Investigation of sediment geochemistry in areas with elevated arsenic in groundwater of Matlab, Bangladesh and Murshidabad, India

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The assessment of the incidence of arsenic (As) and other oxyanions forming trace elements was examined in Bengal delta floodplain groundwaters from Matlab Upazila, Bangladesh and Murshidabad District, India. These field areas cover an area of about ~400km^2 (von Brömssen *et al*. 2008) and ~438km^2 (Datta *et al*. 2011) respectively. The study focuses on the sediment geochemistry and adsorption behavior of oxidised red brown and reduced grey sediments and their respective capacity to attenuate As. Sediment cores were collected at regular intervals within depth of 125m in Matlab and ~40m in Murshidabad. Detailed sequential extractions of sediments indicate relatively low amount of As released from oxidized sediments. The study describes the lithofacies, mineralogy and results of adsorption experiments on the sediments from two sites and establishes a relationship between aqueous and solid phase geochemistry along the various depths of the aquifers. DNA recovered from Matlab core samples averaged 450ng/g from course-grained samples and 800ng/g from fine-grained samples. Sequencing of the DNA is utilised to identify microbial communities and their role in the biogeochemical processes controlling the groundwater As levels. Synchrotron aided μXANES and μXRD studies conducted for solid state As and S speciation in the core samples at different depths indicate the occurrences of hotspots of As differently distributed in red-brown and grey sediments in both these sites. The projected outcome is to incorporate detailed sediment characteristics of the different aquifers including all possible color variations available in exploited depths within Matlab and Murshidabad respectively. Porewater from Matlab abstracted from oxidized reddish sediments, in contrast to reducing greyish sediments contain substantially lower amount of dissolved As and can be a source of safe water. This study has wider implications towards broad scale regional approach for As mitigation that incorporates the enquiry of efficiency of sediment color as a simple and easy tool for identifying safe aquifers in major As prone areas.

[1] Datta S. *et al* (2011). *Geophysical Research Letters*. **38**.2 [2] von Brömssen M. *et al* (2008). *Journal of Contaminant Hydrology* **99**.1: 137-149.

Peat and sapropel as the sources of humus for the restoration of degraded lands of the Amur region (Far East, Russia)

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The natural ability of soil to produce biological products decreases each year. The problem of the land resources has become one of the largest global problems. It is connected with the growth of world population and, consequently, decrease of sown area per capita; increased area of degraded and disturbed soils. In particular, in the Amur region of degraded and disturbed lands is increasing every year. Also because of the lack of organic fertilizers, that has decreased from 63 kg/ha in 1995 to 5 kg/ha in 2011 [1]. The specific weight of fertilized area of organic fertilizers in the total sown area in 1995 was 0.5 %, in 2011 – 0.09%. Only 2% of the soils of the region (660 thousand hectares) are characterized by high soil fertility, where humus horizon reaches 20 - 40 cm sometimes 50 cm. Humus content in the upper part of the soil is from 4 up to 8%. The annual loss of humus soils of the Amur region is 0.45 tons per ha. At the same time with the loss of humus, the destruction of soil structure is mentioned, soil compaction lead to a deterioration of its physical and chemical characteristics [2]. Soil restoration is possible with the introduction of organo-mineral fertilizers produced from peat and sapropel deposits of the Amur region. The region possesses significant reserves of peat and sapropel. The total area of deposits of sapropel, in the border of the industrial depth of the deposits is 1493 ha. The total content of useful (1553 g/t) and harmful (436 g/t) elements in sapropels of Amur region in comparison with other sapropels and soils of Russia has the highest - lowest values [3]. Peat general reserves of the Amur region include 600 deposits. The total projected resources of peat, including reserves of explored fields, are 158.5 million tonnes, with 40% of the conditional humidity. Total area of the deposits is 5663.5 km2 [4]. These reserves are sufficient to restore the fertility of the soils of the region.

[1] Diachenko *et al*. Amur statistical Yearbook of 2012: the Statistical collection. Blagoveschensk: Zeya. 2012. 602. [2] Pavliuk (2005) Geography of Amur region: training manual. Blagoveschensk: BGPU. 364. [3] Alekseiko *et al*. (2003) Sapropel of the Amur region: properties, production and use. Blagoveshchensk: Dalnauka. 210. [4] Vasilev *et al*. Mineral-raw material base of the Amur region at the turn of the century. (2000). Blagoveshchensk: Zeya. 168.

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