Volcano monitoring using ultraviolet cameras: two case studies from Volcan de Colima, Mexico and Volcan Villarrica, Chile

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Ultraviolet cameras can yield high temporal resolution (1–3 Hz) images of volcanic plumes suitable for measurements of SO2 flux. This data rate offers better possibilities for integrating SO2 emission rate time–series with other geophysical, geodetic or geochemical data. Such a multiparameter approach is valuable for recognizing and understanding eruption precursors and thereby supports monitoring and forecasting efforts. For the mildly degassing activity typical, at present of Volcan de Colima and Volcan Villarrica, the ability of the UV camera to measure immediately above the emission source substantially limits the effects of eddy development, which can bias measurements made by narrow field–of–view spectrometers (i.e., COSPEC, Flyspec and DOAS approaches). Additionally, detailed quantitative study of the atmospheric interactions surrounding degassing and explosion events is possible via processing SO2 absorbance maps as a continuous series of images similar to time–lapse video.

To illustrate the capabilities of UV cameras and data synergies, we present measurements from two contrasting volcanoes: Colima (andesite) and Villarrica (basalt to basaltic andesite), the former renowned for dome-building and Vulcanian eruptions, and the latter for persistent degassing through a small lava lake. A dual-camera system based on two EnviCAM 1 UV cameras, with filters centered at 310 and 328 nm, was used in the investigation. We identify variations in gas output on minute–hour–day timescales and consider the origins of this variability.