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Continuous in-situ measurements of volcanic gases at Pisciarelli-Phelgrean Field (Italy): a new experimental approach

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We present a new experimental approach for continuous real-time monitoring of volcanic gases. The realization of this new set-up based on the experience derived from several earlier short-time gas monitoring campaigns carried out in 2006, 2007 and 2008 at different sites (Tor Caldara, Latium Region, Central Italy; Solfatara and Pisciarelli, Campania Region, Souther Italy). The monitoring station is now implemented at a fumarole field in Pisciarelli, about 1 km SE of the Solfatara volcano. Fumarolic gas is continuously pumped through 200m Teflon © tube with a membrane pump (pumping rate 400cc/min) into a small field laboratory, where the gas phase is analyzed minutely by means of a quadrupole mass spectrometer for H_2, H_2S, CH_4, N_2, O_2, Ar, He, and CO_2 and with a tuneable diode laser spectrometer. Further analytical devices may be added in the future. Off-line gas samples are taken regularly to crosscheck the gas composition with a gas chromatograph and for noble gas analysis. Prior to gas analysis, gaseous water is condensed in a water trap placed in a cooling box in close vicinity to the fumarole. The water is removed from the trap in regular intervals (2 h) by a peristaltic pump. The amount of water is determined directly in the trap by measuring the rise of the water level in intervals of 5 minutes. Knowledge of the gas flow and the amount of water would enables us to determine the gas/water ratio of fumarolic gases, however, the actual fumarole temperature (December 2008) at Pisciarelli is 95.8°C, thus water condensation has already occurred prior to gas sampling. The gas from the Pisciarelli fumarole is dominated by CO_2 (>98.5 vol.-%), followed by N_2, H_2S, O_2, H_2, Ar, CH_4 and He. O_2 and partly N_2 and Ar are due to atmospheric contamination of the system. The air-free calculated gas composition is in good agreement with already published gas composition data. Within the time of investigation, no significant variations were detected in the composition of the fumarolic gases in any of the surveys performed between 2006 and 2008.