

## Yearly monitoring of the fugitive CH<sub>4</sub> and CO<sub>2</sub> emissions from the Arico's closed landfill, Tenerife, Canary Islands

Cecilia Morales (1), Doro Niang (2), Briana Jaeger (3), Laura Acosta (1,4), Violeta T. Albertos-Blanchard (1), María Asensio-Ramos (1), Eleazar Padrón (1,4,5), Pedro A. Hernández (1,4,5), Nemesio M. Pérez (1,4,5)

(1) Instituto Volcanológico de Canarias (INVOLCAN), 38320 La Laguna, Tenerife, Canary Islands, Spain (nperez@iter.es),

(2) Geology Department, Faculty of Sciences and Technics, Cheikh Anta Diop University of Dakar-Senegal, Senegal, (3)

Department of Geoscience, West Chester University, West Chester, PA 18414, U.S.A., (4) Agencia Insular de la Energía de Tenerife (AIET), 38600 Granadilla de Abona, Tenerife, Canary Islands, Spain, (5) Instituto Tecnológico y de Energías Renovables (ITER), 38600 Granadilla de Abona, Tenerife, Canary Islands, Spain

Landfills are large sources of many pollutants and must be properly controlled, even after decades of their closure. Controlling the release of gases (CO<sub>2</sub>, CH<sub>4</sub>, volatile organic compounds, etc.) into the atmosphere or groundwater pollution is a challenge that needs to be addressed. Our work examined the behavior of the 2004 sealed Arico's municipal landfill (0.3 km<sup>2</sup>) in Tenerife, Canary Islands, Spain, during the period 1999-2018. Our work focuses on estimating the spatial-temporal distribution of CO<sub>2</sub> and CH<sub>4</sub> that is released diffusely into the atmosphere through one cell of the landfill's surface. To achieve this purpose, we have performed 11 gas emission surveys during the abovementioned period. Each survey consisted of around 450 sampling sites where measurements were carried by means of a portable non-dispersive infrared spectrophotometer (NDIR) model LICOR Li800 following the accumulation chamber method. Once in the laboratory, gases taken in the chamber were analyzed using a double channel VARIAN 4900 micro-GC. CH<sub>4</sub> efflux measurements were computed combining CO<sub>2</sub> efflux measurements and CH<sub>4</sub>/CO<sub>2</sub> ratio in the landfill's surface gas. To quantify the total CH<sub>4</sub> emission, CH<sub>4</sub> efflux contour map was constructed using sequential Gaussian simulation (sGs) as interpolation method. In general, a decrease in the CO<sub>2</sub> emission is observed since the cell was closed (2004) to the present. The total CO<sub>2</sub> and CH<sub>4</sub> diffuse emissions estimated in the 2018 survey were  $3.6 \pm 0.1 \text{ t} \cdot \text{d}^{-1}$  (1309 t·y<sup>-1</sup>). The general aim of this work is to improve the knowledge about how degassing occurs in a landfill. With this information, public and private entities will be able to establish efficient biogas extraction systems. The controlled release of gases in landfills means a higher level of energy production and a reduction in air pollution.