Re-evaluation of the global dust longwave direct radiative effect from laboratory estimates of the refractive index and model simulations

C. DI BIAGIO[1,*], P. FORMENTI[1], Y. BALKANSKI[2], L. CAPONI[1,3], M. CAZAUNAU[1], E. PAUNGUI[1], E. JOURNET[1], S. NOWAK[4], S. CAQUINEAU[5], M. O. ANDREAE[6,12], K. KANDLER[7], T. SAEED[8], S. PIKETH[9], D. SEIBERT[10], E. WILLIAMS[11], O. BOUCHER[13] AND J.F. DOUSSIN[1]

[1] LISA, CNRS, UPEC et UPD, IPSL, Créteil, France (*correspondence : cldibiagio@gmail.com)
[2] LSCE, CEA CNRS UVSQ, 91191, Gif sur Yvette, France
[3] University of Genoa, Genoa, Italy
[4] Plateforme RX UFR de chimie, UPD, Paris, France
[5] IRD-Sorbonne Universités (UPMC) – CNRS-MNHN, LOCEAN, IRD France-Nord, Bondy, France
[6] Max Planck Institute for Chemistry, Mainz, Germany
[7] Technische Universität Darmstadt, Darmstadt, Germany
[8] College of Basic Education, PAAET, Al-Ardeya, Kuwait
[9] North-West University, Potchefstroom, South Africa
[10] Walden University, Minneapolis, Minnesota, USA
[11] Parsons Laboratory, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA
[12] Geology and Geophysics Department, King Saud University, Riyadh, Saudi Arabia
[13] LMD, IPSL, Paris, France

New measurements of the dust longwave (LW) refractive index and its global variability have been obtained from laboratory measurements of 19 real dust samples with contrasted mineralogical composition from 4 continents [1]. Laboratory results indicate that the LW refractive index of dust strongly varies with the source region of emission in link with the changes of its mineralogy. This inedited dataset of refractive indices have been used as input into an optical model to estimate the global variability of the mass extinction coefficient, single scattering albedo, and asymmetry factor of dust based on realistic assumptions on their size distribution. The obtained optical parameters have then been sent as input to the LMDZORINCA model coupled with the RRTM radiative transfer module. This represents a first attempt to use regional-dependent values of the longwave refractive indices rather than generic values in models. Results from the simulations indicate that with these new refractive indices the LW radiative effect of dust is significantly smaller compared to most of the already published results.

[1] Di Biagio *et al.*(2017) *Atmos. Chem. Phys.* **17**, 1901-1929.