Probabilistic analysis of the spatiotemporal variability of the Pugllohuma wetland using Synthetic Aperture Radar images of the Sentinel-1 Mission

Paul David Carchipulla Morales[1,a]

[1] Environmental Engineering Career, Environmental and Civil Engineering Faculty, National Polytechnic School, Quito, Ecuador

Keywords: Wetlands, Machine Learning, Sentinel - 1

ABSTRACT:

The paramo ecosystem is such an unique landscape around the world, singularly located in South America. Along with the presence of wetlands in this ecosystem, the paramo becomes richer in biodiversity and ecosystem services. In that sense, the following study uses synthetic aperture radar images mission and supervised classification to analyze the spatiotemporal variability of a wetland located over 4000 meters above the sea level, until now not successfully achieved at low economic cost. The wetland mentioned provides ecosystem services to Quito which is Ecuador's capital city. That is the reason why the Water Protection Fund, an Ecuadorian organization, studied optical satellite images to analyze the wetland. Failing because of the resolution of the images and the present cloudiness greater than 60%, in the case of Landsat 8 and Sentinel 2 respectively.

Using machine learning and SAR technology, it is possible to study the spatiotemporal variability of water for consumption and irrigation source without being limited by budgets, access difficulties, and meteorological conditions. Firstly, topographic and meteorological parameters are being studied in the area of interest such as, slope, elevation, precipitation, temperature and wind speed to determine the uniformity of data in the conservation area, as well as the probability that the images used characterize the season and landscape classification. Also, it is possible to use machine learning to differ between water mirrors and flooded vegetation. Finally, the temporal variability analysis uses polarimetric indices, such as polarized ratio, normalized difference polarized index, normalized VH index, and normalized VV index.

Acknowledgments. The present study was supported by a National Polytechnic School project, which is registered as PIJ 17-05: Global climate patterns and their influence on the temporal and spatial response of spectral indices of the paramo vegetation in Ecuador.