Column test of water treatment via the desert dunes near Beijing

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The large dunes nearby the Guanting Reservoir in Beijing are parts of the sources of local dust of sandstorm. However, mineral and chemical analysis showed that these dunes provide great amount of perfect infiltrating material for treatment of polluted surface water in the reservoir, one of the two main surface water resources of the capital city of China. A system which takes the dune sand as infiltrating material was designed based on the following ideas: 1) the self-purification function of the dunes is helpful to remove inorganic pollutants via adsorbability, while microbes can be used to degrade organic ones. 2) dunes are porous media, helpful for microbes to agglutinate on the material easily. 3) geochemical reactions such as oxidation reactions, reducing reactions and metasomatic reactions may occur during treatment, which are promising to remove both of inorganic and organic pollutants. This treatment system was called "anemoarenyte treatment system", ATS shortly.

Column test has been done to confirm the effect of ATS to purify polluted water in Guanting Reservoir. Study shows that: 1) dunes contain less heavy metals with great penetrability. They are cheaper than manmade infiltrating material. 2) the effect of ATS to remove the pollutants is excellent. The quality of outlet is of I~III class for drinking water resourec when inlet water is of V class or even worse. 3) with a hydraulic loading of 1.0~1.5m/d, ATS can satisfy the demand of an actual water plant. 4) it is stable against impact load and has the ability of self-evolution also. The ability to remove pollutants will strengthen because the microbes become acclimated in the infiltration system. 6) the structure of AST needs no giant or complex equipments, hence the biulding and running cost is unusually low.

The alternation of wet and dry periods makes the vacillation of oxidation reactions and reducing reactions. Nitrification and denitrification are the main reactions for the degradation of organic pollutants. Dissolution, absorption and metasomatic reactions were observed in the columns. After 4 months of column test, the magnetite in dune sand disappeared. SEM was used to detect the change of the content of Na^+ and Ca^{2+}. The result shows that Ca^{2+} was substitute by Na^+ at the edge of feldspar during the test, anorthite changes to albite. Apatite is found in the column which is scarce in the original material, which means that P precipitated from water.

It is believed that, with the application of ATS, it will help to remove pollutants in surface water and to fix the sand dunes to reduce the sandstorm dust resource.

Hydrographic estimates for developing East Asian monsoon proxies in IMAGES South China Sea studies

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We conducted a high-resolution study on planktic foraminiferal faunal and isotopic variations on two sediment cores located off eastern Vietnam (IMAGES Core: MD012394) and near Palawan Island (IMAGES Core: MD972142), where a contrast of hydrographic conditions was observed in modern monsoon climate setting in the South China Sea (SCS). The changes of the faunal assemblages were used to analyze and evaluate the change in the upper-water hydrographic conditions during the late Quaternary. Our quantitative analyses of planktonic foraminifer faunal abundance data indicate that *Globigerinoides ruber* and *Neogloboquadrina dutertrei* are dominant species. These faunal variations offer good proxies for paleoceanographic changes over the past 135,000 years. We developed a regional calibration equation based on a revised transfer function method (RTF). A total of 1682 downcore faunal assemblage data from the SCS were used to define a factor model and project onto a newly-compiled western Pacific coretop data base (N=870) to calibrate against the annual mean sea surface temperature (SST). When estimating a SST gradient by subtracting MD012394 from MD972142, our results show a long-term decrease of the SST gradient. This trend is consistent with many published marine or terrestrial records showing long-term decreases / increases in the intensity of SCS summer / winter monsoon winds in the East Asia. By combined all upwelling and downwelling faunal assemblages and SST and thermocline depth estimates from these two cores, our results indicate that the interglacial stages 3 and 5 are characterized by a larger east-west hydrographic gradient with larger amplitude variations. The Holocene and glacial stages 2 and 4 exhibit relatively small gradients. Superimposed on the long-term trend, the variations of the faunal and hydrographic gradients show a strong 23-kyr cycles, which mimic the long-term "ENSO" variations estimated from Zebiak-Cane Models. More interestingly is that the intervals of larger faunal and hydrographic gradients from our records approximately correspond to large precession variations before 65,000 years ago. This result suggests that a dynamic tropical monsoon circulation linked with precessional forcing in late Quaternary SCS.