Virtual BSC RS/ ES inDust Webinar: The mysterious abundance of coarse desert dust in Earth?s atmosphere

Objectives

Abstract: Aircraft measurements have revealed that coarse dust (diameter > 5 mm) is surprisingly abundant in Earth's atmosphere. In this seminar, I estimate the global load of coarse dust using a framework that leverages dozens of measurements of atmospheric dust size distributions. I find that the atmosphere contains 17 (10 – 29) Tg of coarse dust, which surprisingly accounts for approximately a third of all aerosol mass in the atmosphere. However, current global models on average account for only about a quarter of this large loading of coarse dust, thereby missing a warming effect of 0.15 (0.10 – 0.24) Wm^{-2}. I explore the causes of this model underestimation of coarse dust and derive a new parameterization for the size distribution of emitted dust aerosols that matches measurements of coarse dust close to source regions. Despite this improvement in the accuracy of coarse dust emissions, models still greatly underestimate super coarse dust in dust outflow regions. Thus, the model underestimation of super coarse atmospheric dust is in part due to the underestimation of super coarse dust emission and likely in part due to errors in deposition processes.

Short bio: Jasper Kok was born in the Netherlands, where he obtained a B.S. in physics at Leiden University. He then moved to the United States for graduate school and obtained his PhD in Applied

Physics from the University of Michigan in 2009, for which he received a Distinguished Dissertation Award. Since then, he has focused his research on climate and the atmospheric sciences. This was facilitated first by an Advanced Study Program postdoctoral fellowship at the National Center for Atmospheric Research (2009-2011) and then by a National Science Foundation (NSF) Climate and Large-Scale Dynamics postdoctoral fellowship at Cornell University (2011-2013). Jasper took an assistant professor position at the department of Atmospheric and Oceanic Sciences at UCLA in 2013, where he received tenure in 2017 and was promoted to Full Professor in 2021. Jasper was awarded an NSF CAREER award in 2016 and received the 2019 American Meteorological Society's Henry Houghton Early Career award for "novel approaches to studying the physics of dust emissions into the atmosphere and the

interactions of dust aerosols with Earth’s climate and beyond.”

Speakers

Speaker: Jasper Kok, Department of Atmospheric and Oceanic Sciences, University of California - Los Angeles

Host: Sara Basart, BSC Earth Sciences Recognised researcher, Atmospheric Composition Group

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