Variations in composition and size of dissolved and colloidal organic matter in the Bay of St. Louis estuary

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The Bay of Saint Louis (BSL) estuary receives high organic loads from rivers and discharges into the northern Gulf of Mexico, where hypoxia has been linked to nutrient enrichment and organic inputs. To investigate the variation of DOM composition, size-distribution, and transport processes, water samples were collected along a salinity gradient from the BSL for size fractionation using ultrafiltration and flow field-flow fractionation techniques, and for the measurement of DOC concentration, UV-vis absorbance, and fluorescence excitation emission matrix (FluoEEM). Both field and mixing experimental results show that optical properties (a_{355}, fluorescence index, and biological index) behaved conservatively during estuarine mixing along the salinity gradient and correlated significantly with DOC. While DOC concentration decreased ~2.5 fold from the river to coastal seawater, values of a_{355} varied 19 fold, suggesting that marine DOM is less optically active and/or that optically active DOM is preferentially removed during estuarine mixing. The percentage of colloidal organic carbon (>1 kDa) in the bulk DOC decreased from 67% in river waters to 38% in coastal seawater. Higher UV absorbance, lower biological index and lower spectral slope were found in the colloidal fraction, indicating HMW-DOM contained more optically active but less microbially derived materials, with increasing humification index from low to high salinity waters. All samples had the largest population of UV-absorbing and humic-fluorescent colloids in the 0.5-4 nm size range, suggesting chromophores and humic-type matirials are associated with the same organic macromolecules, which are hypothesized to be fulvic acids in nature. Protein-type DOM was found to associate with not only the 0.5-4 nm but also the 3-8 nm and the >20 nm colloidal fractions. The relative proportion of medium and large colloidal sized protein-type DOM appeared to increase with increasing salinity, suggesting sources from freshly produced organic matter in the lower estuary and coastal waters. A removal of mid-size (8-20 nm) protein-type materials was observed in low and mid salinity (0-20) water, indicating possible salt-induced flocculation. Size fractionation techniques, coupled with chemical characterization could provide new insights into DOM transport and transformation in estuarine environments.

Groundwater isotope characteristics of the potential site of a high-level radioactive waste repository in the JiuJing Area in China

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The site knowledge of hydrogeological conditions is extremely important In the high-level radioactive waste repository site because any radioactive material released from the repository will be migrated to the environment or biosphere of human through the groundwater. Beishan area is located in northwestern Gansu Province in northwest China, which is one of the important pre-selected area of China's high-level radioactive waste repository. In order to know the hydrogeological conditions of pre-selected area, and the site suitability as a high-level radioactive waste repository from the hydro-geological point of view evaluation, according to groundwater isotopic data and the available geological, hydrological data and information, this paper, taking the pre-selected area Beishan Jiujing as an example, analyzed the origin, formation, evolution and cycle characteristics of bedrock groundwater in the study area through experiments and hydro-geochemical model simulation. Studies show that, in pre-selected area Beishan Jiujing, deep groundwater and shallow groundwater both derived from the recharge of precipitation in popularity. It also tells us low water-bearing, low permeability, low-flow rate are the main hydro-geological characteristics of this area.

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