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Interactive comment on "A general database of hydrometeor single scattering properties at microwave and sub-millimetre wavelengths" *by* Patrick Eriksson et al.

Anonymous Referee #1

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General comments:

This manuscript introduces a database of scattering properties for different ice particles including also raindrops. This database is one of the first ones to include high microwave frequencies up to the submillimeter range. The authors' goal is to provide an easy interface for users and a broad range of particle types, which is important in many retrieval studies. In particular, these can be easily utilized in the atmospheric radiative transfer simulator (ARTS).

Overall, I find this manuscript and the database highly relevant for researchers wanting to include better microphysical models in their algorithms.

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Discussion paper

I recommend the publication of this manuscript with only minor revisions.

Specific comments:

page 14, line 16, sentence 'Contrary to most aggregate...': I find this a bit too general statement. The more physics-based stochastic aggregation model which takes into account the mutual velocities and random collisions of falling ice crystals and aggregates, such as the one described by Westbrook (2004) and Maruyama (2005), is used in many models, e.g. Kuo et al. (2016), Leinonen and Szyrmer (2015) and Tyynelä and Chandrasekar (2014).

page 14, line 19, sentence 'Aggregate sticking is only...': The assumption of parallel faces is generally not assumed in the physics-based aggregation models due to the turbulence close to the particles (Pruppacher and Klett, 1997). This is also assumed in Maruyama's aggregation model. I would like to see what this decision is based on. Also typo: 'be be parallel'.

page 17, line 2: This sentence needs some revision. There are no interactions between particles in DDA. You are computing the interaction between dipoles inside a single particle. Amplitude matrix and Mueller matrix elements have in principle the same information included in them in a fixed orientation. When you do the orientation averaging scheme as you described in Eq. (2), you are summing squared electric fields from different orientations/particles together, which means that the phase information of the scattered electromagnetic waves for individual orientations is lost. As an example, some radar measurenents, like the specific differential phase Kdp, can capture the phase information. In this case, you need to sum the electric fields directly in the forward scattering direction for each orientation and particle.

page 21, line 16, sentence 'The Tyynelä aggregates...': Here it might be simpler to just mention that the aggregation was based on Westbrook (2004), which is a similar model as Maruyama et al. (2005).

page 30, Fig. 13 caption: Why 88.8 GHz? The W-band cloud radar frequency is 94 GHz, not 88.8 GHz. Radiometers use the 89 GHz channel.

References:

Pruppacher, H. R., and J. D. Klett (1997), Microphysics of clouds and precipitation, Kluwer Academic, 954 pp.

Westbrook, C.D. (2004), Universality of snow formation. PhD Thesis, University of Warwick, Coventry, UK.

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