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The impact of cloud seeding of marine stratocumulus on the ocean

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Clouds play a profound role in influencing the energy balance of the Earth system. It is also well known that relatively small variations in cloud properties, e.g. drop size, precipitation efficiency, areal extent, or cloud lifetime, can produce large changes in the radiative properties of clouds. In 1990 John Latham suggested that a deliberate increase in cloud brightness and longevity, through the introduction of extra cloud condensation nuclei (CCN), over selected regions of the globe might be used to counteract global warming resulting from increases in greenhouse gases as a geoengineering strategy.

Latham and his colleagues suggested that the subtropical marine stratocumulus regions were the optimal location for this kind of geoengineering since much sunlight could be found in these regions and those low (warm) clouds were susceptible to the introduction of extra CCN. They have explored this concept in a variety of studies, investigating the consequences of increases in CCN theoretically, in simple models of particular cloud types, and in an atmospheric general circulation model study employing fixed sea surface temperatures. However, these studies have explored only the change in forcing resulting from a change in cloud albedo, but did not explore the response of the climate system to such a change. The studies assumed or concluded that a significant change in albedo over only a few (approximately 5) percent of the planet would be sufficient to counteract the approximately 4 W/m2 forcing resulting from a doubling of CO2.

In this study we will describe our preliminary findings about the consequences of geoengineering of marine stratus and stratocumulus to the Earth system through sim-

ulations with the NCAR Community Atmosphere Model and tbe slab ocean version of the NCAR Community Climate Sytem Model.