

Interactive comment on “A comprehensive study of hygroscopic properties of calcium- and magnesium-containing salts: implication for hygroscopicity of mineral dust and sea salt aerosols” by Liya Guo et al.

Anonymous Referee #2

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This paper uses two complementary techniques to explore the water uptake properties of commonly found Mg and Ca salts in mineral dust and sea salts that are relevant to atmospherically aged particles. The manuscript is thorough and very well written. I recommend this work for publication after minor revisions.

Major Comments: I have several major comments:

1. More discussion of salts found in freshly emitted and heterogeneously processed sea salt aerosols would have balanced out the intro and discussion in this paper.

C1

2. The conclusions and implications section would have benefited from discussion of the implications for water uptake and CCN activation of freshly emitted and processed dusts and sea salts.

3. The authors should create another table or a κ plot with their κ_{GF} values and to report these values in the abstract. This will attract more attention to their work.

Specific Comments: Abstract

1. I recommend pointing out that your results also fit theoretical predictions from the Clausius-Clapeyron equation and to report κ_{GF} values obtained from this work. This is important for incorporating your results into models.

Introduction

1. Please also reference [Gaston et al., 2017] which explored the CCN activity of playa dusts.
2. Lines 75-78: CaCl₂ would also be important for sea spray aerosol.
3. Lines 80-83: were these previous studies incomplete that the work warrants further investigation? How so?

Methods

1. Were diameters corrected for shape factors particularly for dry particle diameters?

Results

1. Line 414: Gaston et al., 2017 also measured κ_{CCN} for CaCl₂ and for a MgCl₂ hydrate.
2. The authors are encouraged to create another table or a κ plot with their κ_{GF} values and to report these values in the abstract. This will attract more attention to their work.

Conclusions:

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1. The authors are encouraged to point out the broader implications of their work for the water uptake and cloud nucleating properties of fresh and processed dusts and sea salts.

2. The authors are encouraged to also point out the ability of the Clausius-Clapeyron equation to predict the temperature-dependent behavior of the water uptake properties of some of the salts.

References: Gaston, C. J., K. A. Pratt, K. J. Suski, N. W. May, T. E. Gill, and K. A. Prather (2017), Laboratory studies of the cloud droplet activation properties and corresponding chemistry of saline playa dust, *Environmental Science & Technology*, 51(3), 1348-1356.

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