

## ***Interactive comment on “Nutrients Dissolution Kinetics of Aerosols at Qianliyan Island, the Yellow Sea by a High Time-resolution Nutrient Dissolution Experiment, Potential Linkages with Inorganic Compositions and P solubility controlled factors” by Ke Zhang et al.***

### **Anonymous Referee #2**

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Review of Zhang et al This paper describes an extensive series of experiments on the solubility of N, P and Si from some aerosols collected off the coast of China. The work has been carefully done and thoroughly analysed and should be published. The paper is generally well written but would benefit from an additional edit in a few places. The discussion does seem to me to be too long in some places. The authors discuss the detailed comparisons of a few aerosols from this one site, but most readers will be more interested in the generalities of the results which I think can be summarised

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as inorganic N dissolves completely and rapidly, while only a percentage of P and Si dissolves and that dissolution takes place over timescales of a few hours. I would also suggest that the authors need to note a few caveats of this type of experiment. Firstly wet deposition dominates in most places. The pH of aerosol or rain depositing to seawater will rise to close to 8 almost immediately so prolonged acid exposure can happen in clouds but will then rapidly be reversed. The timescales of dissolution relevant to marine ecosystems are the lifetimes in the surface mixed layer of particles which are days to weeks so the dissolution rates of even the Si and P species are rapid with respect to that. A few specific comments Line 100 Explain why weekly collections only span 20 hours, I assume it is collecting for 1 day each week. Line 120 why was 1M HCl used, that is surely very much more acidic. In addition the P and Si analyses methods are sensitive to the pH of the analysed solution, did this cause any issues? Line 226 Why do you link the FeP pattern to acid processing rather than source, it seems to me it could be either. Line 280-5 and 328-358 These are quite long discussion sections that could be shortened to focus on key and generalizable conclusions rather than specific comparisons of a few aerosols from this one site – consider the wider implications for readers from outside the region. The issue of comparisons of rates of dissolution for pure minerals, particularly silicates, to the observed rates (around line 380) are an interesting observation that should be retained. Line 307 The logic of the discussion around nitrate/ammonium ratios seems to me to be a bit flawed. At the very least it ignores sodium nitrate formed by the seasalt displacement reaction in the coarse mode aerosol. The nitrate/ammonium ratio in an aerosol depends on emission rates and deposition so I'm not sure this section is particularly useful.

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