Volcanic gases as precursor of the 2010 Merapi explosive eruption

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The 2010 Merapi explosive eruption, bearing a VEI 4, was not preceded by the formation of a lava dome. This phenomenon was contrary to what had normally been expected. The precursors of volcanic activity occurred in a short time. On October 26, 2010, Merapi erupted for the first time. The raising of its activity status prior to the eruption was determined according to the increase in the seismicity, deformation, as well as in the amount of the volcanic gas emission. Pre-eruptive volcanic gas emission began to significantly changes in August, 2010, in which the H2O concentration decreased from its normal condition, 90 % mol, down to 80 % mol. Such other gases as CO2, H2S, SO2, and HCl, also underwent a remarkable change of concentration. The HCl and SO2 ratio was used as an initial indicator of increasing activity before eruption. It turns out that there occurred an increase in concentration ratio of those two gases when compared with their normal condition, May 2010. The ratio of CO2 and SO2, CO2 and HCl, and CO2 and H2O also increased, serving as indicator that the source location of those volcanic gases had with the passage of time moved even deeper down, up to the moments when the volcano was about to erupt. The decreasing CO2 and H2S ratio also indicated that, considering the fact that despite an increasing pressure H2S is a stable sulphuric compound, a deeper source location was to be found. The CO2 gas changed very significantly, and as it is characteristically magmatic with low solubility when compared with any other volcanic gases, it was the first to be emitted. The CO2 gas concentration went up to 34 % mol and 62 % mol on 20 October 2010, higher when compared with its concentration in its normal condition, which was less than 10 % mol. The flux of SO2 gas seems to give indication of the explosive eruption. From the long term monitoring, 1992-2009, it had different indicators between 1992-1998 and 1999-2009. It has slightly decreasing and increasing with the slope value -0.017 and 0.032 trend line of SO2 gas flux respectively. Given the description as such, it becomes clear that the emission of volcanic gases was a clear early indication of Merapi eruption on October - November 2010.