



Future volcanic lake research: revealing secrets from poorly studied lakes

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Volcanic lake research boosted after the 1986 Lake Nyos lethal gas burst, a limnic rather than volcanic event. This led to the formation of the IAVCEI-Commission on Volcanic Lakes, which grew out into a multi-disciplinary scientific community since the 1990's. At Lake Nyos, a degassing pipe is functional since 2001, and two additional pipes were added in 2011, aimed to prevent further limnic eruption events. There are between 150 and 200 volcanic lakes on Earth. 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-Kusatsu-Shiran, 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 gas build-up and thus higher potential risk. In temperate climates, such lakes tend to turn over in winter (monomictic), and thus liberating its gas charge yearly. We line out research strategies for the different types of lakes. We believe 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. After 25 years of pioneering studies on rather few lakes, the scientific community should be challenged to study the many poorly studied volcanic lakes, in order to better constrain the related hazard, based on probabilistic approaches.