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Interactive comment on "The effect of physical and chemical aerosol properties on warm cloud droplet activation" *by* G. McFiggans et al.

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The authors would like to thank Dr Poeschl for pointing out an area of importance that we neglected to cover in the original manuscript. Although there is little direct evidence for the effect of organic nitogen containing compounds on droplet activation, there is a strongly identified potential for roles for the identified classes of nitrogen-containing compounds in affecting the activation properties of the atmospheric aerosol. An additional section has been added to section 3.1.4.1 identifying these classes of compound, citing the appropriate literature.

"In addition to the functional groupings identified above, there are a number of classes of nitrogen-containing compounds which are relatively abundant in airborne particulates (Saxena & Hildemann, 1996; Miguel et al., 1999; Zhang & Anastasio, 2001, 2003;

Zhang et al., 2002; Mace et al., 2003a,b,c; Kuznetsova et al., 2005; Matsumoto & Uematsu, 2005; Poeschl, 2005). Thought to be primary in origin, and hence generally concentrated in the coarse mass modes, proteins, peptides, amino acids and related amino-compounds are reasonably documented in terms of their mass loadings. More recent postulations suggest that secondary processes may contribute to their transformation (Franze et al., 2005). Studies of these compounds in particulate matter, hydrometeors, and precipitation have reported high concentrations, indicating that they account for a major mass fraction of water-soluble organic carbon and may be present in significant numbers of fine particles. These compounds are known to act as surfactants and are thereby likely to influence the interaction of atmospheric aerosol particles with water vapor through the surface tension term in equation 1 or through other surface effects (see section 4.1.4). The roles of these compounds are discussed in section 4.1.9"

It is not known how abundant these compounds are by number in the atmosphere. However the study of Mikhailov et al. (2004) has shown that they will strongly affect a particle's interaction with water (through subsaturated hygroscopicity measurements). A brief discussion of the effects and reference to the study is included in section 4.1.9:

"Mikhailov et al. (2004) demonstrated that proteins can form envelopes around salt particles, can affect the microstructure and porosity of mixed organic-inorganic particles, and influence the deliquescence, efflorescence, and hygroscopic growth of sodium chloride, ammonium nitrate, and ammonium sulfate particles even at low concentration levels. The study demonstrates that not only organics of limited / low solubility but also highly water-soluble biopolymers such as proteins and related (macro-) molecules can significantly change the surface properties and water interactions of aerosol particles both by thermodynamic and kinetic effects. The thermodynamic effects may be efficiently included in Köhler model calculations. Studies should be carried out to directly establish the effects on CCN properties of such compounds. In addition, it remains to be investigated whether such nitrogen-containing compounds are present in suffi-

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cient numbers of fine particles or giant CCN (with reference to the study of Medina and Nenes, 2004) to sugnificantly affect cloud activation and development."

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