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Photophoretic levitation of aerosols for geoengineering

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The possibility of increasing the earth's albedo to offset CO₂-driven warming has been a subject of speculation for decades. Research and debate have been spurred by Crutzen's call for systematic analysis of geoengineering in light of the threat of abrupt climate change and the continued acceleration of CO₂ emissions. Most research has focused on the possibility of injecting sulfate aerosols into the stratosphere, although more elaborately engineered aerosols and space-based light scattering systems have also been analyzed. Here I examine the possibility that particles might be engineered to exploit photophoretic forces. Such particles might offer important advantages over sulfate aerosols. First, photophoretic levitation could loft particles above the stratosphere reducing their capacity to interfere with ozone chemistry. Second, levitated particles can have long lifetimes, reducing the need for continual replenishment of the aerosol. And third, particles could be engineered to migrate poleward enabling albedo modification to be tailored to reduce polar warming so as to reduce the risk of rapid deglaciation and consequent sea level rise.