Research team claims Samalas volcano source of great 1257 eruption

October 1 2013, by Bob Yirka

A small eruption of Mount Rinjani, with volcanic lightning. Location: Lombok, Indonesia. Credit: Oliver Spalt, Wikipedia.

(Phys.org) —An international team of researchers has concluded that an eruption by Samalas volcano on Lombok Island in Indonesia was the source of a large volcanic eruption traced back to 1257. In their paper published in *Proceedings of the National Academy of Sciences*, the team describes their exhaustive work in tracking down the source of an eruption that scientists have known about for decades, but were unable

to pinpoint.

Several decades ago, scientists studying ice cores found evidence of a volcanic eruption so large, it left deposits on ice in both the northern and southern ice fields. Since that time, many scientists have offered guesses as to which volcano was actually responsible for the deposits, but no real consensus had been reached. In this new research effort, the team combined data from the ice deposits with new sample information from several possible volcanic sites and even from early writings that described changes in weather that led to hardships during the time period shortly after the eruption occurred.

The Samalas Volocano was on the short list of suspects—to find out if it was the culprit, team members traveled to Lombok Island and took not just soil and rock samples, but also tree ring samples and studied a text known as Babad Lombok, written by people that lived near the area of the volcano during the time it erupted. They found that the samples from the island were a close match to samples found in polar ice and that the tree ring data from the island matched closely with the time-line established by the depth of ash in ice samples—the Indonesian text described changes to the island around the time of the eruption. The research team also pointed out that early European texts have noted a time of bad weather in 1258.

Taken together, the information from the various sources provides a compelling argument for fingering the Samalas volcano as the most likely source of the eruption. The research efforts also led to clues that indicate just how large of an eruption it was—perhaps one of the largest in the past 10,000 years. Ash data suggests that as much as 40 cubic kilometers of debris was ejected into the atmosphere and the plume likely reached 40 kilometers into the sky—enough to impact weather all over the planet for a year or more. Some have even suggested the eruption, along with other events, may have led to The Little Ice Age.

More information: Source of the great A.D. 1257 mystery eruption unveiled, Samalas volcano, Rinjani Volcanic Complex, Indonesia, *PNAS*, Published online before print September 30, 2013, DOI: 10.1073/pnas.1307520110

Abstract

Polar ice core records attest to a colossal volcanic eruption that took place ca. A.D. 1257 or 1258, most probably in the tropics. Estimates based on sulfate deposition in these records suggest that it yielded the largest volcanic sulfur release to the stratosphere of the past 7,000 y. Tree rings, medieval chronicles, and computational models corroborate the expected worldwide atmospheric and climatic effects of this eruption. However, until now there has been no convincing candidate for the mid-13th century "mystery eruption." Drawing upon compelling evidence from stratigraphic and geomorphic data, physical volcanology, radiocarbon dating, tephra geochemistry, and chronicles, we argue the source of this long-sought eruption is the Samalas volcano, adjacent to Mount Rinjani on Lombok Island, Indonesia. At least 40 km3 (dense-rock equivalent) of tephra were deposited and the eruption column reached an altitude of up to 43 km. Three principal pumice fallout deposits mantle the region and thick pyroclastic flow deposits are found at the coast, 25 km from source. With an estimated magnitude of 7, this event ranks among the largest Holocene explosive eruptions. Radiocarbon dates on charcoal are consistent with a mid-13th century eruption. In addition, glass geochemistry of the associated pumice deposits matches that of shards found in both Arctic and Antarctic ice cores, providing compelling evidence to link the prominent A.D. 1258/1259 ice core sulfate spike to Samalas. We further constrain the timing of the mystery eruption based on tephra dispersal and historical records, suggesting it occurred between May and October A.D. 1257.

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