Water Quality Analysis Using Remote Sensing

Avish A C[1], Sanya C S[2]
[1]FMPE
[2]PFE
[1, 2] KCAET

Abstract- *Water is valuable natural resources that essential to human survive and the eco system health. The domestic's sewage, factories effluents, and agricultural waste can lead to deterioration of water quality. Because of that the water quality monitoring program are needed in order to raise awareness of public by address the consequence of present and future threats of contamination to water resources. Remote sensing technique is an economical way to monitor water quality, because it can monitor large areas in a short time on a repetitive basis.*

Keywords- Remote sensing, water quality

I. INTRODUCTION

With advances in space science and the increasing use of computer applications and increased computing powers over recent decades, remote sensing techniques have become useful tools to achieve this goal. Remote sensing techniques make it possible to monitor and identify large scale regions and water bodies that suffer from qualitative problems in a more effective and efficient manner. The collection of remotely sensed data occurs in digital form and therefore is easily readable in computer processing. Remote sensing techniques have been in use since the 1970's and continue to be widely used in water quality assessment in the contemporary world .

Different sensors mounted on satellites and other platforms, such as airplanes, measure theamount of radiation at various wavelengths reflected from the water's surface. These reflections can be used directly or indirectly to detect different water quality indicators, such as total suspended solids (TSS), chlorophyll-a concentration, turbidity, salinity, total phosphorus (TP), Secchi disk depth(SDD), Temperature, pH, Dissolved Organic Carbon (DOC),etc. The spectral characteristics of water and pollutants, which are functions of the hydrological, biological and chemical characteristics of water, etc are essential factors in the monitoring and assessment of water quality. The study thus introduces the widely employed space borne and airborne sensors in water quality investigations and discusses the utility of remotely sensed techniques in the qualitative assessment of water bodies.

Various properties (spectral, spatial and temporal, etc.) of space borne and airborne sensors are tabulated to be used as a sensor selection guide. Finally, based on the literature survey, the study presents a compilation of the various sensors useful in the study of some measurable water quality parameters, and investigates in more detail eleven water quality parameters based on the employed approaches to measuring their concentrations.

II. METHODS FOR DETERMINING WATER QUALITY

A rosette sampler is a device used for water sampling in deep water (such as the Great Lakes or oceans) in order to investigate about its quality.

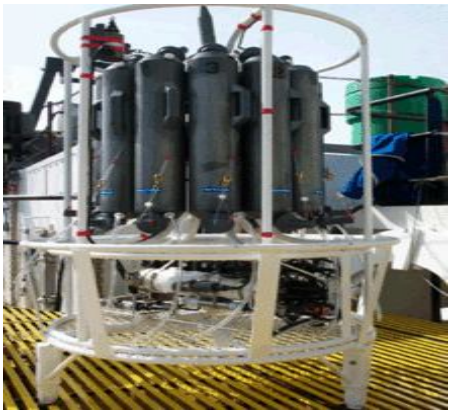

Fig.1.rosette sampler

Water samples are usually obtained by filling a container held beneath the surface of the water – commonly referred to as a dip or Grab sample. Composite samples are usually obtained by mixing equal volumes of discrete grab samples (collected at one point at regular time intervals. A composite sample provides an estimate of average water quality conditions.

Fig .2.2grab sample

The methods defined in the relevant standards can be broadly classified as:

Conventional wet chemistry including Winkler method method for dissolved oxygen , precipitation , filtration for solids, acidification, neutralisation titration etc. Colourimetric methods such as MBAS assay which indicates anionic surfactants in water and on site comparator methods to determine Chlorine and Chloramines. Nephelometers are used to measure solids concentrations as turbidity. These methods are generally robust and well tried and inexpensive, giving a reasonable degree of accuracy at modest sensitivity.

Electro chemistry including pH, Conductivity and dissolved oxygen using oxygen electrode. These methods yield accurate and precise results using electronic equipment capable of feeding results directly into a laboratory data management system.

Spectrophotometry particularly for metallic elements in solution producing results with very high sensitivity but which may require some sample preparation prior to analysis and may also need specialised sampling methods to avoid sample deterioration in transit.

Chromatography is used for many organic species which are volatile or which can yield a characteristic volatile component of after initial chemical processing.

Ion chromatography is a sensitive and stable technique that can measure Li, NH4 and many other low molecular weight ions using ion exchange technology.

Gas chromatography can be used to determine methane, carbon dioxide, Cyanide oxygen and nitrogen and many other volatile components at reasonable sensitivities.

Mass spectrometry is used where very high sensitivity is required and is sometimes used as a back-end process after Gas liquid chromatography for detecting trace organic chemicals.

Depending on the components, different methods are applied to determine the quantities or ratios of the components. While some methods can be performed with standard laboratory equipment, others require advanced devices, such as inductively coupled plasma mass spectrometry (ICP-MS

III. WATER QUALITY ASSESSMENT AND REMOTE SENSING

In-situ data collections are only able to represent point estimations of the quality of water conditions in time and space, and obtaining spatial and temporal variations of quality indices inlarge water bodies is almost impossible. Briefly listed below are the most important limitation associated with conventional methods:

- In-situ sampling and measurements of water quality parameters are labor intensive, time
  Consuming, and costly.
- Investigation of the spatial and temporal variations and water quality trends in large water bodies is almost impossible.
- Monitoring, forecasting, and management of entire water bodies might be inaccessible, for example due to the topographic situation.
- Accuracy and precision of collected in-situ data can be questionable due to both field-sampling error and laboratory error.

To overcome these limitations, the use of remote sensing in water quality assessment can be a useful tool. For more than four decades, remote sensing has illustrated strong capabilities to monitor and evaluate the quality of inland waters. Many researchers frequently use the visible and near infrared bands of the solar spectrum (mostly from blue to near infrared region) in their investigations to obtain robust correlations between water column reflection (in some cases emission) and physical and biogeochemical constituents, such as transparency, chlorophyll concentration (phytoplankton), and the organic matters and mineral suspended sediments in different water bodies .Although the capabilities of remote sensing to assess water quality are undeniable, this technique alone is not sufficiently precise and must be used in conjunction with traditional sampling methods and field surveying. In other words, to obtain a better insight, an integrated use of remote sensing, in-situ measurements and

computer water quality modelling may lead to an increased knowledge of the water quality of water systems. Collaboration between different governmental, federal and private agencies and data sharing is also helpful to increase the data required for regional studies.

IV. INVESTIGATIONS THROUGH REMOTE SENSING

Water quality study is the process of determining the chemical, physical and biological characteristics of water bodies and identifying the possible contamination sources that degrade the quality of water. Degradation of the quality of water resources may result from waste discharges, pesticides, heavy metals, nutrients, microorganisms, and sediments. Different water quality standards have been developed to aid in checking the extent of water pollution, and consequently to maintain these quality standards.

Water Remote Sensing studies the color of water through the observation of the spectrum of water leaving radiation. From the study of this spectrum, the concentration of optically active components of the upper layer of the water body can be concluded via specific algorithms. Water quality monitoring by remote sensing and close-range instruments has obtained considerable attention since the founding of EU Water Framework Directive.

V. CONCLUSION

Water provides variety purpose such as a source of water supply and it is essential for domestic and industrial use, irrigated agriculture, livestock and mining activities. However by increasing of the industrial development and anthropogenic activities the quality of water has decreased dramatically. Therefore, The monitoring programs using remote sensing needed to threats all contamination occurs and provides the effectives action at all levels. Remote sensing is effective, cheaper and it is a valuable tools in monitoring water quality parameters .Each water quality parameter such as suspended matter ,phytoplankton concentration, turbidity ,and dissolved organic matter has their own estimation reflectance within the range of 400-850µm .In the future ,the solution to water quality issues can be solved rapidly using these technologies for sustainable water resources management .The integrated use of remotely sensed data will enable consultants and natural recourses managers to develop management plans for a variety of natural recourse management applications .

REFERENCES

[1] Mahesh Ramkrishna Huchhe1, Dr. N. N Bandela , “Study Of Water Quality Parameter Assessment Using Gis And Remote Sensing In Dr. B.A.M University, Aurangabad, Ms “2016 , Volume 5.

[2] Nadia BabikerIbrahim.Shaka “Integration Of Remote Sensing And Gis In Ground Water Quality Assessment And Management” ,2015 .

[3] NorsalizaUsali&MohdHasmadiIsmail , “Use Of Remote Sensing And Gis In Monitoring Water Quality”,2010 Volume 3.

[4] Somvanshi , Kunwar , Singh.N, Shukla.S, Pathak.V , “Integrated Remote Sensing And Gis Approach For Water Quality Analysis Of Gomti River, Uttar Pradesh”, 2012 ,Volume 3 .

[5] S. S.Asadi , PadmajaVuppal A And M. Anji Reddy , “Remote Sensing And Gis Techniques For Evaluation Of Groundwater Quality In Municipal Corporation Of Hyderabad (Zone-V India” , 2007.