Soil contamination of heavy metals in Katedan industrial area, Hyderabad, Andhra Pradesh, India

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Studies on quantitative soil contamination due to heavy metals were carried out in Katedan Industrial Development Area, south of Hyderabad, Andhra Pradesh, India under the Indo-Norwegian Institutional Cooperation Programme. The geology of the study area consists of granites and pegmatite of Archaean age with residual soil from granite. The area falls under a semi-arid type of climate with average rainfall of 800 mm per year. The industrial area is having about 325 industries manufacturing batteries, chemicals and dealing with cloth dying, metal plating and edible oil production. Many industries discharge their effluents either on the open land, ditches or creeks. Solid waste from some of the industries is randomly dumped along roads contaminating the soil and water in the area.

Soil samples were collected during two hydrological cycles and were analyzed for major, minor and trace elements by XRF spectrometry. Comparing the results with the Soil Quality Guidelines (SQGL), it was observed that almost whole of the industrial area is heavily contaminated by high concentrations of lead, arsenic, chromium, copper, nickel and zinc. By and large, the residential area is not heavily contaminated except some of the pockets where high concentrations of Pb, As and Cr are observed. The pre and post monsoon studies indicate that As, Cd and Pb contaminants are more mobile and may reach the groundwater while the other contaminants seem to be more stable. The source of high concentrations of heavy metals like Cr, Cu, Pb etc seem to be anthropogenic and it is not possible to derive these concentrations from surrounding rocks which are predominantly granite.

Correlation diagram were plotted to find out the relationship between various trace metals. There is a well-defined relationship between As vs. Pb with extraordinary linear correlation.

Studies were carried out on surface water samples also, which indicate high concentration of toxic elements. Geochemical maps showing the distribution of many metals are prepared for the whole area and results will be presented in this paper.

Measurements of oxygen and hydrogen isotopes in the Skagway River catchment, Alaska

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This work investigated the seasonal variations in oxygen and hydrogen isotopes in the Skagway River, a medium-sized catchment (375 km^2) fed by moderately high precipitation and glacial meltwater. Nearly weekly samples of river flow were gathered from August 2000 through November 2001 and again in the summers of 2002 and 2003. During the summer periods, samples of glacier ice, precipitation, and groundwater were also collected.

Riverwater showed the most depleted $\delta^{18}O$ near the river's mouth in early summer. Similar values were found in meltwaters sampled at the toe of Laughton Glacier. The precipitation samples were gathered from three sites of varying elevations: at sea level, at 825 meters, and at 1025 meters near the valley summit. The $\delta^{18}O$ values ranged from -8.2 $^0/_{00}$ at the lowest eleveation site to -20.3 $^0/_{00}$ at the highest. Measured groundwater $\delta^{18}O$ value was -17.3 $^0/_{00}$, and the mean for surface glacier ice was -17.5 $^0/_{00}$.

The fractional components of water sources in the river were determined by using mass balance and by establishing isotopically derived endmembers of river baseflow and glacial meltwater. The baseflow $\delta^{18}O$ was computed from groundwater values taken by sampling a nearby well. Glacial runoff, measured in late June and early July at the toe of Laughton Glacier, yielded a mean meltwater value for $\delta^{18}O$ of -19.7 $^0/_{00}$. Rainfall contributions to the river have greatest influence in the fall, the typically rainy season, and during winter storms when temperatures are above freezing to allow for isotopically heavier rain, rather than snow, to fall. During these occasions, the riverwater may exhibit an isotopic signature more enriched than the groundwater endmember.

The δD values for a few of the river samples ranged from -125 $^0/_{00}$ to -137 $^0/_{00}$. A plot of these results and their corresponding $\delta^{18}O$ values, $\delta D = 7.7\ \delta^{18}O + 4.9$ with R^2 = 0.97, shows a good fit with Craig's meteoric water line.

A 4 $^0/_{00}$ shift in $\delta^{18}O$ to more negative values occurred around mid-May. This shift corresponds with atmospheric temperature increases that result in lower $\delta^{18}O$ and δD from upper elevation snowpack and glacial melt becoming the major contributor to runoff. Isotopic analysis determined that up to 87 % of water in the riverbed during June is derived from glacial melt.