

Field Survey and Satellite Validation of Water Quality Parameters of Rivers in the Surroundings of Santo Domingo Metropolitan Area, Dominican Republic

Esteban R. Miño¹, Yuji Sakuno², Tetsuji Okuda³, Hidemi Mutsuda², Satoshi Naka⁴, Wataru Nishijima³, Marcos Rodríguez⁵ and Franklin M. Reyes⁵

¹Institute for Sustainable Sciences and Development, Hiroshima University, Japan

²Department of Transportation and Environmental Systems, Graduate School of Engineering, Hiroshima University

³Environmental Research and Management Center, Hiroshima University

⁴Department of Chemical Engineering, Graduate School of Engineering, Hiroshima University

⁵Institute of Chemistry, Faculty of Sciences, Autonomous University of Santo Domingo (UASD), Dominican Republic

About one third of the population of the Dominican Republic is concentrated in Santo Domingo Metropolitan area (SDMA). Ozama, Isabela and Haina rivers are the three main rivers in the surroundings of SDMA. Ozama River is considered the 4th most important in Dominican Republic because of its flow. Ozama and Haina rivers flow crossing SDMA at the East and West, respectively, before emptying into the Caribbean Sea. Isabela River is one of the main tributaries of Ozama River and it runs in the North part of SDMA.

Water quality monitoring of rivers and coastal areas requires a great amount of effort and monetary investment. Satellite imagery covers a broad area and requires neither great amount of money nor effort. Remote sensing through satellite imagery is a technique that can be used to understand the macro situation of the environmental pollution of rivers and their influence in coastal areas. Therefore, the purpose of this research is to perform field surveys of the water quality in the above mentioned rivers and coastal areas and to validate the data using satellite imagery in order to create a model that could be used any time to determine the water quality of the rivers and coastal areas mentioned.

In situ monitoring of the representative locations of Ozama, Isabela and Haina rivers, including the mouth of Ozama and Haina was performed from a vessel using a portable water quality meter (TOA-DKK WQ24). Dissolved oxygen (DO), pH, conductivity, turbidity, temperature, total dissolved solids (TDS), salinity, sea water specific gravity and chlorophyll a were determined. Water samples were also taken and filtered through a fiberglass filter (Whatman GF/F) to determine the amount of suspended solids (SS). A correlation between the amount of SS and color spectra of water was determined and it was used to validate the data with the satellite imagery.

Along the banks of the rivers there are a great number of sewage pipe ends as well as several ravines that converge in the rivers, all of them discharging their flow of domestic and industrial wastewater as well as garbage. Results show that SS, turbidity and chlorophyll a values are very high in these places and DO values are very low. Chlorophyll a values for the most polluted locations are higher than 40 µg/l and 25 µg/l for the Haina and Ozama-Isabela rivers, respectively, showing conditions of hypereutrophication. A significant correlation (0.72) was observed between the color spectra of water and ALOS band 1 (blue band), which shows the possibility of the use of remote sensing to determine the macro situation of pollution in the rivers and coastal areas

Contact Information: Esteban R. Miño., Institute for Sustainable Sciences and Development, Hiroshima University, Kagamiyama 1-3-2, Higashi Hiroshima shi, Hiroshima ken, 739-8511 Japan, Phone: +81-82-424-6195, Fax: +81-82-424-4351, Email: ermino-a-env@hiroshima-u.ac.jp and erminoa@hotmail.com