

Volcanic lakes: the more you know, the less you need

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Volcanic lake research boosted after the 1986 Lake Nyos (Cameroon) lethal gas burst, a limnic rather than a volcanic event. This led to the foundation of the IAVCEI–Commission on Volcanic Lakes, which grew out into a multi–disciplinary scientific community since the 1990s. I here introduce the first data base of volcanic lakes, containing over 300 lakes. In my opinion, this number is surprisingly high, which implies that many of the lakes were mostly unknown, or at least unstudied to date. Some acidic crater lakes topping active magmatic–hydrothermal systems are monitored continuously or discontinuously. Such detailed studies have shown their usefulness in volcanic surveillance (e.g., Ruapehu, Yugama, Poás). Others are Nyos–type lakes, with possible gas accumulation in bottom waters, and thus potentially hazardous. Nyos–type lakes tend to remain stably stratified in tropical and sub-tropical climates (meromictic), leading to long-term build–up of gas, which can be released after a trigger. Many of the unstudied lakes are in the latter situation. In temperate climates, such lakes tend to turn over in winter (monomictic), liberating its gas charge yearly. Acidic crater lakes are easily recognized as active, whereas Nyos–type lakes can only be recognized as potentially hazardous if bottom waters are investigated, a less obvious operation. I will review and line out research strategies for the different types of lakes. A complementary, multi–disciplinary approach (geochemistry, geophysics, limnology, biology, statistics, etc.) will lead to new insights and ideas, which can be the base for future following–up and monitoring. More profound deterministic knowledge (e.g., precursory signals for phreatic eruptions, or lake roll–over events) should not only serve to enhance conceptual models of single lakes, but also as input parameters in probabilistic approaches. After more than 25 years of pioneering studies on rather few lakes (~20% of all), the scientific community should be challenged to take a step beyond and study the many poorly studied volcanic lakes, in order to better constrain the related hazard. The introduced data base of volcanic lakes should become an interactive, open-access working tool where our community can rely on in the future.