



**WATER CHEMISTRY  
INTERPRETATION TECHNIQUES  
(WATCHIT Version-1)  
Software & its Application Manual**

By  
Prof. A. Balasubramanian  
&  
Prof. D. Nagaraju



Open File Report- 01, 2019  
**Centre for Advanced Studies**  
**Department of Studies in Earth Science**  
&  
**University-Industry Interaction**  
**Centre(UIIC), University of Mysore**  
**Mysore-570006, Karnataka, INDIA**

**Hydrogeochemistry**

Today, a comprehensive computer software is needed for quickly processing the data of water chemistry, with a wide range of parameters to be selected for different purposes. This software is an advanced version thoroughly revised from the popular HYCH software developed by the authors and used widely during the last two decades, by several researchers. This software WATCHIT (WATER CHEMISTRY Interpretation Techniques) - is a batch-processing version which requires an input data file containing a minimum of three records of water quality data, unlike the HYCH program which could process even one sample data. The program creates an instruction file while executing it without any input data. The total number of parameters computed by WATCHIT are more than 100. The software generates several hundred pages of output including graphs, tables and other computed details for every water sample data which is given as input with reference to the major ion chemistry. It is a potential research tool for scientists, engineers and decision makers at all levels. **WATCHIT is an open source software with its copyright rests with the authors(Balasubramanian and Nagaraju, 2019).**

**Water Quality Parameters computed by WATCHIT Version-1 are as follows:**

Ion Balance and Permissible error, EC Calculated, TDS Calculated, Total Soluble Cations & Anions  
Computation of all Ions as  $\text{CaCO}_3$ , Ionic Strength of every ion, Activity Coefficients of ions, Saturation Index of  $\text{CaCl}_2$ , Saturation Index of -Aragonite, Saturation Index of -Calcite, Saturation Index of  $\text{Ca}_2(\text{NO}_3)_2$ , Saturation Index of -Dolomite, Saturation Index of -Huntite, Saturation Index of -Anhydrite, Saturation Index of  $\text{KCl}$ , Saturation Index of  $\text{KNO}_3$ , Saturation Index of  $\text{K}_2\text{CO}_3$ , Saturation Index of  $\text{KHCO}_3$ , Saturation Index of -Magnesite, Saturation Index of  $\text{MgNO}_3$ , Saturation Index of  $\text{MgCl}_2$ , Saturation Index of  $\text{MgHCO}_3$ , Saturation Index of  $\text{MgSO}_4$ , Saturation Index of  $\text{NaCl}$ , Saturation Index of  $\text{NaHCO}_3$ , Saturation Index of  $\text{NaNO}_3$ , Saturation Index of  $\text{Na}_2\text{CO}_3$ , Temperature & Solubility of  $\text{CaCO}_3$ , Temperature & Solubility of -Aragonite, Temperature & Solubility of Calcite, Temperature & Solubility of  $\text{Ca}_2(\text{NO}_3)_2$ , Temperature & Solubility of -Dolomite, Temperature & Solubility of Huntite, Temperature & Solubility of Anhydrite, Temperature & Solubility of  $\text{KCl}$ , Temperature & Solubility of  $\text{KNO}_3$ , Temperature & Solubility of  $\text{K}_2\text{CO}_3$ , Temperature & Solubility of  $\text{KHCO}_3$ , Temperature & Solubility of Magnesite, Temperature & Solubility of  $\text{Mg}(\text{NO}_3)_2$ , Temperature & Solubility of  $\text{MgCl}_2$ , Temp. & Solubility of  $\text{MgHCO}_3$ , Temperature & Solubility of  $\text{MgSO}_4$ , Temp. & Solubility of  $\text{NaCl}$ , Temperature & Solubility of  $\text{NaHCO}_3$ , Temperature & Solubility of  $\text{NaNO}_3$ , Temperature & Solubility of  $\text{Na}_2\text{CO}_3$ , Corrosivity Ratio, Base Exchange Index, Residual Sodium Carbonate, Total Hardness & Carbonate Hardness, Non-carbonate Hardness, Permeability Index, Pollution Index, Chloroalkaline Index-1 & 2, Sodium Adsorption Ratio, Mechanisms of Water Chemistry, Handa's: Hardness /Salinity, Schoeller's Water Type ( $r=\text{epm}$ ), Piper's Hydrochemical Facies, Stuyfzand's Classification of Facies, Significant Environment of Water, USSL: Salinity / Sodium hazard, Alkalinity of water, Calcium Hardness, Magnesium Hardness, Permanent Hardness,  $\text{CaCO}_3$  Sat.Index by Methods - A to G, Solubility of  $\text{CO}_2$ , Acid Neutralising Capacity, Sodium Adsorption Ratio(SAR), Salinity Rating of Water using EC, Salinity, Impact of Chloride, Impact of Residual Sodium

Carbonate, Kelly's Ratio, Magnesium Adsorption Ratio, Potential Salinity, Exchangeable Sodium Percentage, Sodicity hazard and its Impact, Soluble Sodium, Percentage, Aggressiveness Index, Ryznar Stability Index & its impact, Puckorius Index & its Significance, Larson Skold Index, Oxidation Capacity of Water, Von Wirdum Ion Ratio, Lime dose requirement, Soda Ash dose requirement, Salt Index, Sodium Dominance Index, Non-Marine concentrations of ion-Ca, Non-Marine concentrations of ion-Mg, Non-Marine concentrations of ion-Na, Non-Marine concentrations of ion-SO<sub>4</sub>, Adjusted Sodium Adsorption Ratio, Dissolved Inorganic Carbon(DIC), Non-Sea Salt (NSS of Ions In Water), Seawater Intrusion Detection, if any.

<p>----- Input data as a model : (Notepad file)</p> <p>BASIN NAME  NUMBER OF SEASONS  SEASON NAME-1, NO. OF SAMPLES  Location Name, Ca, Mg, Na, K, HCO<sub>3</sub>, CO<sub>3</sub>, Cl, NO<sub>3</sub>, SO<sub>4</sub>, Ba, PO<sub>4</sub>, F, Fe, SiO<sub>2</sub>, TDS, Ec, pH, T  Model shown below:  -----  TAMBRAPARNI RIVER BASIN  1  SEASON-1, 53  Ponnani,78,10,100,8,130,0,116,124,67,0,0,0,0,0,560,893,7.09,21  Chittur,67,42,75,7,424,0,83,29,87,0,0,0,0,0,602,917,8.17,23  Pudupalli,56,22,210,14,265,0,402,24,46,0,0,0,0,0,937,1549,6.76,22  ----continue upto 53 full set in total</p>	<p>EXAMPLE(AS A MODEL)-2  KARNATAKA STATE-INDIA  5  DISTRICT-1,154  DISTRICT-2,146  DISTRICT-3,128  DISTRICT-4,112  DISTRICT-5,131  Ponnani,78,10,100,8,130,0,116,124,67,0,0,0,0,0,560,893,7.09,21  Chittur,67,42,75,7,424,0,83,29,87,0,0,0,0,0,602,917,8.17,23  Pudupalli,56,22,210,14,265,0,402,24,46,0,0,0,0,0,937,1549,6.76,22  --FIRST 154 FOR DISTRICT-1 AND SECOND 146 FOR DISTRICT-2, LIKE THAT  -----</p>
---	--

**Software User ID and Passcode:**

*This software has 1) a software code as Under ID*

*and 2) a passcode related to it. If both codes tally, then only the processing will proceed.*

*Note: When WATCHIT is executed without WCHEM.DAT input file, it will just print the INS File (Instruction File) for the benefit of user to prepare the INPUT DATA file.*

WATCHIT creates 9 kinds of output files with different names. The Files names have 2 parts: A three letter code followed by time & date of processing (HHMMDDMMYY). Everytime when WATCHIT is executed, new files will be created. Old files also exist, for future reference.

**The total output file statistics are as follows:**

- Number of parameters determined for every sample will be more than 100.
- Number of pages of results for(RES) for every sample would be 9 pages. Number of pages of rough work(RWK) for every sample would be 30 + pages. Number of graphs-Scatter Plots (GRA) will be 224 x no of seasons.
- Number of master tables(MAT) of results would be 20 each season. Number of pages of statistical tables(tab) for every group will be > 60+. List of tables are given in a separate output file TTL
- List of graphs are given in a separate output file starting with "PER...."  
(one of 224 Scatter Plots )

<pre> S Plot = 1      =SEASON-1 AREA : BHARATHAPUZHA RIVER BASIN 2 SEASONS   Date of Processing :23-02-2019 S Plot= EC in mmhos/cm in X -Axis and Ca      in ppm in Y -Axis Intercept, Slope, Corr. Coeft. Are  16.6051273  0.0447632  0.6656208  Ca in ppm 1000.0000 100.0000 10.0000 1.0000 0.1000 1.000000  10.000000  100.00000  1000.0000  10000.0000 EC in mmhos/cm (Index to number of Overlapping samples  o=1  †=2  *=3 and ‡=4) </pre>	<p>Copies can be had from the authors from the Department of Studies in Earth Science, University of Mysore, Mysore-6 OR  Director, University-Industry Interaction Centre, University of Mysore, Mysore-6</p> <p>For WATCHIT Details &amp; Trial Version, Log on to: <a href="http://www.uni-mysore.ac.in/watchit/">http://www.uni-mysore.ac.in/watchit/</a>  <b>WATER CHEMISTRY INTERPRETATION (WATCHIT) TECHNIQUES SOFTWARE DEVELOPED BY</b>  * A.BALASUBRAMANIAN &amp; D. NAGARAJU  * DEPARTMENT OF STUDIES IN EARTH SCIENCE  * UNIVERSITY OF MYSORE, INDIA  <b>Click the Given link to download WATCHIT SOFTWARE</b></p>
--	---