Mobility of pesticides in groundwater of Western Bengal basin aquifers

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Groundwater in shallow aquifers of Western Bengal basin is identified as one of the important arsenic contaminated zones. Due to rising population, groundwater sources are getting polluted as a result of human activities. Such activities can be broadly categorized into different sources such as municipal, industrial, domestic and agricultural. Agricultural contamination comes primarily from overuse of pesticides and fertilizers that can later seep into groundwater sources. This study deals with the status of pesticides and their adsorption in surficial sediments of Western Bengal basin which includes major different three minerals such as quartz, calcite, and kaolinite [1]. Five pesticides were taken into considerations which are available in the respective study region and they are namely Chlorpyrifos, Malathion, Lindane, Alachlor, and Atrazine. The fate of pesticides in aquifers is influenced by the significant adsorption of pesticides to mineral surfaces. Batch experiments with five pesticides and three mineral surfaces were conducted to quantify the contributions to adsorption from different mineral surfaces and compare adsorption characteristics of selected pesticides. Specific surface area and mineral surface charge proved to be one of the important parameters for the adsorption of these pesticides. Detectable adsorption of the anionic pesticides (Malathion, Alachlor, Chlorpyrifos and Lindane) However when $CaCl_2$ was added as an electrolyte, a noticeable adsorption of Malathion and Alachlor was also measured in kaolinite (which shows a negative surface charge) due to the formation of Ca-pesticide surface complex. There was an insignificant effect of ionic strength for the uncharged pesticides such as Atrazine. The result indicates clay minerals showed effective and measurable adsorption capacity than that of quartz and calcite.

References:

[1] Einsiedl, F., Radke, M., Maloszewski, P. (2010), Journal of Contaminant Hydrology 117, 26 – 36.