Natural resources and the environment

Remote sensing takes to the oceans

Remote sensing technology is, literally, being taken to new depths as a newly-established multi-institutional marine remote sensing unit aims to determine how one would optimally use this technology in an unstable and untested marine environment. The group is based in Cape Town.

Collaborating on this research are the CSIR, the University of Cape Town, Marine and Coastal Management and the South African Earth Observation Network (SAEON).

Stewart Bernard of CSIR Natural Resources and the Environment says, "The marine environment is tremendously important - especially given the fact that the earth consists of 70% water. Apart from its recreational uses and its value as a food source, the oceans also have an impact on the climate. Scientists still know very little about the workings of the oceans, necessitating dedicated studies and measurement for better understanding. However, part of the challenge is that the marine environment is very difficult to measure. The cost of logistics is very high - up to R100 000 per day to take a ship out to sea."

The ocean is also a very dynamic system and to get a good understanding of some processes, one would have to take measurements at daily or even higher frequencies, he explains, making it logistically impossible.

Using remote sensing will allow researchers to build systematic observations to try and understand how the oceans work and how these may change in relation to climate change or a red tide. "The satellite provides you with a unique perspective," he says.

The unit aims to be a central facility that provides for the operational and research remote sensing requirements for the marine community. A key deliverable currently being finalised is a website, which will provide a variety of accessible near-real time and archived remotely-sensed data for sub-Saharan Africa. Data from other African countries currently available include Angola, Cote d' Ivoire, Guinea, Mauritania, Mozambique, Namibia, Nigeria, Senegal, Somalia and Tanzania.

Ideally, one would not use remote sensing in isolation. "We would use it in combination with other information from inside the sea as well as with models that would, for example, tell you what the circulation of the ocean is. That becomes very powerful - just as you have a weather forecast, you could have an ocean forecast," he continues.

He says a good example is the Southern Ocean - one of the largest marine carbon sinks in the world. If one is concerned about how much carbon is going up into the atmosphere, this would be the place to start using the 10 or 20 years' worth of

available data sets. Bernard explains, "Then we could, for example, look at how the wind blew during that time, how that affected the temperature of the water, and how phytoplankton responded to that. Looking at data over a specific period gives one an indication of trends - and could possibly also be used as a predictive system." Having all this information, gleaned through remote sensing, water buoys, boat measurements and other means, linked to a central web-based system will allow for easy access and interpretation by stakeholders.

One of the many opportunities contributing to comprehensive ocean measurement, Bernard says, is ChloroGIN, the Chlorophyll Global Integrated Network. A Global Earth Observation (GEO) pilot project, ChloroGIN aims to provide near-real time ocean colour products in coastal regions across the globe. "South Africa is already a major role player and can play a lead role in the development of core dissemination systems," he says.

This integrated approach is also in line with the Global Earth Observation System of Systems (GEOSS), which South Africa is keen to implement. Using multiple observation systems, the GEOSS project aims to "help all nations involved produce and manage their information in a way that benefits the environment as well as humanity by taking a pulse of the planet". The purpose of GEOSS is "to achieve comprehensive, coordinated and sustained observations of the Earth system, in order to improve monitoring of the state of the Earth, increase understanding of Earth processes, and enhance prediction of the behaviour of the Earth system."

Bernard concludes, "The marine remote sensing unit should serve as a portal and a southern African hub for all marine remote sensing information, products and services by providing for both research and operational marine remote sensing needs, using a standardised open spatial infrastructure data archiving and metadata system."