Mineral dust is incredibly important for the Earth system; however, recent observations show a lack in our understanding of the abundance and transport processes associated with coarse dust particles. Aircraft observations and a Met Office Unified Model climate simulation have been compared and used to better understand the processes involved in coarse particle transport and deposition from the Sahara to the Caribbean. We find that the climate model deposits coarse particles too swiftly and consistently underestimates dust mass at all locations, with increasing underestimation with distance from the Sahara. Testing processes such as turbulent mixing, convective mixing, wet deposition and gravitational settling, we find that to bring the model dust size distribution into better agreement with observations, the gravitational settling of dust needs to be reduced by >80%. Finally, we'll assess whether it is the model’s dust scheme or meteorology which is causing failures in the dust representation.