RETRIEVAL CO2 COLUMNAR ABUNDANCE FROM TROPOSPHERIC VOLCANIC PLUME BY MEANS OF REMOTE SENSING: A PRELIMINARY RESULT ANALYSING AVIRIS DATA ON KILAUEA VOLCANO

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Volcanoes are important natural source of carbon dioxide: several studies estimate about 34 millions tons/day global flux of effusive volcanic emissions, such as tropospheric volcanic plume. Absorbing electromagnetic radiation in several regions of solar spectrum, CO2 plays an important role on the earth radiation budget, although his concentration is low compared to other atmospheric gases. However, measurements of volcanic carbon dioxide are difficult and often hazardous, due to the high background of atmospheric CO2 and to the inaccessibility of volcanic sites. The hyperspectral remote sensing gives a multispectral large and fast view of volcanic plumes and with sophisticated techniques permits to detect volatiles components exolving from craters. In the present study an algorithm has been developed to calculate CO2 columnar abundance in tropospheric volcanic plume. It relies on the assumption that there is a relationship between the dip in the atmospheric spectrum curve, due to the gas absorption, and the gas concentration in the atmospheric column. The algorithm is based on CIBR ’Continuum Interpolated Band Ratio’ remote sensing technique initially developed to calculate water vapour columnar abundance.

The algorithm has been applied to the digital remote sensing images acquired by AVIRIS hyperspectral sensor on April 2000 over the Hawaiian Pu‘u’O’o Vent cone of the Kilauea volcano. The atmosphere has been simulated using Modtran radiative transfer model in the spectral range between 1.9 to 2.1 microns, where the CO2 absorption band is present.
The result is a spatial distribution of CO2 columnar abundance of the Pu‘u’O’o’ Vent volcanic plume. In order to check the obtained results, the CO2 columnar abundance has been compared to the CO2 flux rate deduced by the SO2/CO2 ratio measured during the airborne campaign.