

## ***Interactive comment on “Seasonal and diurnal variations of particulate nitrate and organic matter in the Central European atmospheric aerosol” by L. Poulain et al.***

**Anonymous Referee #1**

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The paper describes highly time-resolve measurements of organic aerosol and nitrate made by AMS and analyses patterns of average diurnal variations. The work is relatively novel in the aspect that the development of the AMS has only recently led to datasets of this kind coming available, and although no wholly new insights into atmospheric chemistry are generated, the results are nonetheless of significance and interest. It was very difficult to evaluate the quality of this manuscript largely because three of the key figures (i.e. Figures 4, 5 and 6 and to a lesser extent, Figure 3) are undecipherable even when expanded in size as far as I was able. This makes expressing a view on the science effectively impossible, and the size of these graphs or the mode of presentation of the data needs to be improved if the science is to be meaningfully

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reviewed.

One other point of obscurity is that much of the discussion relates to the “deliquescence constant”. The meaning of this parameter is not described, and judging from equation 4, it cannot be a direct analogue of the dissociation constant as equation 4 takes no account of relative humidity. References need to be given to the sources of equations 3 and 4 and an explanation of the meaning of deliquescence constant, which incidentally is not in the index of Seinfeld and Pandis (1998).

It is stated on page 11626, line 12 that “it is reasonable to consider that the particles were in equilibrium with the gas phase .....”. Much of the subsequent data interpretation is based upon this premise. A systematic delay in response to decrease in the deliquescence constant is attributed to changes in local air quality or to local photochemistry of HONO. Because of the lack of a definition of the deliquescence constant and the unreadability of the diagrams, the reviewer was unable to critically evaluate this observation. However, there is a small literature suggesting that there are kinetic restraints to the achievement of the ammonium nitrate association/ dissociation equilibrium which do not appear to have been considered as an explanatory factor in this work. This point needs to be considered as an alternative explanation of the observed behaviour.

Another point which needs to be considered is that the data analysis regards ammonium nitrate as an externally mixed component of the aerosol. There is a great deal of evidence in the literature that ammonium nitrate can be internally mixed and the thermodynamics of the mixed systems have been studied by Seinfeld and others.

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