Change of water color in Mizugama, a crater lake of Kusatsu-Shirane volcano, observed in 2005

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The Kusatsu-Shirane volcano with three crater lakes, Yugama, Mizugama and Karagama, near its summit is one of the most active volcanos in Japan. The most recent eruptive activity of Kusatsu-Shirane volcano had been observed from 1970's to 1980's. During this period, the phreatic eruptions occurred in 1982 and 1983 at Yugama following the phreatic eruption at Mizugama in 1976. Lake water of Mizugama had disappeared at the time of the eruption in 1976; it was supposed to have drained underground through a new explosion crater formed at the bottom of the lake. In 1977, Mizugama started recovering its water. The color of the Mizugama water recovered after the eruption had been muddy brown, the same color the Mizugama water had possessed before the eruption, at least until the summer of 2004. At the end of July, 2005, however, we noticed the color of the Mizugama water had changed to opaque yellow-green. In this presentation, we discuss the cause of this water color change at Mizugama.

A change of water color had also observed at Mizugama in the year before the phreatic eruption in 1976; the ocherous brown color probably caused by the suspended particles containing Fe(III) species had changed to blue color in 1975 (Ossaka et al., 2001). This has been considered as the phenomenon based on the change in Fe(II)/Fe(III) ratio in the Mizugama water. Indeed, the Fe(II)/Fe(III) ratio of the Mizugama water in 1975 was found to have been drastically high compared with the ratio of the water collected in 1974. The cause of this abrupt increase in Fe(II)/Fe(III) ratio had most probably been the influx of a low temperature spring water rich in Fe(II), and, in fact, such a spring had been found at the time of observation conducted a few days after the eruption in 1976. The increase in Fe(II)/Fe(III) ratio of the Mizugama water was also found between 2004 and 2005, while the water chemistry showed no substantial change in this period as a whole. More concretely, Fe(II) was not detected in the 2005 water, while the Mizugama water had usually contained a certain amount of Fe(III) before 2005. Analogously to the color change in 1975, this suggested that the change in the color of the Mizugama water in 2005 may also be caused by the increase in Fe(II)/Fe(III) ratio. However, a spring water rich in Fe(II) was not recognized in 2005. In addition, the Mizugama water in 2005 did not have the blue color like the one observed in 1975, but had the opaque yellow-green color that is similar to the color usually seen for the water of Yugama. Therefore, the cause of the change in the water color of the Mizugama crater lake observed in 2005 is probably essentially different from that in 1975. In any case, since the color change in the Mizugama water is expected to reflect some environmental changes around the Mizugama crater, which may be connected to the volcanic activity of the Kusatsu-Shirane volcano, we certainly should keep paying attention to the change in the water chemistry of Mizugama and related phenomena around.

Reference:

J. Ossaka, Y. Kikawada, T. Ossaka (2001) Changes in water quality and color of Mizugama, a crater lake of Kusatsu-Shirane volcano, prior to 1979 eruption (Part II). Abstracts of 54th annual meeting of the balneological society of Japan, p.33.