

Interactive comment on “The ACCENT-VOCBAS field campaign on biosphere-atmosphere interactions in a Mediterranean ecosystem of Castelporziano (Rome): site characteristics, climatic and meteorological conditions, and eco-physiology of vegetation” by S. Fares et al.

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Some remarks about the discussion in pages 1199-1202. The authors try to describe how the sea breeze regime in the Roma region might affect the transport of polluted air in the vicinity of the Montelibretti and Castelporziano sites. I found their discussion particularly interesting from my perspective (a boundary-layer modeller with a fair knowledge of wind regimes in nonuniform terrain, and with an interest in the transport

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processes related to breeze systems).

The sea breeze, blowing SW to NE during the daytime, is supposed to bring photochemically polluted air from Rome towards Montelibretti and the Apennines to the NE of Rome. Meanwhile, the breeze compensation flow, blowing NE to SW aloft, is responsible for the transport of ozone from the Rome urban area towards Castelporziano, the coast and offshore. Based on these processes, the authors try to explain that the daytime ozone concentrations observed in Castelporziano originate in inland areas to the NW of the site, due to the deflection of the return flow towards the SE, operated by the Coriolis (not "Corioli's", as in page 1201 line 5) force. In this regard, it should be underlined that the Coriolis force causes an acceleration normal to the wind direction, and towards the right in the northern hemisphere. This means that the Coriolis effect should steer the return flow (NE-SW) of the sea breeze towards the NW (i.e. to its right), contrary to what the authors state. The sea breeze would instead be rotated towards the SE: but it should bring clean air to the site, rather. Furthermore, a scale analysis of the equations of motion for meso-gamma circulations within the boundary layer would reveal that the Coriolis force is indeed negligible in this context. Finally, it is not clear how a return flow occurring typically at heights between 500 and 900 m can condition surface processes in Castelporziano. Therefore, the speculations of the authors do not appear entirely justified in this case.

Then, it is suggested that the nighttime ozone concentrations in Castelporziano are conditioned by the formation of a surface stable layer in the site, before the onset of the land breeze. In particular, ozone concentrations would be higher in Castelporziano than in Montelibretti, because stable layers would develop in the former site and not in the latter. Stability would imply a lower mixing height, and hence higher concentrations. But, the thermal profile is expected to be stable at any location during the nighttime: why should the atmosphere have a stronger stratification in Castelporziano than in Montelibretti? Are there any peculiar topographical features that might cause the pooling of cold air there? Moreover, vertical mixing is not an efficient process during

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the nighttime and in the absence of wind shear: therefore, mixed layers in the nighttime are not usually observed, except for layers occasionally presenting residual turbulence, quite away from the surface. In a stable environment with no wind (and hence no shear, no turbulence), concentration profiles are not mixed: therefore the depth of the stable layer should be of no concern. Even in this case, the micrometeorological speculations of the authors seem to need some adjustment (and experimental evidence on the nocturnal thermal profiles in the two sites).

To summarize, differences in the ozone concentrations observed in the Castelporziano and Montelibretti sites might indeed be conditioned by meteorological processes, but the explanations provided here do not appear to point to the right direction. The authors might consider looking for other factors, independent from meteorology, to explain the differences they observe: at the moment, they do it only partially (for the night-time situation, when they concentrate on ozone removal processes). They could go further, and make a useful comparison with the next study in this same special issue. Gerosa et al. discuss other ozone measurements in the Castelporziano site in the same period. In their study, observed concentrations range from 0-20 ppbv (nighttime) to 60-70 ppbv (daytime), quite differently from what presented here. In particular, an average ozone cycle derived from the Castelporziano measurements by Gerosa et al. would compare very well with that observed in Montelibretti. Could this raise the suspect of some problems in the measuring equipment used in the present study?

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