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Multiphase buffer theory explains contrasts in atmospheric aerosol acidity

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Aerosol acidity largely regulates the chemistry of atmospheric particles, and resolving the drivers of aerosol pH is key to understanding their environmental effects. We find that an individual buffering agent can adopt different buffer pH values in aerosols and that aerosol pH levels in populated continental regions are widely buffered by the conjugate acid-base pair NH_4^+/NH_3 (ammonium/ammonia). We propose a multiphase buffer theory (Zheng et al., 2020, *Science*) to explain these large shifts of buffer pH, and we show that aerosol water content and mass concentration play a more important role in determining aerosol pH in ammonia-buffered regions than variations in particle chemical composition. Our results imply that aerosol pH and atmospheric multiphase chemistry are strongly affected by the pervasive human influence on ammonia emissions and the nitrogen cycle in the Anthropocene.

References:

Zheng, G., Su, H.*, Wang, S., Andreae, M. O., Pöschl, U., and Cheng, Y.*: Multiphase buffer theory explains contrasts in atmospheric aerosol acidity, *Science*, 369, 1374-1377, 2020.