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Solar-band Climate Engineering Technologies, Risks and Unknowns

DAVID KEITH, University of Calgary

The combination of high inertia and high uncertainty makes the coupled climate-economic system dangerously hard to control. If the climate's sensitivity is at the high end of current estimates, it may be too late to avert dramatic consequences for human societies or natural ecosystems even with immediate and aggressive mitigation efforts. The engineered alteration of planetary radiation budgets—geoengineering—offers and means of managing climate risk, but entails a host of new risks. Most discussion of geoengineering has focused on the injection of sulfur particles into the stratosphere. I will consider the physics of engineered particles, and in particular the possibility of designing self-levitating particles that exploit photophoretic forces, enabling more control over particle distribution and lifetime than is possible with sulfates, perhaps allowing climate engineering to be accomplished with fewer side-effects. Finally, I will discuss options for phased deployment of geoengineering to manage risks and maximize opportunities for learning by doing.