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Marine cloud brightening: The process of increasing the planetary albedo and the effect on global surface temperatures

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Marine Cloud Brightening (MCB) is one of several proposed solar radiation management geoengineering schemes designed to avert some of the undesirable effects of climate change (Latham et al. 2008, Phil Trans Roy Society). Such changes include ice loss, desertification and increased sea levels. MCB hypothesizes that seeding marine stratocumulus clouds with copious quantities of roughly monodisperse sub-micrometre seawater particles can enhance the cloud droplet number concentration and increase cloud albedo. Recent publications (Latham et al. 2012, Phil Trans Royal Soc.) provide more specific details of the technology and the microphysical process, as well as proposing a set of field tests to critically assess the efficacy of MCB.

We describe a set of climate simulations based on the fully coupled ocean atmosphere and ice Numerical Weather Prediction Climate Model, HadGEM1. The model is used to project changes in land and sea surface temperatures as a result of increasing carbon dioxide and geoengineering using the MCB scenario. We show that that the effects of seeding the clouds in three relatively small and localised regions where there is significant stratocumulus cloud cover, produces significant global cooling of land surface and sea surface temperatures which could provide temporary (~ 50 years) amelioration of global temperature rise. Modification of the Meridional Heat Flux is the process whereby the poles are preferentially cooled. (Parkes et al 2012, ISRN). Global land and sea surface temperature plots are shown. Further application to hurricane weakening and cooling of tropical regions to avoid Coral Bleaching is briefly suggested.

Biography

Dr. Alan Gadian is a senior scientist in the UK National Centre for Atmospheric Sciences, and currently based at the University of Leeds, UK. He is working with a team of scientists trying to test the viability of this Geoengineering Scheme to provide a temporary stop gap breathing space to reduce global warming. He has had many years of studying and publishing papers on microphysical process in clouds and modelling dynamical and thermodynamical processes in the lower atmosphere. He is editor of Atmospheric Science Letters.

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