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Interactive comment on “What’s the real role of iron-oxides in the optical properties of dust aerosols?” by X. L. Zhang et al.

Anonymous Referee #2

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I first would like to apologize with authors and the editor for the delay in submitting this review. This manuscript present a sensitivity study of the optical properties of dust mixtures including iron oxides to the values of their refractive index, to their state of mixing within the dust matrix and to the shape. The topic is surely of interest as iron oxides control the light-absorbing properties of mineral dust which ultimately control their direct and semi-direct radiative effect. Pointing out to the discrepancies in the current state of knowledge is surely beneficial in promoting new research in the area. Nonetheless, the paper presents various weaknesses that must be addressed before considering publication. In particular, the paper presents a very large number of references. However, there is a great confusion and a great deal in simplification in their use, leading to misleading discussion and conclusions. The authors should pay more

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attention in separating research results that 1/ dealt with dust in the aerosol phase to those that dealt with dust in soils 2/ dealt with standard material (synthetic minerals, proxies..) to those that dealt with dust in the aerosol phase

Some specific comments: a/ Size distribution (paragraph 2.2): a model of size distribution is proposed. The authors do not consider a coarse mode, whereas, by their own admission, mineral dust is characterized by one. As a matter of fact, the coarse mode of mineral dust can contribute to lower the single scattering albedo of dust. What is the competition with the value of the complex refractive index of the iron oxides? b/ Goethite/hematite ratios: the authors have to distinguish between quantitative (such as those presented in Formenti et al. 2014 using X-ray absorption) and qualitative measurements such as those presented in Formenti et al. 2008, Lafon et al. (2006) and Klaver et al (2011) using diffuse reflectance spectroscopy c/ Abundance of iron and iron oxides (paragraph 3.2.2) c.1/Page 15, lines 20 on. Not all the references you mention used XRD to quantify the iron oxides c.2/Page 16, line 9. Formenti et al. 2014 did NOT use diffuse reflectance spectroscopy to obtain the hematite-to-goethite ratio d/Abundance of iron and iron oxides (paragraph 3.2.2) d.1/Page 15, lines 20 on. Not all the references you mention used XRD to quantify the iron oxides

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