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Pseudo-random Spray Release to Measure World-wide Transfer Functions of Cloud Albedo Control.

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Previous climate models of Latham's proposal to reverse global warming by using sub-micron sea spray to increase cloud albedo have used a variety of spray patterns. Kettles forced CCN concentration to be 375/cm3 everywhere. Rasch et al used the 20% and 70% most susceptible regions. Bala and Caldeira used an even spread. Jones et al. concentrated spray in the 3.3% oceans with the highest susceptibility All used the same rate through the year.

We want to choose a scheme for a climate-modelling experiment designed to identify simultaneously the effects of cloud albedo control at various seasons of the year from spray at all regions of the world on climates of all other regions the world. In particular we want to know seasons and spray places which might have an undesirable effect on precipitation.

The spray systems in various regions of a numerical climate model will be modulated on an off with different but known pseudo-random sequences and a selection of seasons. The mean value of the resulting weather records of the parameters of interest, mainly temperature and water run-off, at each region will be subtracted from each value of the record so as to give just the alternating component with an average value of zero. This will be correlated with each of the chosen pseudo-random sequences to give the magnitude and polarity of the effect of a treatment at each input area and selected seasons of the year with the resulting effects on all regions. By doing a time-shifted correlation we can account for phase-shift and time delay. The signal-to-noise ratio should improve with the square root of the analysis time and so we may be able to measure the transfer function with quite a small stimulus.

The results of a Mathcad simulation of the process with statistical distributions approximating to natural variations temperature and precipitation show that a single run of a climate model over a period of twenty years can give transfer functions from any spray release point to any other part of the world with a standard deviation less than 1.2% of the standard deviation of natural variations. Some examples overleaf have had to be removed because of EGU rules.

It must be emphasized that this is a way to get lots of results in parallel from a global climate model about how fleets of spray vessels should be used. It is NOT a proposal for a way in which a real flotilla of spray vessels would be operated.