A Real-time Monitoring System for Oceanographic Parameters Based on GPRS Technique

Shuang-Shuang Fan, Can-Jun Yang, Ren Hu
The State Key Laboratory of Fluid Power Transmission and Control, Zhejiang University
Hangzhou, Zhejiang, China

ABSTRACT
This paper presents a real-time monitoring system which is comprised of field data logging subsystem, wireless communication subsystem and on-station control center. The real-time monitoring system is applied for field data acquisition of marine environmental parameters, so as to provide key data for research both on the prediction and the cause of marine hazard. The wireless data transmission technique based on GPRS (General Packet Radio Service) facilitates the application of the system, since it eliminates the complexities of arranging wire and wire maintenance. The results of system trial in-situ proved that the real-time monitoring system is feasible and it can perform efficient monitoring of the marine environment.

KEY WORDS: Marine environment; real time; monitoring system; GPRS technique; socket; trial in-situ.

INTRODUCTION
The increasing economic activities along coastal areas bring about the environment problems. The pollution of seawater and marine hazard become more and more serious, e.g., harmful algal blooms, which have posed a threat to marine life and human life and caused enormous economic losses (Lee et al., 2005). Thus, monitoring of the marine environment is essential.

This paper presents a feasibility study on a real-time monitoring system based on GPRS (General Packet Radio Service) technique, which is applied to monitor the marine environment. The real-time monitoring system is developed to continuously measure the changes of oceanographic parameters in situ, such as pH, temperature, salinity and dissolved oxygen of seawater, in order to track the variation of marine environment. This can provide key data for research both on the prediction and the cause of marine hazard. The measurement data will be transmitted back to the server of on-station control center wirelessly in real time without the need of an operator. The wireless data transmission technique based upon GPRS facilitates the application of the monitoring system since it eliminates the complexities of arranging wires and maintenance. It is particularly applicable to the occasion that cabling is unfeasible.

GPRS is a new bearer service for wireless data transmission developed upon GSM (Global System for Mobile Communication), which improves and simplifies wireless access to packet data networks, e.g., to the internet. It is based on packet-switched wireless transmission that the data could be packeted and transmitted through GPRS network and packet data networks in an efficient way. At the air interface, a physical channel will only be allocated when needed and will be released immediately after the transmission of the packets. With this principle, multiple users can share one physical channel to have a much better utilization of the traffic channels, as Bettstetter et al. (1999) discussed. Besides, due to its features of short logon time, high transfer rate without delay, keeping on-line, easy to access to packet data networks and billing by the flow of transmitted data, GPRS technique has a wide application in wireless data transmission.

THE DESIGN OF THE REAL-TIME MONITORING SYSTEM
The real-time monitoring system for oceanographic parameters can be functionally divided into three subsystems: field data logging subsystem, wireless communication subsystem and on-station control center. Fig.1 shows the schematic diagram of the system. The field data logging subsystem is capable of continuously measuring in-situ and recording the parameters of seawater, in order to track the variation of marine environmental parameters. With the help of wireless communication subsystem, the data can be transmitted back to control center wirelessly. The on-station control center equipped with the necessary monitoring software is responsible for the processing of acquired data including the data receiving, display and storage as well as the remote configuration of communication terminals.

Field Data Logging Subsystem
The field data logging subsystem consists of sensors and an electronic pressure case in which the data logging board, communication terminal and battery are sealed. According to the different needs, more than eight kinds of sensors can be connected to our data logging board, this is superior to the commercial CTD probe which can only measure three...