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Application of Multivariate Analysis for Identification of Pollution Sources in the Densu Delta Wetland in the Vicinity of a Landfill Site in Ghana

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ABSTRACT

Surface water samples collected from various sites in the Densu delta wetland, Ghana, were analyzed for pH, temperature, TDS, EC, turbidity, TSS, alkalinity, HCO3-, BOD, COD, Na, K, Mg, Ca, Cl, SO42-, PO4-P, NO3-N, Cr, Pb, Cd, Cu, Co and Fe using titration and Atomic Absorption Spectrometer (AAS). Multivariate statistical analyses such as cluster analysis (CA) and principal component analysis (PCA) were used to identify heavy metal pollution in the wetland area. Results from CA and PCA suggest positive relationships between the two analyses. Linear correlation analysis done also suggests similar relationships. Heavy metals were identified as originating from a common source in all the analyses. The hydrochemistry of the area appears to have been influenced, to a large extent, by dissolution/precipitation as well as numerous but subsistence small-scale agricultural activities that take place in the wetland environment.

KEYWORDS

Densu Delta Wetland, Surface Water, Pollution, Cluster Analysis (CA), Principal Component Analysis (PCA)

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References

[1] R. A. van Dam, C. Camilleri and C. M. Finlayson, "The Poten-tial of Rapid Assessment Techniques As Early Warning Indi-cators of Wetland Degradation: A Review," Environmental Toxicology and Water Quality, Vol. 13, No. 4, 1998, pp. 297-312.

[2] J. R. Fianko, S. Osae and D. Achel, "Impact of anthropogenic activities on the Densu River in Ghana," Water and Environment Journal, Vol. 23, No. 3, 2009, pp. 229-234.

[3] T. Kowalkowski, R. Zbytniewski, J. Szpejna and B. Buszewski, "Application of Chemometrics in River Water Classification," Water Research, Vol. 40, No. 4, 2005, pp. 744-752.

[4] B. Wu, D. Zhao, Y. Zhang, X. Zhang and S. Cheng, "Multivariate Statistical Study of Organic Pollutants in Nanjing Reach of Yangtze River," Journal of Hazardous Ma-terials, Vol. 169, No. 1-3, 2009, pp. 1093-1098.

[5] A. Fac-chinelli, E. Sacchi and L. Mallen, "Multivariate Statistical and GIS-Based Approach to Identify Heavy Metal Sources in Soils," Environmental Pollution, Vol. 114, No. 3, 2001, pp. 313-324.

[6] American Public Health Authority (APHA), "Standard Methods for the Examination of Water and Waste Water," 19th edition, American Public Health Association, Washington, D.C. 1995.

[7] J. W. Einax, D. Truckenbrodt and O. Kampe, "River Pollution Data Interpreted by Means of Chemometric Methods," Microchemistry Journal, Vol. 58, No. 3, 1998, pp. 315-324.

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[8] J. Mazerski, "Basics of Chemometrics," Politechnika Gdanska. Gdanska, Polish, 1997.

[9] J. W. Einax, H. W. Zwanziger and S. Geiss, "Chemometrics in Environmental Analysis," Wiley, Weinheim, 1997.

[10] H. Razmkhah, A. Abirishamchi and A. Torkian, "Evaluation of Spatial and Temporal Variation in Water Quality by Pattern Recognition Techniques: A Case Study on Jajrood River (Tehran, Iran)," Journal on Environmental Management, Vol. 91, No. 4, 2009, pp. 852-860.

[11] S. R. Tariq, M. H. Shah, N. S. Khalique and M. M. Jaffar, "Multivariate Analysis of Trace Metal Levels in Tannery Effluents in Relation to Soil and Water: A Case Study from Peshawar, Pakistan," Journal of Environmental Management, Vol. 79, No. 1, 2005, pp. 20-29.

[12] E. Marengo, M. C.Gennaro, D. Giacosa, C. Abrigo, G. Saini and M. T. Avignone, "How Chemometrics Can Helpfully Assist in Evaluating Environment Data Lagoon Water," Analytica Chimica Acta Anal, Vol. 317, No. 1-3, 1995, pp. 53-63.

[13] D. Chapman, "Water Quality Assessment: A Guide to the Use of Biota, Sediments and Water in Environ-mental Monitoring," 2nd edition, Chapman & Hall Ltd, London, 1996, pp. 84-101.

[14] L. O. Chukwu and D. I. Nwankwo, "The Impact of Land Pollution on the Hydrochemistry and Macro Benthic Community of a Tropical West African Creek," Diffuse Pollution Conference Dublin, ESCA 4: