

CONTRIBUTION TO:
RED IBERICA MM5
WORKSHOP, MARCH, 11-12, 2004. LISBON (PORTUGAL)

ACTIVITIES DEVELOPED BY OUR RESEARCH GROUP
DURING THE PERIOD: 2003-2004 WITH
APPLICATIONS OF MM5

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AIR QUALITY APPLICATIONS

- **INTEGRATION: MM5-CMAQ (2000)**
- **APPLICATIONS:**
 - a) **INDUSTRIAL EMISSION SOURCES**
 - b) **AIR QUALITY FORECASTS**
 - c) **MICROSCALE MODELS (CFD) INTEGRATION**
- **CLUSTER APPLICATIONS:**
 - **Control of industrial and mobile sources air quality impact in real-time and forecasting mode.**



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CGRER CLUSTER (UIOWA)

MAIN NODE:

Pentium 4 2.4 Ghz processor / 533 Mhz FSB
4.0 GB DDR PC2100 ECC Registered System Memory
340 GB EIDE 7200 RPM Hard Drives
200 GB EIDE 7200 RPM Hard Drives
Controller 10/100/1000 BaseT Gigabit
Network Adapter 10/100 BaseT Fast Ethernet Network
Redhat Linux 7.3



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CGRER CLUSTER (UIOWA)

20 NODES:

Pentium 4 2.4 Ghz processor / 533 Mhz FSB

1.024 GB DDR PC2100 System Memory

120 GB 7,200 RPM EIDE Hard Drive

10/100/1000 BaseT Gigabit Network Adapter

Redhat Linux 7.3

NETWORK:

24 Port 10/100/1000 BaseT Gigabit Network Switch



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SOFTWARE

MPICH 1.2.5

Freely portable implementation of **MPI** (Standard for message-passing libraries)

PGI COMPILERS 4.1-2

CMAQ 4.2.2 (Community multiscale air quality modeling system):

CHEMICAL MECHANISM: cb4_ae3_aq

CHEMICAL SOLVER: mebi

MM5 V3.6 (PSU/NCAR meteorological mesoscale model)



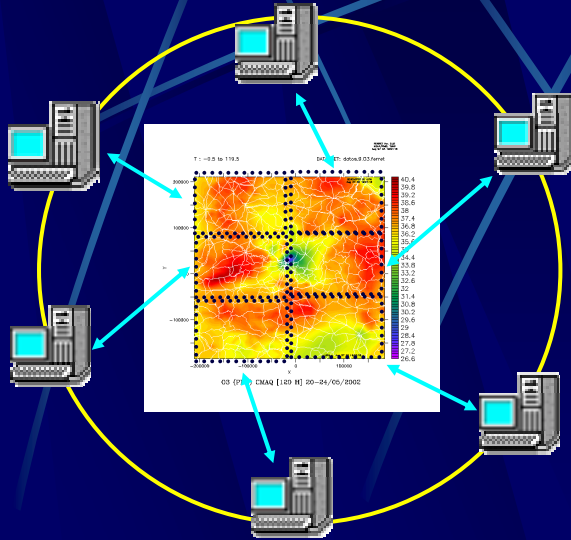
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SPLITTING DOMAINS



6 NODES
DOMAIN 45*45
SPLITTING 2*3
COLS 1:23
24:45
ROWS 1:15
16:30
31:45



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MM5 & CMAQ DOMAINS

MM5 81 KM: 84*60

MM5 27 KM: 69*57

MM5 9 KM: 51*51

MM5 3 KM: 33*39

MM5 1 KM: 30*30

CMAQ 9 KM: 45*45

CMAQ 3 KM: 27*33

CMAQ 1 KM: 24*24

23 VERTICAL LAYER



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CMAQ CPU TIME CLUSTER vs SERIAL

CMAQ CLUSTER:

9 KM -> 52 Min.

3 KM -> 40 Min.

1 KM -> 44 Min.

TOTAL CMAQ 9-3-1 ->
2h:16

CMAQ SERIAL:

9 KM -> 629 Min.

3 KM -> 335 Min.

1 KM -> 356 Min.

TOTAL CMAQ 9-3-1 ->
22h:00

10 TIMES FASTER CLUSTER 20 NODES

&

NO DIFFERENCES IN THE OUTPUTS



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MM5 CPU TIME CLUSTER vs SERIAL

MM5 CLUSTER:

81-27 KM -> 11 Min.

9-3-1 KM -> 74 Min.

TOTAL MM5 CLUSTER 81-27-9-3-1 -> 1h:25

TOTAL MM5 SERIAL 81-27-9-3-1 ->
16h:06

MM5 SERIAL:

81-27 KM -> 155 Min.

9-3-1 KM -> 811 Min.

11 TIMES FASTER CLUSTER 20 NODES

&

NO DIFFERENCES IN THE OUTPUTS

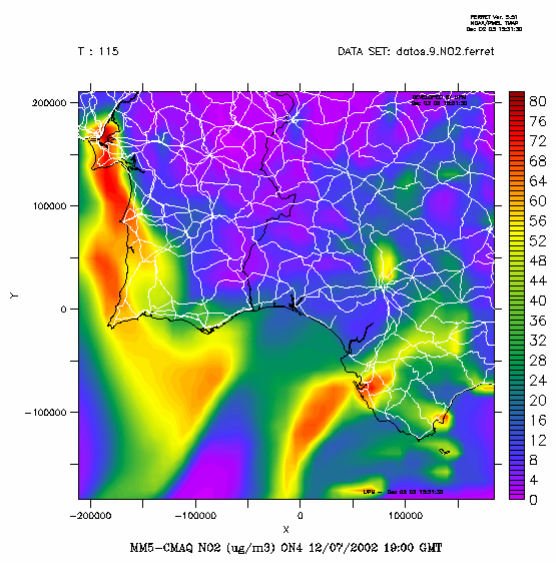


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July, 12, 2002

NO2 concentrations Produced by MM5-CMAQ at 19h00 GMT over an area centered in the southwest of the Iberian Peninsula.

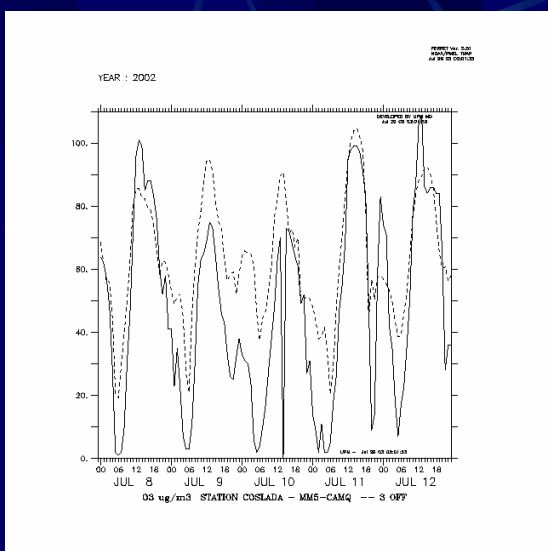
Used to evaluate the impact of a future power plant



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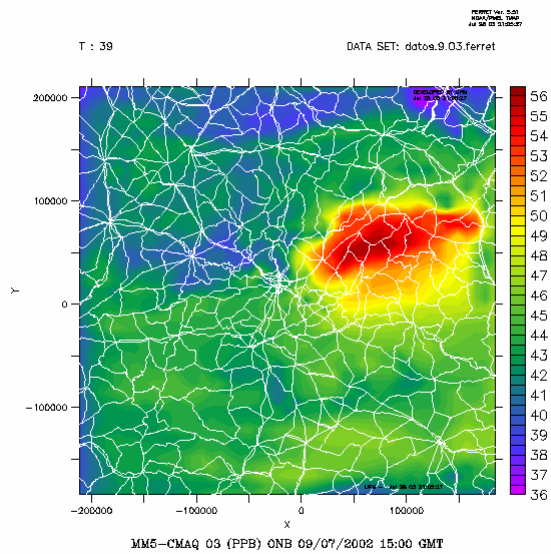
Comparison between O3 observed values at Coslada air quality Monitoring station for July, 8-12, 2002 by Using MM5-CMAQ with 3 km spatial resolution



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O3 concentrations
At 15h00 GMT,
July, 9, 2002

By using
MM5-CMAQ

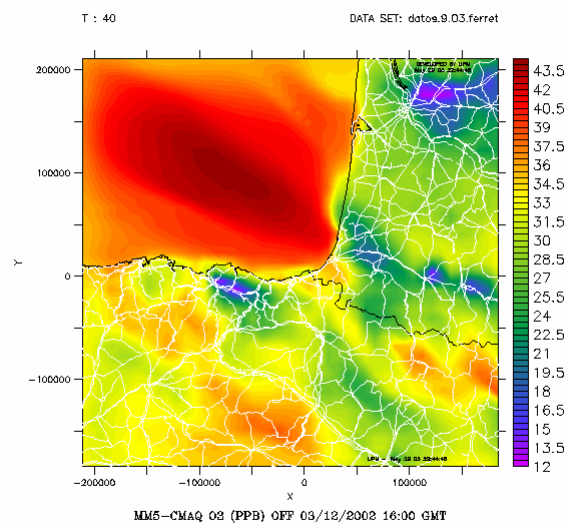
used to evaluate
the air quality
impact for a future
power plant in
the area.



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O3 concentrations
Produced by
MM5-CMAQ
For December,
3, 2002
At 16h00 GMT

Used to evaluate
The impact of a
future
Incinerator in
the area



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TEAP WEB PAGE - Microsoft Internet Explorer

Inicio Editar Ver Favoritos Herramientas Ayuda

Inicio | Home | Time Series | Surface

TEAP

A Tool To Evaluate The Air Quality Impact of Industrial Plants

E12634 - EUROENVIRON TEAP

Title	A Tool To Evaluate The Air Quality Impact Of Industrial Plants	
Project	E0204 -EUROENVIRON TEAP	Status Announced -26-JUN-2002
Class	Sub-Units	Technological Area Environment
Start Date	01-JUL-2001	
Size (lines/coding)	30	
Partner sought	No	
Summary	The Project Focuses On The Development Of A Software Tool To Evaluate The Air Quality Impact Of Industrial Emissions Based On The Optimization Of Industrial Processes And Third Generation Air Quality Models	

© 2004 UPM Model, Los Modelos de PM-204 (Optimad, Optima, UCM e IMA)



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A Tool To Evaluate The Air Quality Impact of Industrial Plants

PHASE

OZONE PERCENTAGE

© 2004 UPM Model, Los Modelos de PM-204 (Optimad, Optima, UCM e IMA)

OPTIONS

TEXTURE

Basins Thickness Mesh Color

Railroads Thickness Mesh Color

TYPE

Shaded Grid Contour

PLLETTAGE TYPE OF ENDS

[Ozone (ug/m³)] [ON-OFF %]

DATE

[E1-29-2002-03:00] Date (dd-mm-yyyy-hh:MM)

SCALE

Automatic Number of Levels

Fixed Min Max Min Max Units

Generate

READY CONTROL



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SISTEMA DE INFORMACIÓN DE LA CALIDAD DEL AIRE
LAS PALMAS DE GRAN CANARIA

PERIODO DE SIMULACIÓN: 01/03/2004 AL 05/03/2004

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Location	X	Y	Z	SO2	CO	NO	NO2	PM10	PM2.5
5002	5002	5002	5002	5002	5002	5002	5002	5002	5002
8002	8002	8002	8002	8002	8002	8002	8002	8002	8002
CO	CO	CO	CO	CO	CO	CO	CO	CO	CO
PM10	PM10	PM10	PM10	PM10	PM10	PM10	PM10	PM10	PM10

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The screenshot displays a software interface with several components:

- 3D Model:** A 3D perspective view of a terrain model with a yellow and blue color gradient.
- Table:** A table with columns for 'X', 'Y', 'Z', 'Seawater', and 'Time Series'. The rows contain numerical values in scientific notation.
- Plots:** Multiple 2D plots showing data distributions and trends. One plot shows a color-coded area, while others show line graphs.
- UI Elements:** A top menu bar, a toolbar on the left, and a status bar at the bottom.

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The screenshot displays a software interface with several components:

- 3D Model:** A 3D perspective view of a terrain model with a purple, red, and blue color gradient.
- Plots:** A 2D color-coded plot and a line graph showing data trends over time.
- UI Elements:** A top menu bar, a toolbar on the left, and a status bar at the bottom.

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XZ	YX	Concentrations	Time Series
SO2	SO2	SO2	SO2
NO	NO	NO	NO
CO	CO	CO	CO
O3	O3	O3	O3

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EXAMPLE OF 3D VISUALIZATION OVER THE Internet for Andalusia region

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CONCLUSIONS:

- ✓ The group has continue to work to produce reliable applications to run MM5 and MM5-CMAQ and another models such as WRF.
- ✓ The objectives cover:
 - 1) A full real-time and forecasting system to control the impact on air quality concentrations of different industrial and large emission souces (traffic, domestic, etc.) by using CLUSTER approach.
 - 2) WIND POWER application: Test to evaluate the impact on electric market of using MM5 forecasts for electric energy in wind power generators.



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