Barcelona, 17 Oct 2016

Barcelona Supercomputing Center
Centro Nacional de Supercomputación

Photochemical modelling to attribute emission sources and source regions to high particulate matter concentration in urban areas in Spain
- PAISA-

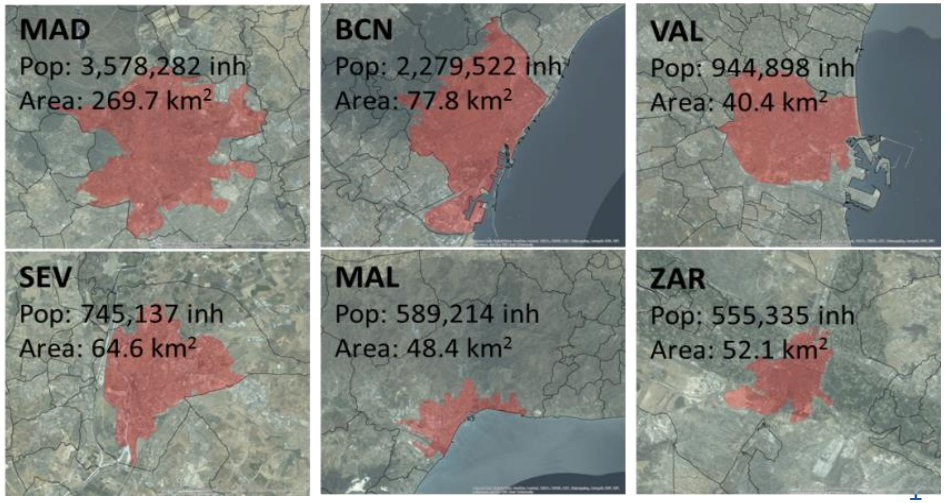
Objectives, methodology and resources

Main objective

To quantify the contribution of **activity sources(1)** and **region sources (2)** to **high PM concentration(3)** over **main Spanish urban areas(4)**

1. Sources: anthropogenic emissions. SNAP1, SNAP2, SNAP34, SNAP71, SNAP72, SNAP73, SNAP74, SNAP75, SNAP8, SNAP9, SNAP10, desert dust, sea salt, biogenic SOA
2. Sources: region emissions.
   - 3 levels: BCON, country, urban
   - 7 regions: Spain + MAD + BCN + VAL + SEV + MAL + ZAR
3. High PM events (**when**): full year 2015 → annual/seasonal/episode contribution
4. Study area: main Spanish urban areas (**where**): the results will be analyzed over the 6 highest Spanish cities
5. Pollutants: PM + O3 (PhD student)

SNAP	Description of sectors (i)
1	Energy industry
2	Residential and commercial combustion: 2.1. Coal; 2.2. Liquid fuel; 2.3. Medium liquid fuel; 2.4. Heavy liquid fuel; 2.5. Gas; 2.6. Solid biomass.
3 & 4	Industry (combustion & processes)
5	Fugitive emissions from fuels
6	Product use including solvents
7	On-road transport: 7.1. Exhaust, gasoline; 7.2. Exhaust, diesel; 7.3. Exhaust, LPG/natural gas; 7.4. Non-exhaust, evaporation; 7.5. Non-exhaust, wear
8	Non-road transport: 8.1. shipping, diesel; 8.2 shipping, heavy fuel oil
9	Waste treatment
10	Agriculture
11	Dust, Sea Salt, Biogenic SOA



Specific objectives

1. To quantify the degree of uncertainty of the CMAQv5.1 model for PM and its chemical components

2. To improve the photochemical modelling of PM concentrations in selected episodes based on detected necessities of improvements (meteorology, emissions and chemistry)

→ Evaluation and improvements of WRF-HERMES-CMAQ (parallel with NMMB/BSC-CTM)

3. To quantify the contribution of the large variety of natural and anthropogenic emission sources and source regions to the PM concentrations

→ Source apportionment

Work Packages and Tasks

	People	expID
WP1. Selection of episodes during the full year 2015		
T1.1. Compilation of air quality measurements	MTP	-
T1.2. Characterization of PM and O_3 on an annual and seasonal basis and during episodes	MTP	-
WP2. Model evaluation and improvements		
T2.1. Evaluation of the PM and O_3 from WRF-CMAQ vs NMMB/BSC-CTM vs cams		
Evaluation over EU at 12 km	MTP	b006 b007 cams
Evaluation at IP at 4 km	MTP	b00a b007 cams
T2.2.1 Improvement of the WRF model		
Urban model	MTP	b00a b00b
High resolution land use and topography	MTP	b00a b00c b00d
T2.2.2 Improvement of the HERMES model		
Multiyear option (here only 2015)	MM	¿?
Print emissions by fuel type and processes (exhaust and non-exhaust)	CT	-
Update Resuspended Paved Road emissions	MG, CT	b00a b00f
Include speciation based on SPECIEUROPE	MG	-
Include speciation to AERO6 (including ions and metals)	MG	-
T2.2.3 Improvement of the CMAQ model		
AERO5 vs AERO6	MTP	b00a b00e
Vertical resolution	MTP	done
WP3. Modelling source apportionment		
T3.1. Source apportionment modelling for full year 2015	MTP, IT, student	b00g b00h b00i b00j
T3.2. Quantify the contribution of source classes to PM over main urban areas is Spain	MTP, IT, student	b00g b00h b00i b00j

Extra tasks

Experiment definition

Experiment / *period*	Key question	ExpID	WP / Task
Evaluation WRF-CMAQv5.0.2-HERMES, NMMB/BSC-CTM, CAMS models / *annual2015*	- How does WRF-HERMES-CMAQ-12km (b006) performed compared with state-of-the-art models in Europe (eg. NMMB/BSC-CTM)? (b006, b007, cams?) - What is the added value WRF-HERMES-CMAQ-4km (b00a) provide compare to CAMS regional forecast? - What are the necessities of improvement in those models?	**b006 (REF1)** **b00a (REF2)** b007 cams	WP2 / Task 2.1
WRF improvements (urban model-landuse-topography) / *episode2015*	- Can an urban model improve air quality forecast in main cities in Spain? - What is the impact of using a high resolution land use and topography database?	**b00a** b00b b00c b00d	WP2 / Task 2.2
CMAQ aerosol mechanism update (AERO5 vs AERO6) / *episode2015*	- How PM2.5 and PM10 forecast can improve with AERO6?	**b00a** b00e	WP2 / Task 2.2
Improving resuspended paved road emission scheme / *episode2015*	- How PM10 forecast in urban areas can improve with an improved paved road resuspension emission scheme?	**b00a** b00f	WP2 / Task 2.2
SA regions PM / *annual2015*	- In what extend international, national and urban contribution determine high PM concentration in main Spanish cities on an annual, seasonal basis and during episodes?	b00g	WP3 / T3.1, T3.2
SA sectors PM / *annual2015*	- In what is the contribution of activity sectors in PM concentration in main Spanish cities? - What is the contribution of diesels and gasoline cars to PM high concentration in main Spanish cities? - What is the contribution of non-exhaust PM emission in main Spanish urban areas? This is key for future vehicle park electrification.	b00h	WP3 / T3.1, T3.2
SA regions O3 / *annual2015*	- In what extend international, national and urban contribution determine high O_3 concentration in Spain on an annual, seasonal basis and during episodes?	b00i	Extra
SA sectors O3 / *annual2015*	- What is the contribution of activity sectors to high O3 concentration in Spain an annual, seasonal basis and during episodes?	b00j	Extra

Annual simulations: 4 + 3 Episode simulations: 5

Chronogram and outcomes

Project month (PM)		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
WP1	T1.1																		
	T1.2																		
WP2	T2.1																		
	T2.2																		
WP3	T3.1																		
	T3.2																		
WP4	Comm		C1																
	Dissem						Dis1						Dis2						Dis3
	Explot													E1					
Milestones				M1			M2					M3	M4						
Deliverable							D1						D2						
Meeting													Me1						
Visit													V1			V2			

Project month (PM)		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
WP1	T1.1																		
	T1.2																		
WP2	T2.1																		
	T2.2																		
WP3	T3.1																		
	T3.2																		
WP4	Comm					C2													C3
	Dissem						Dis4						Dis5					Dis6	
	Explot								E2										E3
Milestones						M5	M6	M7									M8		
Deliverable						D3											D4	D5	
Meeting								Me2									Me3		
Visit								V3			V4					V5	V6		V7

Code	PM	Description
Communication		
C1	2	100 Leaflet
C2	23	100 Leaflet
C3	36	100 Leaflet
Dissemination		
Dis1	6	Annual FAIRMODE technical meeting
Dis2	12	Scientific Conference 1
Dis3	18	Annual FAIRMODE technical meeting
Dis4	24	Scientific Conference 2
Dis5	30	Annual FAIRMODE technical meeting
Dis6	35	Scientific Conference 3
Explotation		
E1	13	Newsletter to stakeholders objectives and aplicability (at BSC Earth System Services website)
E3	26	Newsletter to stakeholders about first results (at BSC Earth System Services website)
E3	36	Technical report to stakeholders
Milestones (tracking progress)		
M1	3	Database of compiled meteorological and air quality measurements
M2	6	List of selected PM episodes
M3	11	Report with the necessities of improvement detected in the CALIOPE system
M4	12	First project meeting
M5	23	Report on achivements in the improvements of the CALIOPE air quality systems
M6	24	List of emission sources and source region to performe the source apportionment study
M7	25	Second project meeting
M8	34	Third project meeting
Deliverables (tracking achivements)		
D1	6	Assessment of the relevant PM episodes in Spain from observation
D2	12	Assessment of the CALIOPE system model uncertainty in selected PM episodes
D3	23	Assessment of PM concentrations under selected episodes using improved modeling and measurements results
D4	34	Assessment of the origin of PM concentration under selected episodes in main urban areas in Spain
D5	35	Final scientfic report and recommendations
Meetings		
Me1	12	First project meeting - Dissemination level: public
Me2	25	Second project meeting - Dissemination level: public
Me3	34	Third project meeting - Dissemination level: public
Visits		
V1	12	1 two-day visit of NILU and JRC at BSC for the kick-off meeting
V2	15	1 five-day visit at NILU
V3	25	1 two-day visit of NILU and JRC for the 2nd project meeting
V4	28-30	1 three-month visit of USEPA at BSC
V5	33	1 five-day visit at JRC
V6	34	1 two-day visit of NILU and JRC at BSC for the final project meeting
V7	36	1 day visit at MAGRAMA

Take into account that MareNostum will be stopped next year!!

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Thank you!

For further information please contact
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