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Prof. Em. H. H. LAMB*

The hundredth anniversary of the great explosive eruption, which on 27 August 1883 destroyed the island of Krakatau in Indonesia and was the subject of the finest and most comprehensive report on any volcanic eruption (*Royal Society* 1888), is an appropriate occasion to review our knowledge of the effects of volcanic explosions on the atmosphere and on climate. This is especially so, since the eruptions of the El Chichón volcano in southern Mexico in late March and early April 1982 have provided the greatest volcanic cloud in the stratosphere for many decades past, perhaps indeed the greatest since 1883.

Scientific interest in possible effects on climate from great explosive eruptions goes back at least to the eruption of Laki in Iceland just one hundred years earlier, in 1783. Benjamin Franklin, who was at the time in Paris as the first diplomatic representative of the newly established United States of America, suggested that the persistent dry fog over Europe and North America in the summer of 1783, originating from the eruption and veiling the sun so that its rays were greatly weakened, might have been the cause of the exceptional severity of the winter which followed. He added that the possibility of similar circumstances in the case of other hard winters recorded in history should be investigated.

No one should suppose that because of the double centenary, which our investigations of the El Chichón eruption and its aftermath mark, there is a prominent 100-year cycle in volcanic activity. The still greater eruption of the volcano Tamboro in the East Indies in 1815, and other historic eruptions, dispel that idea.

After the great Krakatau eruption and the burst of explosive activity of several volcanoes in the West Indies in 1902, there was - apart from one eruption in high latitudes in 1912 - an absence of any great injection of volcanic matter into the stratosphere until the eruption of Agung in Bali in 1963. And there are many suggestions in the meteorological literature that the warming of world climates in the twentieth century, particularly in the Arctic and Antarctic, may have been largely due to the increased transparency of the atmosphere to the sun's radiation, following the clearing away (by fall out) of the volcanic dust and aerosol burden. Schneider and Mass (1975) reported that the course of the prevailing temperatures over the northern hemisphere (for which data were most nearly complete and reliable) could be well simulated by an empirical expression that attributed the changes to variable volcanic activity and the increasing carbon dioxide in the atmosphere resulting from human activities with a small additional contribution from variations

* *Founder and first Director of the Climatic Research Unit - University of East Anglia, Norwich.*

in solar activity. Other attempts at simulation of the temperature curve since have produced similar results and tend to support the same conclusion.

The Agung eruption in 1963 was the first opportunity to observe the volcanic material injected into the atmosphere, and to detect climatic responses both at the surface and in the stratosphere, using the great variety of new techniques that our century has made possible. The eruption products were captured in the stratosphere by aircraft and balloon probes, and samples brought down were analysed in the laboratory for particle size, chemical composition, etc. Stratospheric temperature measurements showed a strong warming attributable to direct absorption of solar radiation by the volcanic matter there, and effects on surface temperatures and the wind circulation at different levels could for the first time be surveyed and integrated over the whole globe.

Thanks to the continued higher level of volcanic activity since that time, most notably with the eruptions of Mount St Helens in 1980 and of an unidentified "mistery" volcano in the winter of 1981-82, followed by the great El Chichón eruption in 1982, opportunities for the many different types of observation and measurement now possible have continued to be much greater than in the earlier part of the century, giving for the first time an insight into the important differences and individual characteristics of the history of each eruption and the atmospheric effects which followed. This symposium on the atmospheric effects of the El Chichón eruption, held at the IUGG Assembly in Hamburg in August 1983, provided a very wide survey of the case of this eruption, of the many-sided techniques now in use or being experimented with, and of informative comparisons with great eruptions in earlier years.

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