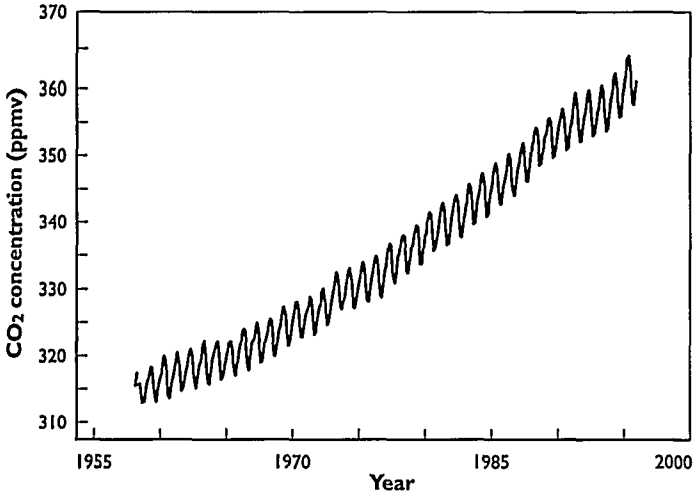
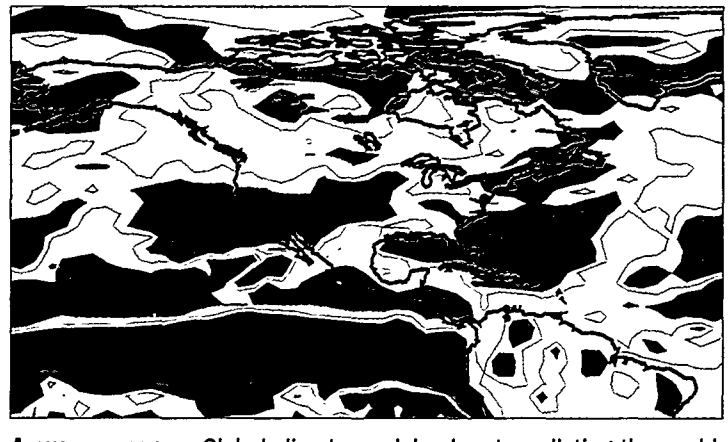


A DANGEROUS TREND? The forty-year record of atmospheric CO_2 concentrations on Mauna Loa in Hawaii depicts an undeviating upward trend, as well as predictable seasonal variations. Since atmospheric CO_2 concentrations have long been correlated with global temperature, these measurements by C. David Keeling of the Scripps Institution of Oceanography, supported in part by the energy agencies, were an important catalyst in stimulating today's research on global climate change.

turn, a keener appreciation of its sensitivity to human activity. The third of the AEC's major research thrusts—atmospheric dynamics on a global scale—contributed in an especially important way to this growing environmental awareness.

In the early sixties, the AEC's interest was the global transport of weapons test debris. Accordingly, at Livermore, mathematical physicist Cecil Leith was one of only a handful of researchers in the world using the emerging power of scientific computing to simulate global atmospheric dynamics. Later, he would move on to the new National Center for Atmospheric Research (NCAR) in Boulder, where he established its reputation as one of the world's leaders in developing atmospheric general circulation models (GCMs)—advanced climate models that provide not short-term meteorological forecasts, but rather long-range prognoses of global climate. In the early seventies, with AEC support, NCAR's Warren Washington was the first to use their GCM to study the possible climatic effects of the heat generated by energy production.

Looming even larger, however, was growing evidence that human activities were tilting the worldwide balance of atmospheric gases: By the late seventies, the burning of fossil fuels was recognized as a principal culprit in a steadily rising level of atmospheric carbon dioxide (CO_2), a trend dramatically illustrated by the measurements of C. David Keeling at the Mauna Loa Observatory in Hawaii. A direct relationship between atmospheric CO_2 concentrations and air temperatures had been known since the turn of the century, so it was natural to be alarmed about the possibility of global warming if the trend continued unchecked. In 1977 ERDA was the first federal agency to outline a comprehensive research program on the CO_2-climate connection.



A CHANCE OF RAIN Global climate models aim at predicting the worldwide consequences of certain input assumptions—a rising concentration of atmospheric CO_2, for example. Here, a Livermore simulation predicts the changes in rainfall patterns during an El Niño event, a period of surface water warming in the tropical Pacific. Precipitation increases (compared with normal) are foreseen in areas shown in blue, whereas decreases are predicted for areas shown in red.

meteorology and atomic energy 1968

1955 Early efforts to understand atmospheric transport and dispersion led to the publication of *Meteorology and Atomic Energy,* which quickly became a basic meteorological reference. A second edition, published in 1968, would for years remain the definitive reference for small-scale meteorology. By 1984 it had evolved into the thousand-page volume, *Atmospheric Science and Power Production.*

1956 The Environmental Research Branch was created within the AEC's Division of Biology and Medicine, for "research pertaining to man and his environment, including disciplines such as ecology, oceanography, marine biology, geophysics, and meteorology."