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Marine cloud brightening essentials for ethicists

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While there are hundreds of papers on the ethics and governance of possible solutions to the world's climate problem, only one of the authors, Clive Hamilton, has ever asked me for information about my work on Latham's idea for marine cloud brightening. Latham wants to exploit the Twomey effect. Twomey measured drop sizes in clouds and their effect on cloud reflectivity. He found that, for the same amount of liquid water in a cloud, a large number of small drops will reflect more than a small number of larger ones. For many conditions doubling the drop number will increase reflectivity by over 0.05. Kohler showed that drop formation requires some form of condensation nucleus. These are scarce in clean mid-ocean air. Latham suggested increasing the number by spraying submicron drops of filtered sea water into the marine boundary layer where turbulence would spread the salt residues left from evaporation. It is the number of nuclei of the right size that matters, not the salt volume. Climate models show that the required cooling need could be done with quite moderate spray volumes. Many papers on climate physics are written for climate physicists and can intimidate outsiders. This paper is written for people from other fields. It will attempt to explain the physics of the Twomey effect and the engineering of the hardware needed to exploit it. It will identify the key design problems of spray production and energy generation in mid-ocean. It suggests the use of wind-driven spray-vessels with electrostatically charged mono-disperse spray from billions of submicron nozzles etched in silicon wafers. It will describe a possible engineering solution using variable-pitch hydrofoils and attempt cost estimates.

Biography

Stephen Salter is emeritus Professor of Engineering Design at the University of Edinburgh. After an Apprenticeship in the aircraft industry he worked on a range of problems including robotics, renewable energy, desalination, oil hydraulics, mine clearance, explosion suppression and voter-friendly traffic-congestion charging.

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