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'Understanding volcanoes and society: the key for risk mitigation'



The evolution of the surface temperature and area of the El Chichón volcanic lake: a satellite perspective.

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El Chichón volcano, located in Chiapas, southeastern México, is a small but dangerous volcano. In 1982 it produced one of the biggest eruptions of the 20th century, causing the death of ca. 2000 people, severe economic losses, and a global climate impact. As a result of this eruption a 1500 m-wide crater was formed, whose bottom was rapidly filled by a lake. The chemical composition of the lake, which has been regularly sampled since 1994, has shown strong changes that result from the time-varying contributions of two different hydrothermal systems (a deep neutral-chloride and a shallow acidic-sulfate) that are feeding it. These changes are accompanied by large variations of the lake volume, surface area and temperature. This work takes advantages of the large data base of satellite images acquired by Landsat, Aster and Spot over the last 35 years to derive a complete chronology of the surface temperature and area of the lake since its formation, and offers a new perspective on the processes governing its recent evolution. Surface area was measured by a simple pixel counting on the visible images, Landsat Temperatures were obtained by applying a basic atmospheric correction to the radiance measured in the single Thermal Infrared band, and ASTER temperature was calculated using the split window algorithm of (Bernard, 2006). These new data sets show a long term increase in area, as well as larger variability in both surface temperature and area since the year 2000. We suggest that remote sensing is a cheap, safe and efficient method to monitor El Chichón volcano and to detect early signs of unrest that could lead to a new eruption.