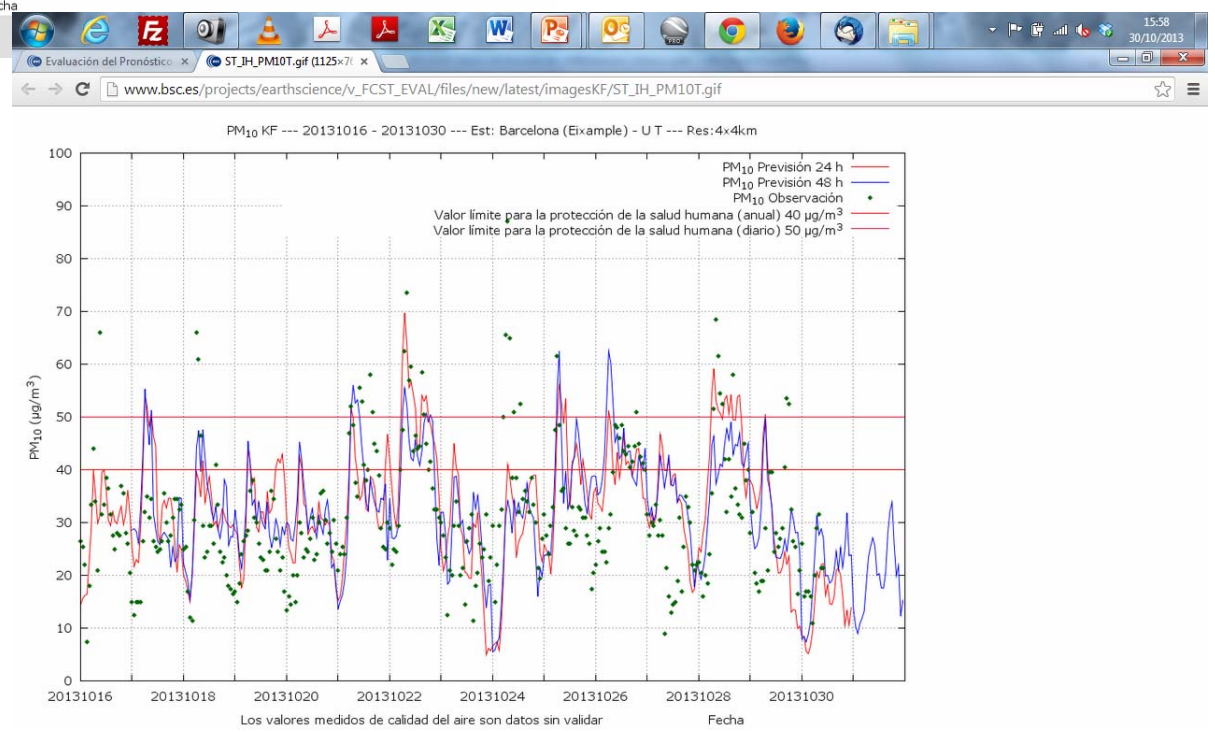
Pronósticos
Evaluación del Pronóstico
Enlaces
Publicaciones
Novedades
Quienes Somos
Contacto
Evaluación del Pronóstico
Metereología
Península Ibérica
Canarias
Andalucía
Europa
Vertical
Pronóstico por CC.AA. y Andorra
Archive
Ficha de evaluación
Mapa
Satélite
Actualmente se reciben datos de las siguientes instituciones:
European Environement Agency
Generalitat de Catalunya
Gobierno de Cantabria
Junta de Andalucia
Gobierno de Canarias
Comunidad de Madrid
Ayuntamiento de Madrid
Govern de les Illes Balears
Xunta de Galicia
Gobierno de La Rioja
Gobierno Extremadura
Junta de Castilla y León
Govern d'Andorra
Los datos de calidad del aire utilizados en esta página son preliminares ya que no han sido validados y podrían cambiar tras su revisión (véanse los anteriores sitios web para obtener más información).
BSC-ES_FORECAST_N....gif
Mostrar todas las descargas...

Avaluació del Pronóstic -- CALIOPE









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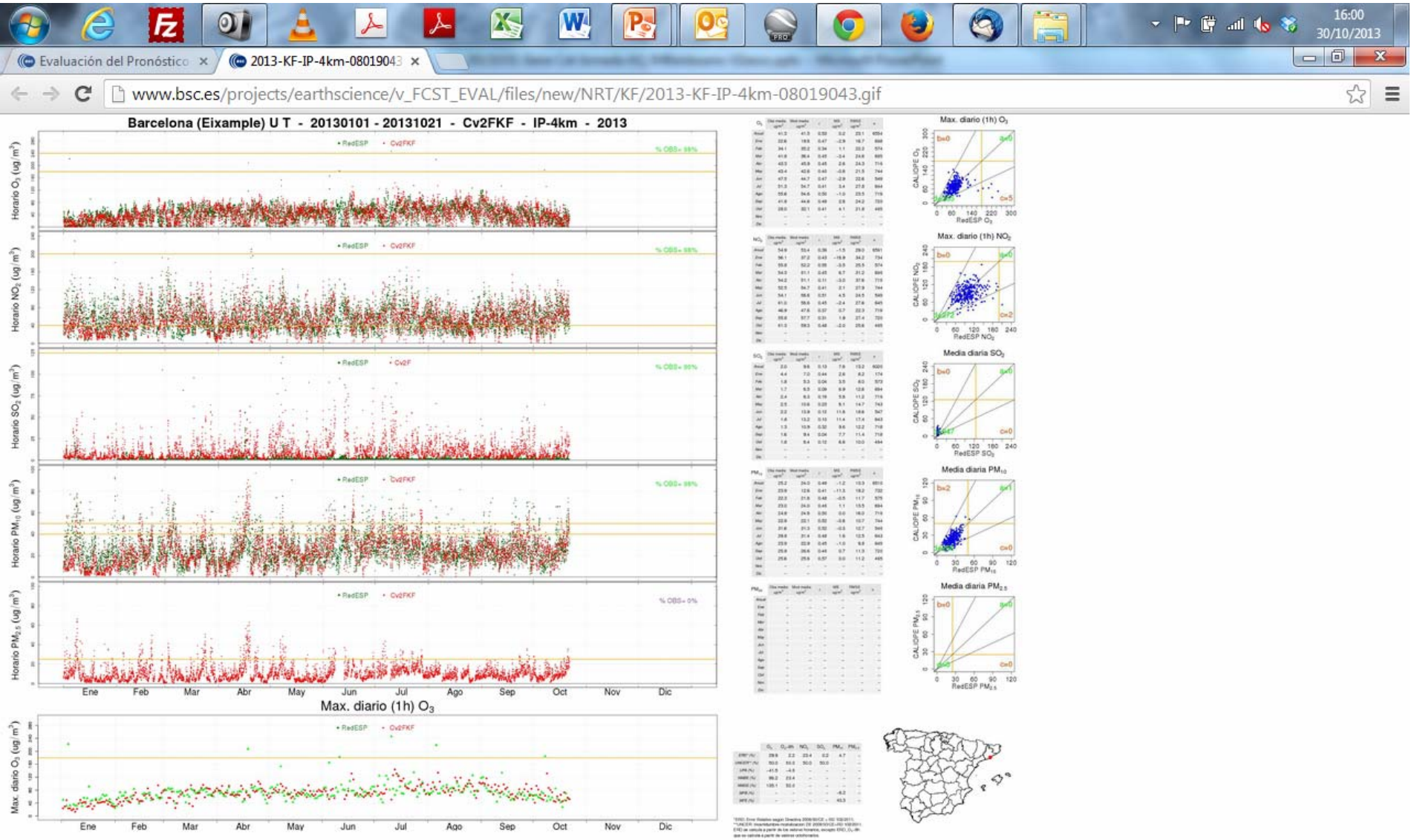
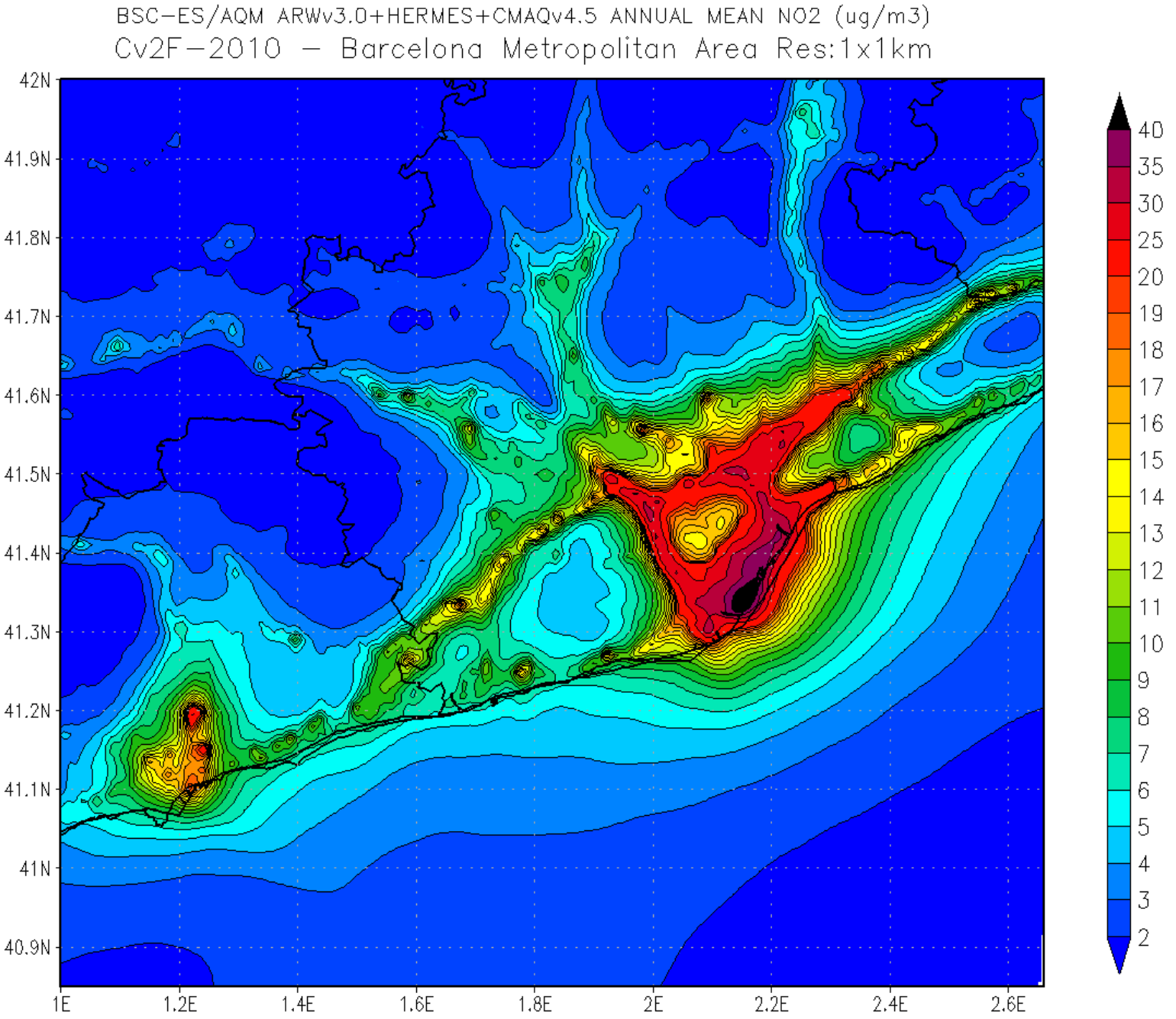
Full de Avaluació i seguiment CALIOPE




BSC-ES/AQM ARWv3.0+HERMES+CMAQv4.5 ANNUAL MEAN NO2 (ug/m3)
Cv2F-2010 - Barcelona Metropolitan Area Res:1x1km
42N
41.9N
41.8N
41.7N
41.6N
41.5N
41.4N
41.3N
41.2N
41.1N
41N
40.9N
1E
1.2E
1.4E
1.6E
1.8E
2E
2.2E
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2.6E
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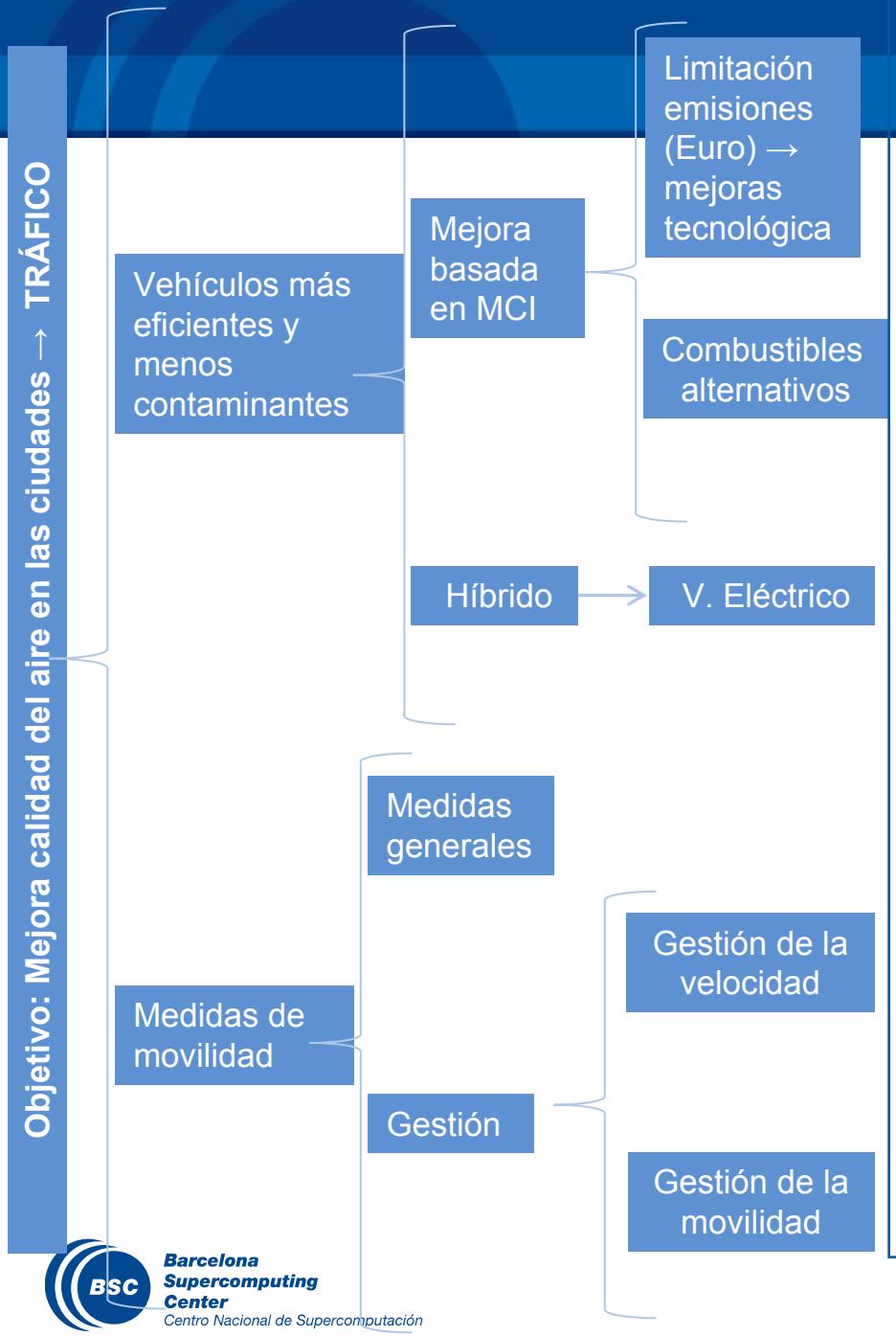


Trabajos BSC-CNS

→ Soret et al., (2011)
Gestión de movilidad y renovación parque vehicular (actualización Euro)

→ Gonçalves et al., (2009a y 2009b)
Introducción de GN como combustible alternativo

→ Gonçalves et al., (2011)
Introducción de vehículos híbridos

→ Soret et al. (2013)
Vehículo eléctrico en Barcelona y en Madrid

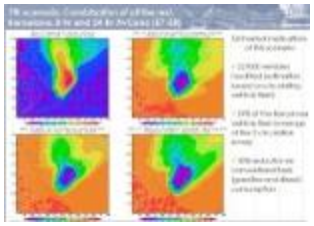
→Baldasano et al., (2010)
→ Gonçalves et al., (2008)
Introducción de la limitación de velocidad a 80km/h en las vías de acceso a Barcelona

→ Soret et al., (2011)
Gestión de movilidad en Barcelona y renovación parque vehicular (actualización Euro)

Projects: Air Quality Planning studies

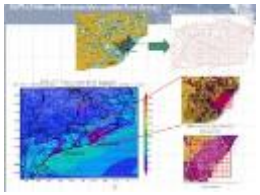
gasNatural

Introduction of NG as a fuel for vehicles in the cities of Barcelona and Madrid



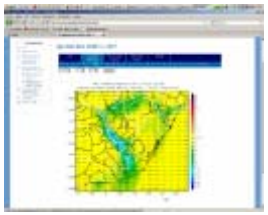
BCN ECOLOGIA Agència d'Ecologia Urbana de Barcelona

Air quality planning for the metropolitan area of Barcelona for 2015



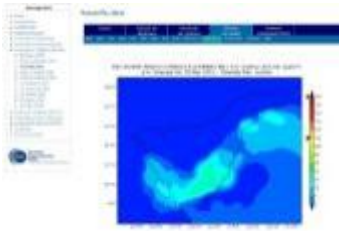
Generalitat de Catalunya
Departament de Medi Ambient i Habitatge

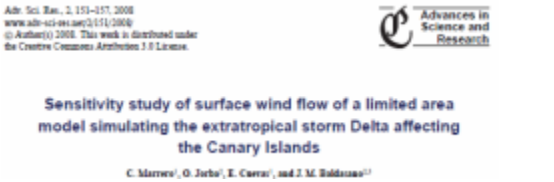
Assessment of the measure of 80 km/h in the Metropolitan Area of Barcelona



Gobierno de Canarias
Consejería de Medio Ambiente y Ordenación Territorial

Assessment of air pollution in the city of Santa Cruz de Tenerife





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Centro Nacional de Supercomputación

Conclusions

- ✓ **The response to the emissions abatement strategies depend on the location, due to:**
  1) The **specific vehicle fleet composition**
     - The percentage of heavy duty vehicles, cars or mopeds affects the design of strategies to the abatement of emissions.
  2) The **different contribution of activity sectors to total emissions**
     - While on-road transport is the main emitter of air pollutants in urban areas, additional sources can not always be neglected (e.g. power plant, industrial shaped cities, harbours or airports)
  3) The **topography, meteorological conditions and the atmospheric transport**
     - The concentration of pollutants at surface level are directly affected by the mixing volume, the PBL evolution, the local topography, etc.
  4) The **chemical regime** (different NOx-VOCs ratio that directly affects O_3, secondary aerosol formation → production response to emissions abatement strategies)
     - Equivalent reductions on NO_x emissions provide different responses on local O_3 concentrations depending on the chemical sensitivity regime

- ✓ **Each strategy must be assessed for the specific area of application, not being possible the extrapolation of results**

Gracias por su atención

¿Cuestiones?