



Izu-Oshima volcano, Japan: nine years of geochemical monitoring by means of CO₂ soil diffuse degassing

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Izu-Oshima is a 15×9 km active volcanic island located around 100 km SSW of Tokyo. The centre of the island is occupied by a caldera complex with a diameter of 3 km. A large post-caldera cone known as Mt. Mihara is located at the south-western quadrant of the caldera. Izu-Oshima has erupted 74 times, consisting mainly in fissure eruptions, both inside and outside of the caldera. The last eruption of Izu-Oshima occurred in 1986. Since 2007, seven soil gas surveys have been carried out to investigate the spatial and temporal evolution of diffuse CO₂ emission from this volcanic system and to identify those structures controlling the degassing process. Diffuse CO₂ emission surveys were always carried out following the accumulation chamber method. Spatial distribution maps were constructed following the sequential Gaussian simulation (sGs) procedure. The location of the CO₂ anomalies has always shown a close relationship with the structural characteristics of the volcano, with most of the gas discharged from the rim of the summit crater. Temporal evolution of diffuse CO₂ emission rate from Mt. Miharayama has shown a good temporal correlation with the seismicity recorded in and around Izu Oshima island during the period of study. The two peaks of seismic activity occur when highest CO₂ diffuse emissions were computed, March 2007, August 2010 and July 2011, may be associated with fluid pressure fluctuations in the volcanic system due to the seismicity. In order to strength the contribution of deep seated gases to the diffuse emission, we performed carbon isotopic analysis of soil gas samples at selected sites during 2010, 2013 and 2015 surveys. At isotopic compositions lighter than ~- 6‰ the soil CO₂ effluxes were always low, while at heavier isotopic compositions an increasing number of points are characterized by relatively high soil CO efflux as a consequence of the addition of the hydrothermal CO₂ source. Soil CO₂ efflux peak values (xBackground) showed also a good correlation with the observed seismicity, with the largest value computed on June 2013. This parameter is a geochemical expression of the magnitude of the anomalous degassing, and the observed change in the trend may indicate an increase of the seismic-volcanic activity in the next future. Therefore, performing regularly soil CO₂ efflux surveys seems to be an effective geochemical surveillance tool Izu-Oshima volcano in order to detect a change in the tendency of the CO₂ emission rate in case of future episodes of volcanic unrest.