Appendix 1

Monitoring Volcanic Activity

Until the catastrophic eruption of Mount St. Helens in Washington State on May 18, 1980, most Americans regarded volcanoes as curious geologic features that affected other countries. The eruptions of Mount St. Helens have renewed public interest in this spectacular form of geologic catastrophe.

Within minutes after the initial blast from Mount St. Helens the geostationary meteorological satellite (GOES) began recording this awesome event at half-hourly intervals from 22,000 miles above the Equator (fig. I-1). A vast plume of ash and smoke rose into the atmosphere and was carried by the winds for hundreds, even thousands of miles. Each half hour the progress of the dust veil was recorded by GOES, allowing meteorologists to advise those downwind what to expect in terms of ash fallout and when it might arrive. Aircraft were rerouted. In fallout areas, local governments issued advisories. The magnitude of the blast alerted hydrologists that rivers could change course, lakes could drain, and floods were both probable and imminent.

Other volcanic eruptions that have been studied by satellites include the Krafla, Iceland, eruption of February 1981; the Heckla, Iceland, eruption of April 1982; the Alaid, U. S. S. R,, eruption of 1981; the Galunggung, Indonesia, eruption of July 1982 (fig. 1-2); and the El Chichon, Mexico, eruption of April 1982.

The Icelandic eruptions tended to be in the form of large lava flows, and were best detected by the thermal infrared channels on the National Oceanic and Atmospheric Administration's (NOAA) polar orbiter. The Alaid eruption sent a plume of ash across the North Pacific for hundreds of kilometers. El Chichon sent a plume of sulfur dioxide and hydrogen sulfide gas high up into the stratosphere, where it girdled the globe in about **28** days, then spread slowly over all the Northern Hemisphere in the form of sulfuric acid droplets. This highly unusual eruption is being monitored carefully all over the world because of its potential for temporarily altering the climate of the Northern Hemisphere. The stratospheric migration of this atmospheric "cloud" was ingeniously tracked by NOAA scientists by noting artificial temperature anomalies in sea-surface temperatures caused by the attenuation of solar energy by the sulfuric acid aerosols.

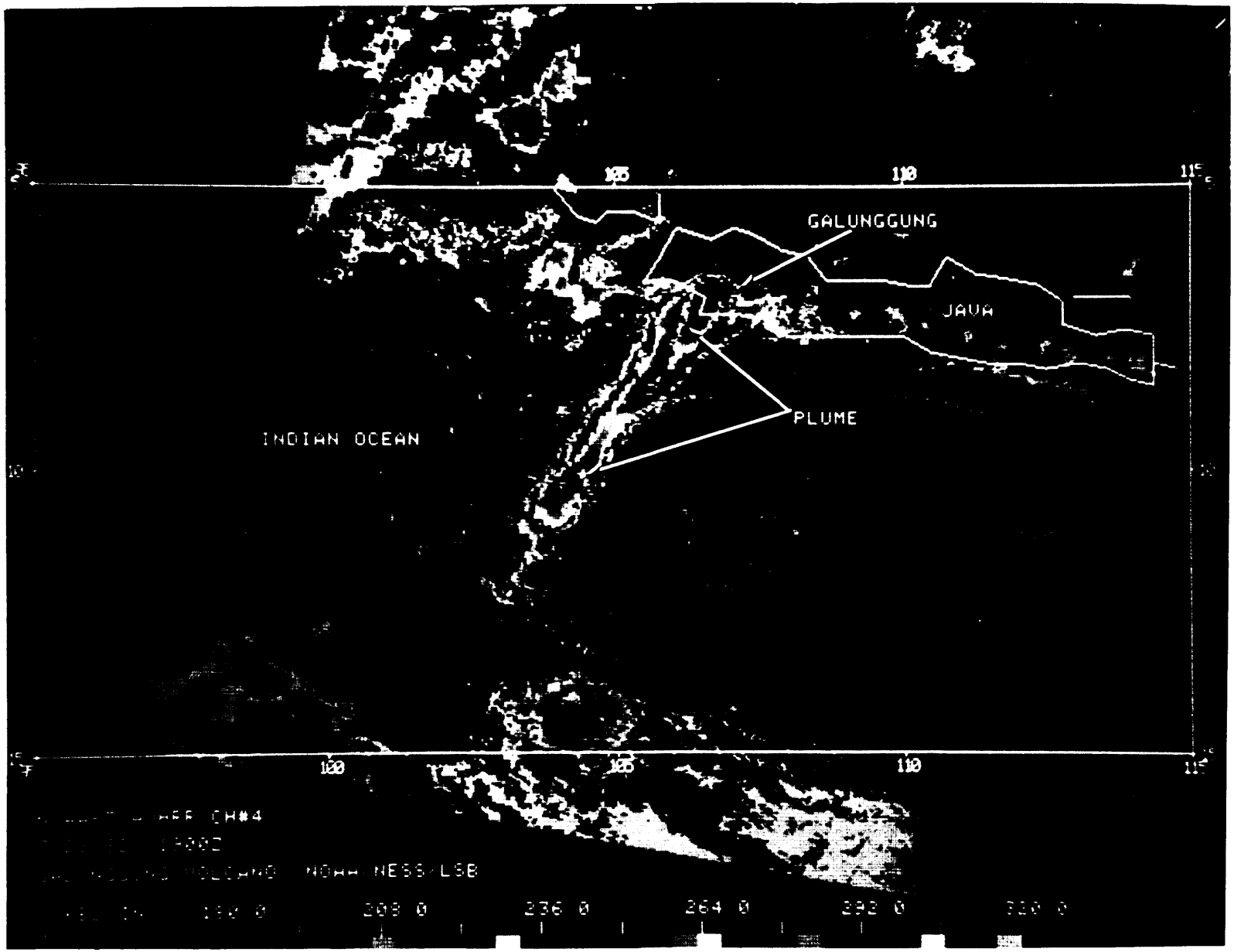
Galunggung in southwestern Java has erupted in fits and starts for years, but it made headlines when its plume was penetrated by a British passenger airliner which nearly crashed when hot volcanic dust clogged its jet engines. Incredibly, the same airliner **6** months later again was victimized by a Galunggung eruption and again was nearly incapacitated by volcanic dust.

Aviation authorities are seriously considering a monitoring scheme using the World Meteorological Organization's World Weather Watch satellites to put out aviation alerts on possible volcanic eruptions based on satellite imagery.

Figure I.1 .— May 18, 1980, Eruption of Mount St. Helens, Wash., as Recorded by the GOES Satellite, 0845 PDT

SOURCE National Oceanic and Atmospheric Administration

Figure I-2.—Computer-Enhanced, Enlarged False-Color Image of Galunggung Volcano, Java, Showing the Plume Extent at 1900Z 7/28/82. A BOAC Aircraft Lost A Four Jet Engines As Encountered This Plume



SOURCE: National Oceanic and Atmospheric Administration.