



Distribution of Antimony in a Tropical Estuary Dominated by Mangroves

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ABSTRACT

Seasonal variation of antimony was studied in order to characterize its distribution in estuarine water, pore water, sediment, and diagenetic behavior in the Sundarbans mangrove ecosystem. The mean concentration of dissolved inorganic Sb ranged between 230.8 and 303.1 ng L⁻¹ over the period of study with a minimum during the post-monsoon closely associated with spring diatom bloom. Molecular diffusion flux of Sb was found greater than its value advected and deposited on sediment-water interface and there was significant remobilization of Sb in the Sundarbans mangrove ecosystem.

KEYWORDS

Antimony (III & V), Molecular Diffusion Flux, Phytoplankton Bloom, Mangrove

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References

- [1] M. J. Nash, J. E. Maskall and Hill, " Methodologies for Determination of Antimony in Terrestrial Environmental Samples," *Journal of Environmental Monitoring*, Vol. 2, 2000, pp. 97-109. doi:10.1039/a907875d
- [2] M. Filella, N. Belzile and Y. W. Chen, " Antimony in the Environment: A Review Focused on Natural Waters I. Occurrence," *Earth Science Review*, Vol. 57, No. 1-2, 2002, pp. 125-176. doi:10.1016/S0012-8252(01)00070-8
- [3] M. Filella, N. Belzile and Y.-W. Chen, " Antimony in the Environment: A View Focused on Natural Waters: II. Relevant Solution Chemistry," *Earth-Science Review*, Vol. 59, No. 1, 2002, pp. 265-285. doi:10.1016/S0012-8252(02)00089-2
- [4] M. Filella, P.A. Williams and N. Belzile, " Antimony in the Environment: Knowns and Unknowns," *Environmental Chemistry*, Vol. 6, No. 2, 2009, pp. 95-105. doi:10.1071/EN09007
- [5] Jr. J. F. Carlin, " Geological Survey Mineral Commodity Summaries, U.S.," 2000.
- [6] B. A. Fowler and P. L. Goering, " Antimony," In: E. Merian, Ed., *Metals and Their Compounds in the Environment*, VCH, Weinheim, 1991.
- [7] T. Crommentuijn, M. D. Polder and E. J. van de Plasche, " Maximum Permissible Concentrations and Negligible Concentrations of Metals, Taking Background Concentrations into Account," RIVM Report No. 601501001, National Institute of Public Health and the Environment, Bilthoven, The Netherlands, 1997.
- [8] A. Kabata-Pendias and H. Pendias, " Trace Elements in Soils and Plants," CRC Press, Boca Raton, 1985.
- [9] X. Huang, I. Olmez, N. K. Aras and G. E. Gordon, " Emission of Trace Elements from Motor Vehicles:

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- [10] C. Dietl, M. Waber, L. Peichl and O. Vierle, " Monitoring of Airborne Metals in Grass and Depositions," Chemosphere, Vol. 33, No. 11, 1996, pp. 2101-2111. doi:10.1016/0045-6535(96)00301-3
- [11] United States Environmental Protection Agency, " National Primary Drinking Water Standards," USEPA Office of Water, Washington DC, 1999, Doc. 810-F-94-001.
- [12] M. O. Andreae and P. N. Froelich, " Arsenic, Antimony, and Germanium Biogeochemistry in the Baltic Sea," Tellus, Vol. 36B, 1984, pp. 101-117. doi:10.1111/j.1600-0889.1984.tb00232.x
- [13] G. A. Cutter, " Dissolved Asenic and Antimony in Black sea," Deep-Sea Research. Vol. 38, Suppl. 2, 1991, pp. S825-S843. doi:10.1016/S0198-0149(10)80011-1
- [14] G. A. Cutter and L. S. Cutter, A. M. Featherstone and S. E. Lohrenz, " Antimony and Arsenic Biogeochemistry in the Western Atlantic Ocean," Deep-Sea Research: Part II, Vol. 48, No. 13, 2001, pp. 2895-2915.
- [15] Takayanagi and D. Cossa, " Vertical Distributions of Sb(III) and Sb(V) in Pavin Lake, France," Water Research, Vol. 31, No. 3, 1997, pp. 671-674. doi:10.1016/S0043-1354(96)00285-0
- [16] H. Gürleyük, V. Van Fleet-Stalder and T. G. Chasteen, " Confirmation of the Biomethylation of Antimony Compounds," Applied Organometallic Chemistry, Vol. 11, 1997, pp. 471-483.
- [17] P. Andrewes, W. R. Cullen and E. Polishchuk. " Antimony Biomethylation by Scopulariopsis Brevicaulis: Characterization of Intermediates and the Methyl Donor," Chemosphere, Vol. 41, No. 11, 2000, pp. 1717-1725. doi:10.1016/S0045-6535(00)00063-1
- [18] R. Ray, D. Ganguly, C. Chowdhury, M. Dey, S. Das, M. K. Dutta, S. K. Mandal, N. Majumdar, T. K. De, S. K. Mukhopadhyay and T. K. Jana, " Carbon Sequestration and Annual Increase of Carbon Stock in a Mangrove Forest," Atmospheric Environment, Vol. 45, No. 28, 2011, pp. 5016-5024.
- [19] H. Biswas, S. K. Mukhopadhyay, T. K. De, S. Sen and T. K. Jana, " Biogenic Controls on the Air-Water Carbon Dioxide Exchange in the Sundarban Mangrove Environment, Northeast Coast of Bay of Bengal, India," Limnology & Oceanography, Vol. 49, No. 1, 2004, pp. 95-101.
- [20] D. Das, G. Samanta, B. K. Mondal, R. T. Chowdhury, C. R. Chanda, P. P. Chowdhury, G. K. Basu and D. chakraborti, " Arsenic in Ground Water in Six Districts of West Bengal, India," Environmental Geochemistry and Health, Vol. 18, No. 1, 1996, pp. 5-15. doi:10.1007/BF01757214
- [21] S. K. Mandal, M. Dey, D. Ganguly, S. Sen and T. K. Jana, " Biogeochemical Controls of Arsenic Occurrence and Mobility in the Indian Sundarban Mangrove Ecosystem," Marine Pollution Bulletin, Vol. 58, No. 5, 2009, pp. 652- 657. doi:10.1016/j.marpolbul.2009.01.010
- [22] S. K. Mukhopadhyay, H. Biswas, T. K. De and T. K. Jana, " Fluxes of Nutrients From the Tropical River Hooghly at the Land- Ocean Boundary of Sundarbans, NE Coast of Bay of Bengal, India," Journal of Marine System, Vol. 62, No. 1-2, 2006, pp. 9-21. doi:10.1016/j.jmarsys.2006.03.004
- [23] H. D. Schulz, " Quantification of Early Diagenesis: Dissolved Constituents in Pore Water and Signals in the Solid Phase," In: H. D. Schulz and M. Zabel, Eds, Marine Geochemistry, Second Edition, Springer, Germany, 2006, pp. 73-124. doi:10.1007/3-540-32144-6_3
- [24] DOE, " Handbook of Methods for the Analysis of the Various Parameters of the Carbon Dioxide System in Sea Water," Version 2, ORNL/CDIAC-74, 1994.
- [25] P. E. Keller, S. A. Paulson and L. J. Paulson, " Methods for Biological, Chemical and Physical Analysis in Reservoirs Technical Report. 5," Lake Mead Limnological Research Centre, University of Nevada, Reno, 1980.
- [26] K. Grasshoff, " Determination of Nutrients," In: K. Grasshoff, M. Ehrhard and K. Kremling, Eds, Determination of salinity and Oxygen, Methods of Seawater Analysis, Verlag Chemie, Weinheim, 1983, pp. 31-72.
- [27] APHA, " Standard Methods for the Examination of Water and Waste Water," American Public Health Association, Washington DC, 1995, pp. 5-15.
- [28] C. S. Piper, " Soil and Plant Analysis," Interscience Publication, New York, 1950, p. 67.
- [29] A. Walky and I. A. Black, " An Examination of the Degtjareff Method for Determining Soil Organic

Matter and Pro- posed Modification of the Chromic Acid Titration Me- thod," Soil Science, Vol. 37, No. 1, 1934, pp. 29-38. doi:10.1097/00010694-193401000-00003

- [30] H. Ghatak, S. K. Mukhopadhyay, H. Biswas, S. Sen and T. K. Jana, " Quantitative Study of Co (III) Complexation by Syncvronous Fluorescence Spectroscopy with Sun- derban Mangrove Habitat Humic Substances," Indian Journal of Marine Science, Vol. 37, 2002, pp. 136-140.
- [31] M. Yamamoto, M. Yasuda and Y. Yamamoto, " Hydride- generation Atomic Absorbtion Spectrometry Coupled with Flow Injection Analysis," Analytical Chemistry, Vol. 57, No. 3, 1985, pp. 1375-1382. doi:10.1021/ac00284a045
- [32] D. H. Loring and R. T. T. Rantala, " Manual for the Geochemical Analysis of Marine Sediment and Suspended Particulate Matter," Earth Science Review, Vol. 32, No. 4, 1992, pp. 235-283. doi:10.1016/0012-8252(92)90001-A
- [33] R. S. Barman, D. L. Johnson, C. C. Foreback, J. M. Ammons and J. L. Bricker, Analytical Chemistry, Vol. 49, No. 4, 1977, pp. 621-625. doi:10.1021/ac50012a029
- [34] A. Lerman, " Geochemical Processes. Water and Sedi- ment Environments," John Wiley and Sons, Hoboken, 1979, p. 343.
- [35] H. Biswas, M. Dey, D. Ganguly, T. K. De, S. Ghosh and T. K. Jana, " Comparative Analysis of Phytoplankton Composition and Abundance over a Two-Decade Period at the Land-Ocean Boundary of a Tropical Mangrove Ecosystem," Esuaries and Coasts, Vol. 33, No. 2, 2010, pp. 384-394. doi:10.1007/s12237-009-9193-5
- [36] H. A. Sloot.Van der, D. Hoede and J. Wijkstra, " Trace Oxyanoions and Their Behaviour in the River Porong and Solo, Java Sea & the Adjacent Indian Ocean," Netherland Journal of Sea Research, Vol. 23, No. 4, 1989, pp. 379- 386.
- [37] C. Migan and C. Mori, " Arsenic and Antimony Release from Sediments in a Mediterranean Estuary," Hydrobiologia, Vol. 392, No. 1, 1999, pp. 81-88. doi:10.1023/A:1003561609548
- [38] J. T. Byrd, " Comparative Geochemistries of Arsenic and Antimony in Rivers and Estuaries," Science of Total Environment, Vol. 97, No. 8, 1990, pp. 301-314. doi:10.1016/0048-9697(90)90247-R
- [39] C. M. Berg, G. van den, S. H. Khan, P. J. Daly, J. P. Riley and D. R. Turner, " An Electrochemical Study of Ni, Sb, Se, Sn, U and V in the Estuary of the Tamar," Estuararies and Coastal Shelf Science, Vol. 33, No. 3, 1991, pp. 309- 322.
- [40] G. van den and C. M. Berg, " Complex Formation and the Chemistry of Selected Trace Elements: Coastal and Estuarine Research Federation Stable URL," Estuaries, Vol. 16, No. 3A, 1993, pp. 512- 520.
- [41] A. A. Benson and R. A. Cooney, " Antimony Metabolites in Marine Algae," In: P. J. Craig and G. F. Longmans, Eds., Organometallic Compounds in the Environment. Principles and Reactions, Harlow, 1988, pp. 135-137.
- [42] S. Maeda, H. Fukuyama, E. Yokoyama, T. Kuroiwa, A. Ohki and K. Naka, " Bioaccumulation of Antimony by Chlorella Vulgaris and the Association Mode of Anti- mony in the Cell," Applied Organometallic Chemistry, Vol. 11, 1997, pp. 393-396. doi:10.1002/(SICI)1099-0739(199705)11:5<393::AID-AOC593>3.0.CO;2-7
- [43] S. Maeda and A.Ohki, " Bioaccumulation and Biotrans- formation of Arsenic, Antimony and Bismuth Compounds by Freshwater Algae." In: Y.-S. Wong and N. F. Y. Tam, Eds., Wastewater Treatment with Algae, Springer- Verlag and Landes Biosciences, Berlin, 1998, pp. 73-92.