The contribution of large-scale atmospheric patterns to pollution with PM_{10}: the new Saharan Oscillation Index

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1 The Matter

Particule

Pollution

Coughing
Wheezing
Bronchities
Asthma
Cancer

High blood pressure
Arterios clerosis
Heart attack

2 The Aim

The assessment of the PM_{10} concentrations in Morocco and the study of their relationship with climate indexes and the general circulation, in order to better understand and handle their effects on human health.

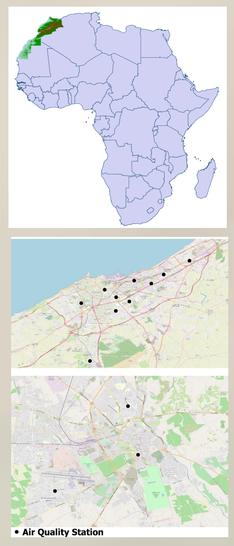
3 The Tools

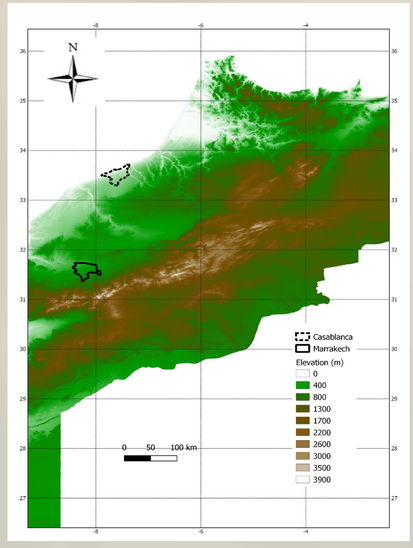
- Daily Means of PM_{10} concentrations;
- Annual data of NAO and MO indexes;
- Sea Level Pressure (SLP) data;
- Statistical approach.

4 The Period

The study was performed on daily basis between 2013 and 2016.

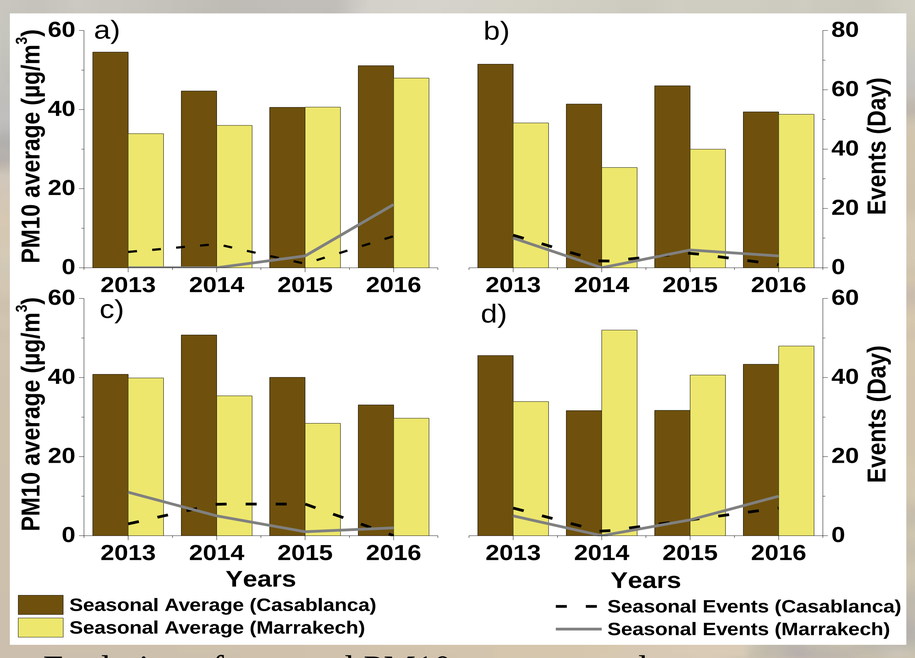
5 The Area



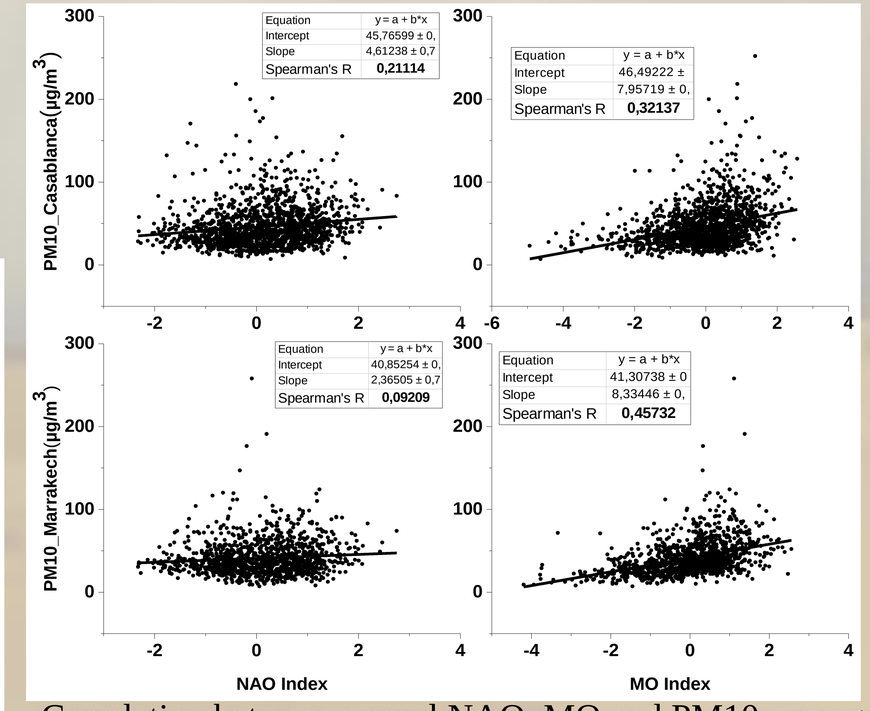


6 The Results

PM_{10} concentrations depend on the city, PM local sources and seasonal meteorological parameters.



Evolution of seasonal PM10 averages and extreme events
a) autumn, b) winter, c) spring, d) summer

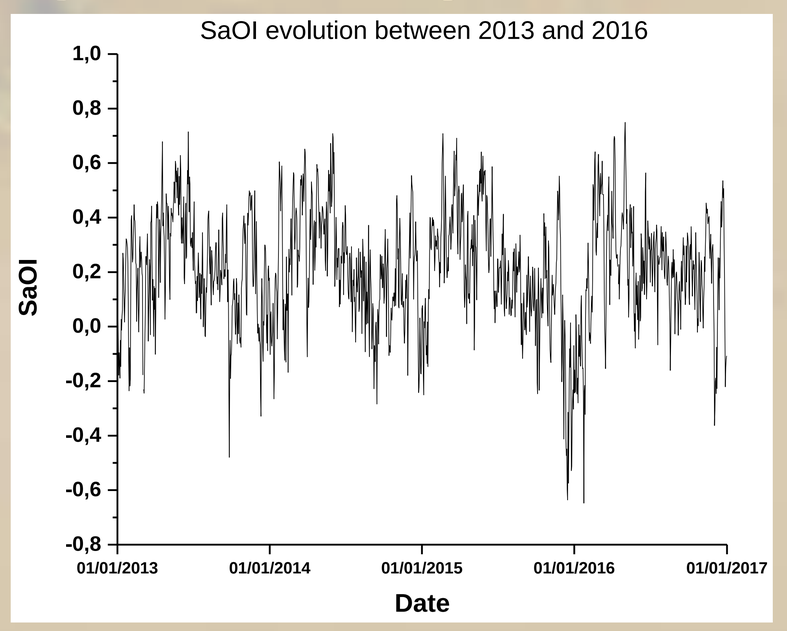


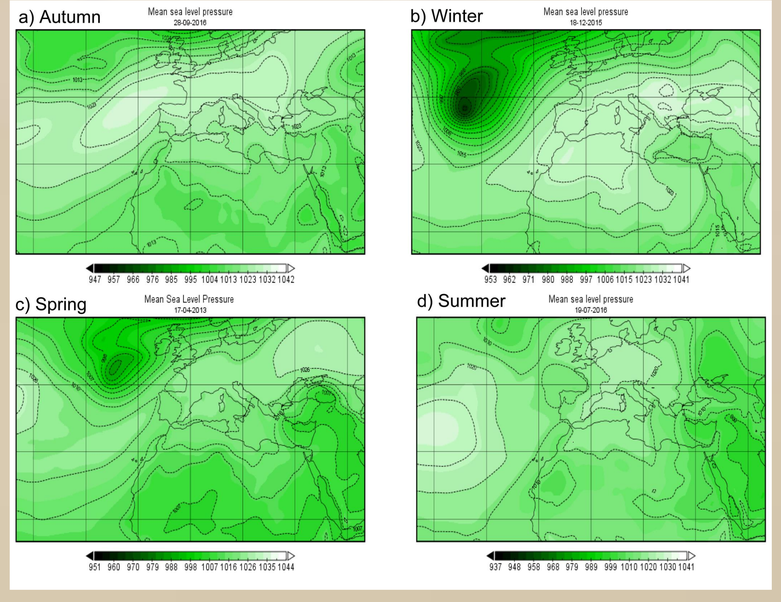
Correlation between annual NAO, MO and PM10 averages
Spearman's coeffcicent is significant in all cases

NAO and MO relate to PM_{10} averages in both cities.

MO plays a major role in particle pollution in Morocco.

The Dipole between the Azores High and the Saharan Depression (the Saharan Oscillation (SaO)) may also play a role.





$$SaOI_d = Pn_d(Azores) - Pn_d(Niamey)$$

$SaOI_d$: daily Saharan Oscillation Index
Pn_d: daily normalized pressure between 2013 and 2016

Formulation of the new Saharan Oscillation Index (SaOI)

7 The References

Khomsi, K., Najmi, H., Chelhaoui, Y., & Souhaili, Z. (2020). **Assessment of the large-scale atmospheric patterns to pollution with PM10: the contribution of the new Saharan Oscillation Index**. *Submitted to: Aerosol and Air Quality Research Journal*

Spearman coefficient of correlation between annual and seasonal PM_{10} averages and Climate Indexes (NAO, MO and SaOI)
Bold Character: Coefficient is statistically significant, Significance level = 0.05

Site	Annual			Autumn			Winter			Spring			Summer		
	NAO	MO	SaOI	NAO	MO	SaOI	NAO	MO	SaOI	NAO	MO	SaOI	NAO	MO	SaOI
Casablanca	**0.21**	**0.32**	**-0.17**	**0.12**	**0.42**	**0.13**	0.00	**0.56**	**-0.42**	**0.15**	**0.31**	**-0.13**	0.07	**0.35**	0.01
Marrakech	**0.09**	**0.46**	**-0.26**	**0.16**	**0.46**	0.03	0.06	**0.53**	**-0.52**	0.10	**0.40**	**-0.18**	0.12	**0.29**	**-0.07**
NAO	-	-	**0.19**	-	-	**0.31**	-	-	**0.24**	-	-	**0.23**	-	-	**0.26**
MO	-	-	-0.04	-	-	0.04	-	-	**-0.24**	-	-	0.10	-	-	0.08