Title: Assessing the role of atmospheric stability on surface pollen concentrations

Start and end date: 13/10/2022 to 28/10/2022

Participants:

- Juan Luis Guerrero Rascado (University of Granada, Spain, grantee)
- Maria João Costa (University of Évora, Portugal, host)
- Ana Galveias (University of Évora, Portugal)
- Gregori de Arruda Moreira (Federal Institute of São Paulo, Brazil)

Main outputs:

This VM has contributed to demonstrate how the use of remote sensing systems can help to understand the link between the ABL dynamics and the pollen dispersion process. Furthermore, this VM potentially will have a social (health) and economic impact (prevention of extreme allergic responses with potential hospitalization), because our results might be applied to improve the predictive models and alert systems, since the information generated in this VA has identified which atmospheric variables has a moderate influence on pollen levels for certain taxa (see Figures 1 and 2). Furthermore, this approach can be easily replicated in other research centers over Europe combining MWRnet and EAN (European Aerobiology Network).

During the final meeting, the researchers involved in this VM agreed to present the results in an international conference (ELC, ISARS or EMS) and to prepare a manuscript (Q1 JCR, to be submitted in Science of the Total Environment, International Journal of Aerobiology or Atmospheric Research). This is a contribution for the PROBE's objectives mainly for the following MoU specific objectives: (1) 'Capacity building for end-users through training and demonstration on the use and impact of ABL products in multiple applications for societal benefit', and (2) 'build capacity in exploiting advanced ABL profiling data for short-term weather forecasts, aviation hazards, renewable energy applications, pollution dispersion and long-term climate applications'. Besides, this VM promoted the collaboration between different academic and research institutions, in the framework of WG2 (sub-topic: Aerosols) and it contributes to the MoU deliverables D2.2. 'Scientific paper on instrument synergy' and D2.3. 'Recommendations for measurement-product requirements for data assimilation and long-term reanalysis of multi-variable ABL profiling dataset'.

	I_{inv}^{mean}	I_{inv}^{max}	I_{inv}^{min}	I_{inv}^{P90}	I_{inv}^{P95}	I_{inv}^{modal}	D_{Inv}
Quercus	0.00	0.01	-0.01	0.01	0.01	0.02	-0.02
Poaceae	0.10**	0.10**	0.04	-0.05	-0.05	0.17**	0.06*
Platanus	-0.05	-0.05	0.01	-0.02	-0.02	-0.07**	-0.12**
Olea	0.09**	0.10**	0.01	-0.06*	-0.06*	0.14**	0.03
Cupressus	-0.01	-0.02	0.02	0.08**	0.08**	-0.05	0.01
Morus	-0.09**	-0.07*	0.00	-0.01	-0.01	-0.09**	-0.13**

	$z_{base\ inv}^{mean}$	$z_{base\ inv}^{max}$	$z_{base\ inv}^{min}$	$z_{base\ inv}^{P90}$	$z_{base\ inv}^{P95}$	$z_{base\ inv}^{modal}$	$T_{base\ inv}^{mean}$	$T_{base\ inv}^{max}$	$T_{base\ inv}^{min}$	$T_{base\ inv}^{P90}$	$T_{base\ inv}^{P95}$	$T_{base\ inv}^{modal}$
Quercus	0.05	0.05	-0.02	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.01
Poaceae	0.14**	0.14**	0.06*	-0.04	-0.04	0.10**	0.23**	0.23**	0.23**	-0.04	-0.04	0.23**
Platanus	-0.06*	-0.06*	-0.04	-0.03	-0.03	-0.02	-0.09**	-0.09**	-0.09**	-0.04	-0.04	-0.12**
Olea	0.13**	0.13**	0.08**	-0.03	-0.03	0.09**	0.20**	0.20**	0.21**	-0.03	-0.03	0.18**
Cupressus	-0.08*	-0.06*	-0.04	0.06*	0.06*	-0.03	-0.22**	-0.22**	-0.23**	0.06*	0.06*	-0.17**
Morus	-0.05	-0.06	-0.02	-0.02	-0.02	-0.02	-0.12**	-0.11**	-0.12**	-0.02	-0.02	-0.13**

	$z_{top\ inv}^{mean}$	$z_{top\ inv}^{max}$	$z_{top\ inv}^{min}$	$z_{top\ inv}^{P90}$	$z_{top\ inv}^{P95}$	$z_{top\ inv}^{modal}$	$T_{top\ inv}^{mean}$	$T_{top\ inv}^{max}$	$T_{top\ inv}^{min}$	$T_{top\ inv}^{P90}$	$T_{top\ inv}^{P95}$	$T_{top\ inv}^{modal}$
Quercus	0.01	0.00	0.05	0.00	0.00	0.05	0.00	0.01	0.00	0.00	0.00	0.01
Poaceae	0.14**	0.11**	0.16**	-0.04	-0.04	0.16**	0.21**	0.21**	0.23**	-0.04	-0.04	0.23**
Platanus	-0.09**	-0.09	-0.05**	-0.03	-0.03	-0.06*	-0.09**	-0.08**	-0.09**	-0.04	-0.04	-0.12**
Olea	0.12**	0.09**	0.17**	-0.03	-0.03	0.14**	0.19**	0.19**	0.21**	-0.03	-0.03	0.19**
Cupressus	-0.06*	-0.06	-0.04*	0.06*	0.06*	-0.03	-0.21**	-0.20**	-0.23**	0.06	0.06*	-0.17**
Morus	-0.13**	-0.13	-0.05**	-0.02	-0.02	-0.09**	-0.13**	-0.11**	-0.13**	-0.02	-0.02	-0.14**

Figure 1. Spearman correlation between the pollen concentrations and the variables calculated from the thermal inversions at Évora. Correlations with values of p< 0.05 and p < 0.01 are marked with (*) and (**), respectively.

	LI^{mean}	LI^{max}	LI^{min}	LI^{P90}	LI^{P95}	LI^{modal}	KO^{mean}	KO^{max}	KO^{min}	KO^{P90}	KO^{P95}	KO^{modal}
Quercus	-0.10**	-0.07*	-0.12**	-0.06*	-0.07	-0.05*	-0.05	-0.09**	-0.01	-0.08**	-0.08**	-0.06*
Poaceae	-0.07*	0.00	-0.13**	0.01	0.00	0.03	-0.02	-0.03	-0.01	-0.02	-0.02	0.00
Platanus	-0.12**	-0.12**	-0.12**	-0.12**	-0.11	-0.12**	-0.06*	-0.09**	-0.04	-0.09**	-0.09**	-0.09**
Olea	-0.07*	-0.01	-0.13**	0.00	0.00	0.03	-0.04	-0.03	-0.05	-0.03	-0.03	-0.02
Cupressus	-0.01	-0.06*	0.04	-0.06*	-0.06	-0.09*	0.00	-0.05	0.02	-0.04	-0.04	-0.04
Morus	-0.17**	-0.15**	-0.17**	-0.16**	-0.15	-0.15**	-0.12**	-0.18**	-0.07*	-0.17**	-0.17**	-0.13**

	TTI^{mean}	TTI^{max}	TTI^{min}	TTI^{P90}	TTI^{P95}	TTI^{modal}	KI^{mean}	KI^{max}	KI^{min}	KI^{P90}	KI^{P95}	KI^{modal}
Quercus	0.05	0.04	0.06*	0.03	0.03	0.06*	-0.02	-0.02	-0.01	-0.02	-0.03	0.01
Poaceae	-0.10**	-0.11**	-0.09**	-0.11**	-0.11**	-0.09**	-0.04	-0.05	-0.04	-0.05	-0.05	-0.03
Platanus	0.12**	0.11**	0.13**	0.10**	0.10**	0.12**	0.04	0.05	0.05	0.03	0.03	0.06
Olea	-0.08**	-0.08**	-0.07*	-0.09**	-0.10**	-0.06*	-0.01	-0.01	-0.01	-0.03	-0.03	-0.01
Cupressus	0.11**	0.13**	0.10**	0.11**	0.11**	0.12**	-0.06*	-0.02	-0.06*	-0.04	-0.05	-0.02
Morus	0.21**	0.20**	0.21**	0.19**	0.19**	0.20**	0.05	0.06*	0.06*	0.05	0.05	0.06*

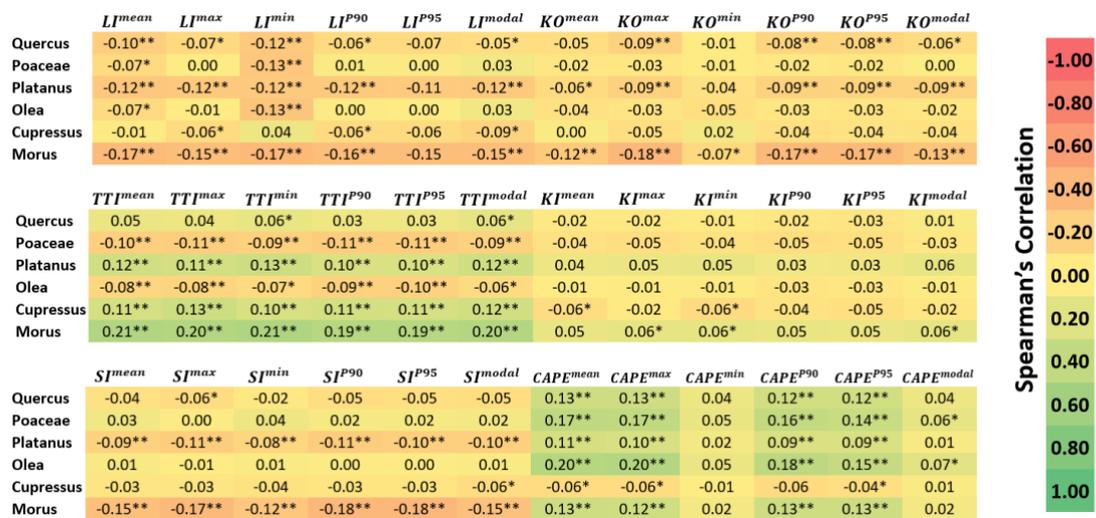|	SI^{mean}	SI^{max}	SI^{min}	SI^{P90}	SI^{P95}	SI^{modal}	$CAPE^{mean}$	$CAPE^{max}$	$CAPE^{min}$	$CAPE^{P90}$	$CAPE^{P95}$	$CAPE^{modal}$
Quercus	-0.04	-0.06*	-0.02	-0.05	-0.05	-0.05	0.13**	0.13**	0.04	0.12**	0.12**	0.04
Poaceae	0.03	0.00	0.04	0.02	0.02	0.02	0.17**	0.17**	0.05	0.16**	0.14**	0.06*
Platanus	-0.09**	-0.11**	-0.08**	-0.11**	-0.10**	-0.10**	0.11**	0.10**	0.02	0.09**	0.09**	0.01
Olea	0.01	-0.01	0.01	0.00	0.00	0.01	0.20**	0.20**	0.05	0.18**	0.15**	0.07*
Cupressus	-0.03	-0.03	-0.04	-0.03	-0.03	-0.06*	-0.06*	-0.06*	-0.01	-0.06	-0.04*	0.01
Morus	-0.15**	-0.17**	-0.12**	-0.18**	-0.18**	-0.15**	0.13**	0.12**	0.02	0.13**	0.13**	0.02

Figure 2. Spearman correlation between the pollen concentrations and the variables calculated from the stability indices at Évora. Correlations with values of p< 0.05 and p < 0.01 are marked with (*) and (**), respectively.