

## NOTE

**Regression Analysis of Ground Water Quality Data of Old Aurangabad City (Maharashtra)**

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Ground water samples from different places of old Aurangabad city (Maharashtra) have been analyzed for various water quality constituents during 1998 and correlation coefficients among different parameters determined. A regression equation to predict the concentration of water quality constituents having significant correlation coefficients with oxidation-reduction potential (ORP) and the usefulness of their equations in predicting the ground water quality have been discussed.

Now-a-days an increasing trend is being observed among researchers to correlate different ground water parameters<sup>1-3</sup>. For this a statistical method is used to find out regression line. According to Wald<sup>4</sup> statistics consists of a set of methods allowing relational optimal decisions to be made in case of uncertainty.

In the present study an attempt has been made to correlate oxidation-reduction potential (ORP) with other water quality constituents.

Thirty-six water samples representing the ground water of the above area have been collected during pre-monsoon and post-monsoon season of 1998. The bore-wells from which samples have been collected are used for domestic purpose. The analysis of water has been carried out by using standard methods<sup>5,6</sup>. The correlation coefficient and other statistical parameters have been calculated using computers.

The water quality data, *i.e.*, geometric mean, range and standard deviations have been given in Table-1. The pH values lie in between 4.87 to 5.91. This indicates the acidic nature of ground water. The correlation matrix for different ground water quality variables is given in Table-2. It is evident that distribution of hardness, chloride, sulphate, calcium and magnesium are correlated with oxidation-reduction potential. The  $r^2$  values represent the proportion of the

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variation in the dependent variables accounting for the linear regression equation. The  $r^2$  values of different water quality parameters with ORP are given in Table-3. A relationship between ORP and different water quality parameter variables is shown in Table-4. The linear regression analysis between ORP and correlated ionic constituents in water showed that these constituents could be estimated from ORP values.

TABLE-1  
HYDROCHEMICAL DATA OF GROUND WATER SAMPLES DURING 1998

	Redox	pH	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup>	ardness	Ca <sup>2+</sup>	Mg <sup>2+</sup>
Average	180.86	5.28	352.02	39.96	724.12	178.38	72.32
Geo-mean	180.61	5.28	336.59	36.78	711.91	174.47	68.34
Max	217.00	5.91	497.66	69.98	1000.32	286.18	114.50
Min	167.00	4.87	44.37	15.22	490.70	118.71	33.55
Std Dev	9.96	0.21	77.29	16.25	134.65	38.75	23.60

TABLE-2  
CORRELATION MATRIX AMONG DIFFERENT WATER QUALITY VARIABLES

	Redox	pH	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup>	ardness	Ca <sup>2+</sup>	Mg <sup>2+</sup>
Redox	1.0000						
pH	-0.0330	1.0000					
Cl <sup>-</sup>	-0.2117	0.1275	1.0000				
SO <sub>4</sub> <sup>2-</sup>	0.2437	-0.1855	-0.1455	1.0000			
Hardness	0.1808	0.0019	0.3295	0.3472	1.0000		
Ca <sup>2+</sup>	0.0971	0.0378	0.1491	0.2416	0.6025	1.0000	
Mg <sup>2+</sup>	0.1685	0.0545	0.3514	0.3146	0.7623	0.1496	1.0000

TABLE-3  
 $r^2$  VALUES OF WATER QUALITY VARIABLES WITH ORP

Water quality variables	$r^2$ value
Redox	1.0000
pH	0.0011
Cl <sup>-</sup>	0.0473
SO <sub>4</sub> <sup>2-</sup>	0.0594
Hardness	0.0327
Ca <sup>2+</sup>	0.0094
Mg <sup>2+</sup>	0.0284

TABLE-4  
REGRESSION EQUATIONS FOR DIFFERENT  
WATER QUALITY PARAMETERS

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$$\text{pH} = -0.0007 (\text{ORP}) + 5.4069$$

$$\text{Cl}^- = -1.6868 (\text{ORP}) + 657.09$$

$$\text{SO}_4^{2-} = 0.3976 (\text{ORP}) - 31.943$$

$$\text{Hardness} = 2.4437 (\text{ORP}) + 282.14$$

$$\text{Ca}^{2+} = 0.3776 (\text{ORP}) + 110.09$$

$$\text{Mg}^{2+} = 0.3991 (\text{ORP}) + 0.1322$$

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### Conclusion

Linear regression equations developed for the constituents having correlation coefficient with ORP can be successfully used for predicting the concentration of these constituents in Aurangabad city. Similar approach can be applied for different parts of the country.

### REFERENCES

1. S. Kumar, N. Garg and K. Gopal, *Indian J. Envir. Prot.*, **14**, 595 (1994).
2. K.S. Rao and B.S. Rao, *Indian J. Envir. Prot.*, **14**, 528 (1994).
3. J.S.R. Krishna, K. Rambabu and C. Rambabu, *Indian J. Envir. Prot.*, **15**, 914 (1995).
4. Wald, *A Statistical Decision Function*, Wiley-Interscience, New York (1950).
5. Alpha: *Standard Methods for the Examination of Water and Wastewater*, New York (1985).
6. A.K. De, *Environmental Chemistry*, New-Age International Ltd.

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