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Global Temperature Stabilisation by Seeding Maritime Clouds: Scientific Considerations

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Non-overlapped, low-level boundary-layer clouds cover about 1/4 of the oceanic surface. The global temperature-stabilization idea under investigation (Latham, 1990, 2002, Bower et al. 2006) is to seed a selected fraction f of the oceanic coverage of such clouds with monodisperse seawater CCN produced at or near the ocean surface beneath them. On entering the clouds, these particles (typically about 1um in diameter) would be activated, enhancing the droplet number concentration N and thereby increasing cloud albedo and producing a cooling. Cloud and GCM modeling of this process indicates that for values of f between about 0.5 and 1, and advertent increase N by a factor of between about 3 and 5, it would be possible to produce a cooling of around 4 W/m2, i.e. sufficient to balance the warming associated with a doubling of the atmospheric CO2 concentration. If this can be achieved technologically it should be possible for this scheme to hold the Earth's temperature constant for a significant number of decades. The GCM computations show strong seasonal variations in optimal seeding regions, and illustrate possible meteorological ramifications of the deployment of such a scheme: such as changes in rainfall distribution.

The proposed technique would be controllable and ecologically benign, the only raw materials required being wind and seawater. It could be switched off immediately if necessary, the situation returning to normal within a few days.

Technological aspects of this scheme are examined in a companion paper.