

Investigating Two-Dimensional Horizontal Mesh Grid Effects on the Eulerian Atmospheric Transport Model

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Table S1. Summary of the physics and dynamics of WRF settings.

Parameter option	Description	Reference
Physics		
Microphysics	WRF Single-Moment 3-class scheme	(Hong et al., 2004)
Long Wave Radiation	Rapid Radiation Transfer Model (RRTM)	(Mlawer et al., 1997)
Shortwave Radiation	Dudhia scheme	(Dudhia, 1989)
Cloud fraction option	Xu-Randall method	
Surface layer	MM5 similarity	(Fairall et al., 2003)
Land surface	Noah Land Surface Model	(Chen et al., 2004)
Boundary layer	Yonsei University scheme	(Jiménez & Dudhia, 2012)
Cumulus option	Kain-Fritsch scheme	(Bullock et al., 2015)
Dynamics		
Diffusion	Simple diffusion	(Reddy et al., 2020)
Eddy coefficient	Horizontal Smagorinski 1 st order	(Simon & Chow, 2021)

Table S2. Emissions modeling configurations.

Parameter option	Description	Reference
Anthropogenic emissions		
Chemistry mechanism	Melchior	(Laurent Menut et al., 2021)
Reggridding landuse vertical distribution	USGS Mailler and Terrenoire modification	(Brands et al., 2019) (Terrenoire et al., 2015)
Time distribution	Ebel guidelines	(Georgiou et al., 2018)
Natural emissions		
Biogenic emissions	MEGAN model	(Guenther et al., 2012)
Sea salt emissions	Monahan, completed by Martensson	(ImUlas, 2013)
Mineral dust emissions	Menut guidelines	(Mailler et al., 2017)
Boundary conditions		
Dust boundary conditions	GOCART global and LMDz-AER	(Ginoux et al., 2001)
Gas boundary conditions	LMDz-INCA	(Folberth et al., 2006)

Table S3. CHIMERE settings summary.

Parameter option	Description	Reference
Numerical solver	TwoStep solver	(Verwer et al., 1996)
Chemistry Options	Reduced mechanism MELCHIOR 2	(L. Menut et al., 2013)
Deep convection fluxes	Tiedtke scheme	(Tiedtke, 1989)
Advection	Upwind scheme	(Zhang et al., 2017)
Photolytic rates	Radiative transfer model	(Mlawer et al., 1997)
Boundary-layer turbulence	Troen and Mahrt scheme	(Miller et al., 1996)
Soil moisture	Fecan scheme	(Fécan et al., 1998)
Dry threshold friction velocity	Shao and Lu scheme	

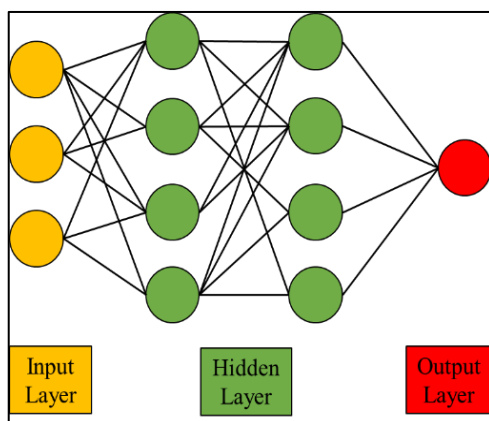


Fig. S1. A typical structure of the ANN

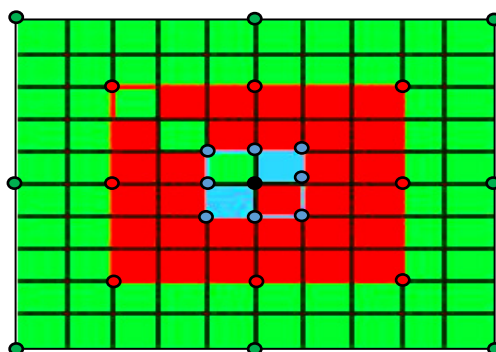


Fig. S2. Spatial discretization between the CHIMERE domains R1A (Green), R2A (Red), R3A (Blue) and the observation site (Black)

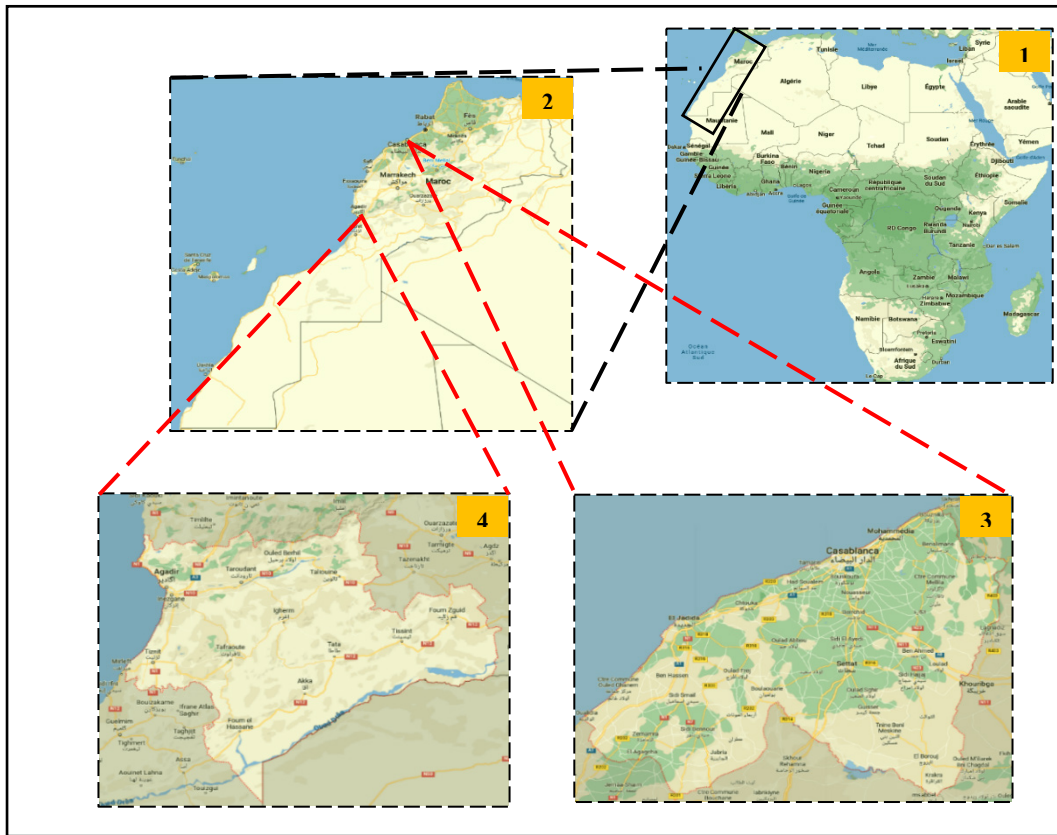


Fig. S3. The geographic area of the study site (1) Africa, (2) Morocco, (3) Casablanca (4) Agadir

Table S4. Coordinates of the four cells representing WRF and CHIMERE domains.

		North-West	North-East	South-East	South-West
WRF domain					
d01 domain	Latitude	43.82453°	43.82453°	20.87130°	20.87130°
	Longitude	-21.24654°	7.972054°	7.97205°	-21.24654°
d02 domain	Latitude	36.71437°	36.71437°	29.86381°	29.86381°
	Longitude	-12.02137°	-2.72593°	-2.72593°	-12.02137°
CHIMERE domain					
Agadir city					
R _{1A} domain (Green)	Latitude	33.7972°	33.7972°	28.1443°	28.1443°
	Longitude	-14.86298°	-2.78170°	-2.78170°	-14.86298°
R _{2A} domain (Red)	Latitude	32.63318°	32.63318°	29.04184°	29.04184
	Longitude	-13.2211°	-4.80623°	-4.80623°	-13.2211
R _{3A} domain (Blue)	Latitude	30.99084°	30.99084°	29.99848°	29.99848
	Longitude	-10.87559°	-8.31281°	-8.31281°	-10.87559
Casablanca city					
R _{1C} domain (Black)	Latitude	36.11015°	36.11015°	27.59972°	27.59972°
	Longitude	-15.1708°	-1.50715°	-1.50715°	-15.1708°
R _{2C} domain (Brown)	Latitude	34.82588°	34.82588°	29.58078°	29.58078°
	Longitude	-10.80079°	-4.142032°	-4.142032°	-10.80079°

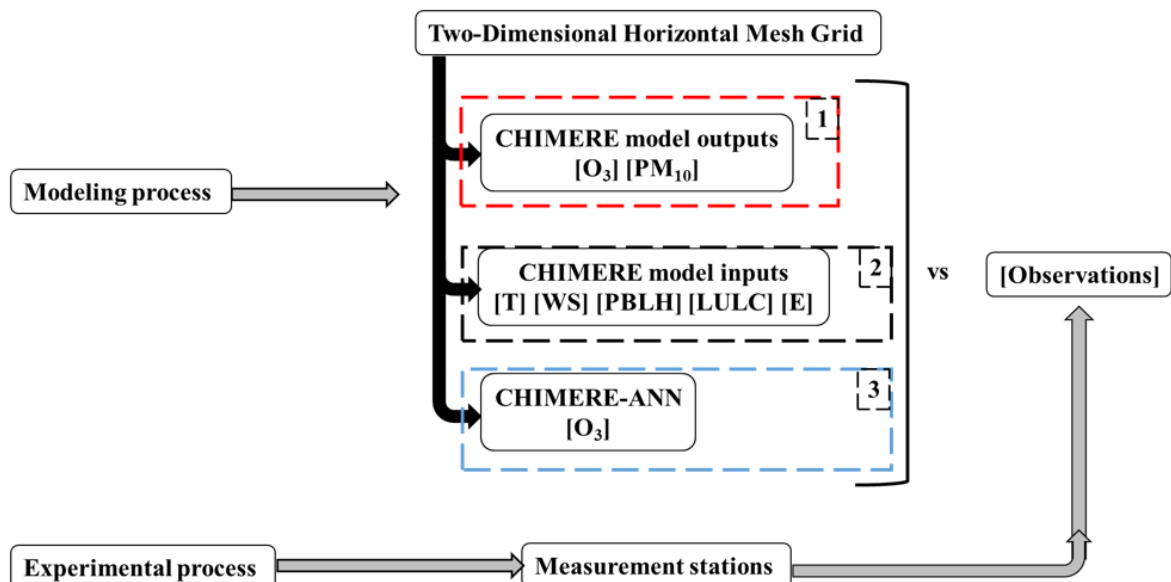


Fig. S4. Technical concept of the study, Aspect 1 (Block 1), Aspect 2 (Block 2), Aspect 3 (Block 3).

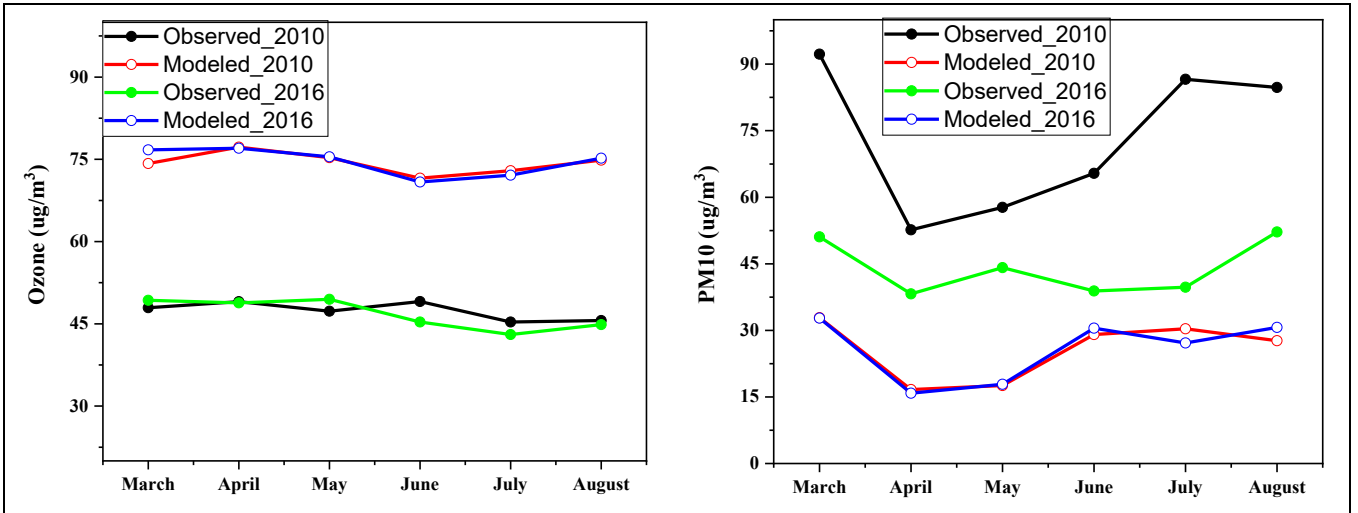


Fig. S5. Monthly average observed and modeled ozone and PM_{10} data in Agadir city on March 1st and August 31st, 2010, and 2016

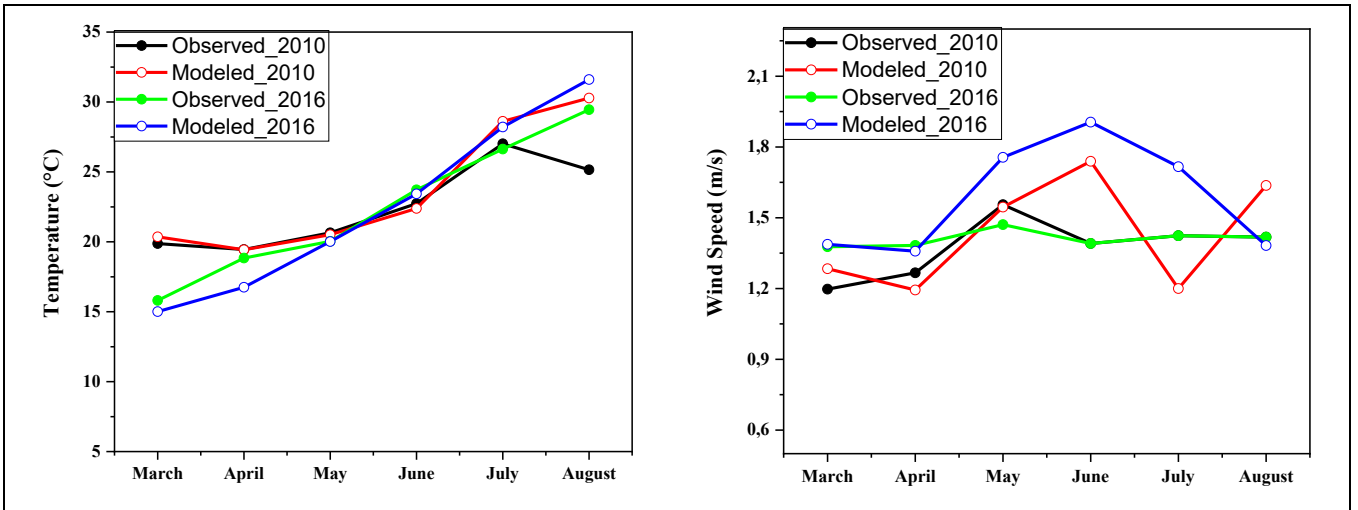


Fig. S6. Monthly average observed and modeled Temperature (a) and Wind Speed (b) in Agadir city on March 1 and August 31, 2010, and 2016.

Table S5. Correlation coefficient, and the root means square error (RMSE), given by the formula shown in Eq. (1), and Eq. (2)

$$\text{Correlation} = \sum_{k=1}^n \frac{(M_k - \bar{M})(O_k - \bar{O})}{\sqrt{(M_k - \bar{M})^2} \sqrt{(O_k - \bar{O})^2}} \quad (1)$$

$$\text{RMSE} = \sqrt{\frac{\sum_{k=1}^n (M_k - O_k)^2}{n}} \quad (2)$$

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