CLIMATIC CHANGES RESULTING FROM MASS EXTINCTIONS AT THE K/T BOUNDARY (AND OTHER BIO-EVENTS?); Michael R. Rampino and Tyler Volk, Earth Systems Group, Department of Applied Science, New York University, New York, NY 10003

The mass extinctions at the Cretaceous/Tertiary (K/T) boundary include about 90% of marine calcareous nannoplankton (coccoliths), and carbon-isotope data show that marine primary productivity was drastically reduced for about 500,000 years after the boundary event — the so-called "Strangelove Ocean" effect. One result of the elimination of most marine phytoplankton would have been a severe reduction in production of dimethyl sulfide (DMS), a biogenic gas that is believed to be the major precursor of cloud-condensation nuclei (CCN) over the oceans. A drastic reduction in marine CCN should lead to a cloud canopy with significantly lower reflectivity, and hence cause a significant warming at the earth's surface. Calculations suggest that, all other things being held constant, a reduction in CCN of more than 80% (a reasonable value for the K/T extinctions) could have produced a rapid global warming of 6 degrees C or more [1].

Oxygen-isotope analyses of marine sediments, and other kinds of paleoclimatic data, have provided evidence for a marked warming, and a general instability of climate coincident with the killoff of marine plankton at the K/T boundary. Similar reductions in phytoplankton abundance at other boundaries, as indicated by marked shifts in carbon-isotope curves, suggest that severe temperature changes may have accompanied other mass extinctions, and raises the intriguing possibility that the extinction events themselves could have contributed to the climatic instabilities at critical bio-events in the geologic record [2].

1. Rampino, M.R., and Volk, T. (1988) Nature 332, 63-65.

2. Walliser, O.H., ed. (1986) Global Bio-Events (Springer-Verlag)