# Application of the statistical methods to the groundwater pollution data from the solid waste disposal site at Pune (India)

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Although the water required for the domestic consumption should possess a high degree of purity, in the municipal cities improper way of solid waste disposal is largely responsible for the groundwater pollution. Two streams and thirteen dug wells were sampled to assess the ground water pollution due to the solid waste disposal site towards SE part of Pune City (India). Most of the wells close to the site have dark brown coloured water with unpleasant smell, indicating a considerable pollution. Twenty-one physico-chemical parameters were determined for the stream and ground water samples in three seasons viz. monsoon, winter and summer during the year 2007-2008. The Pearson correlation coefficient data show some significant relationships amongst the parameters, the most striking being between BOD & COD; EC & TDS; $Na^+$ & $K^+$ hardness & $Ca^{2+}$, alkalinity and $Na^+$. $Cl^-$ is showing good correlation with EC and TDS while $H_2S$ with COD and BOD. The statistical analyses reveal that $NH_3$-N, pH and $PO_4^{3-}$ are least affected through out the three seasons, while TDS shows an extremely high deviation the highest values being in summer. $HCO_3^-$, $Cl^-$, $Na^+$ and hardness are having significant variations while other parameters show somewhat smaller variations. The data indicate that the overall pollution level is increasing from the monsoon to winter and reaching peak during the summer, although the amount of pollution in the wells is decreasing with increasing distance from the stream and the dumpsite. Suitable treatment measures have to be initiated to mitigate the problem urgently in order to reduce the risk of further deteriorations of the groundwater in the area.

# Microbial perspectives of methane fluxes from melting permafrost

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## Background

The Arctic plays a key role in the Earth's climate system, because global warming is predicted to be most pronounced at high latitudes, and one third of the global carbon pool is stored in ecosystems of the northern latitudes. The degradation of permafrost and the associated release of climate-relevant trace gases from intensified microbial turnover of organic carbon and from destabilized gas hydrates represent a potential environmental hazard.

## Microbial Processes and Methane Fluxes

The mean flux rate from polygon depressions was 53.2 ± 8.7 mg $CH_4$ $m^{-2}$ $d^{-1}$, whereas the mean flux rate of the dryer rim part of the polygon was 4.7 ± 2.5 $CH_4$ $m^{-2}$ $d^{-1}$. The $CH_4$ production in the upper soil horizon of the polygon depression was about 10 times higher (38.9 ± 2.9 nmol $CH_4$ $m^{-2}$ $d^{-1}$) in July than in August (4.7 ± 1.3 nmol $CH_4$ $m^{-2}$ $d^{-1}$). The $CH_4$ oxidation behaved exactly in reverse: the oxidation rate of the upper soil horizon was low in July (1.9 ± 0.3 nmol $CH_4$ $m^{-2}$ $d^{-1}$) compared to the activity in August (max. 7.0 ± 1.3 nmol $CH_4$ $m^{-2}$ $d^{-1}$). The findings demonstrate the close relationship between apparent methane fluxes and the modes and intensities of microbiological processes of methane production and oxidation in the polygonal tundra soils.

## Research Needs

Despite increasing studies on microbial processes and communities in permafrost environments [1, and ref. there within], their function, population structure and reaction to environmental changes is largely unknown, which means that also an important part of the process knowledge on methane fluxes in permafrost ecosystems is far from completely understanding. This hampers prediction of the effects of climate warming on arctic methane fluxes, in particular when these predictions are based on models that do not take into account the specific nature of microbial populations in permafrost soils and sediments. Understanding these microbial populations is therefore highly important for understanding the global climatic effects of a warming Arctic.

[1] Wagner & Liebner (2009) *Soil Biology* **16**, 219-236.