Satellite Applications

Case Study

Proteus

Environmental & marine mapping
using satellite imagery & data

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Satellite Applications

PROTEUS

Proteus is pioneering the field of bathymetry and benthic mapping.

The Company

Company Name	Proteus
Managing Director	David Critchley
No. of employees	5 (plus partners)
Launched	2011
Location	Abu Dhabi (UAE) & Bristol (UK)
Sector	Environmental and Marine Mapping

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Overview

A new, British led company is transforming environmental mapping across the globe through the use of satellite derived imagery and data, to create products for marine, agriculture and forestry use.

- As pioneers in the field of bathymetry and benthic mapping, Proteus has world-leading expertise in the mapping of shallow coastal waters.

- Proteus is one of the first companies to offer bathymetry and benthic mapping solutions using DigitalGlobe's World-View 2 satellite imagery. The 8-band multispectral images enable Proteus to survey and map marine environments at a fraction of the cost and time of traditional methods.

- Based in the United Arab Emirates, with offices in the UK, since the company's launch in 2011, Proteus has been contracted to deliver over 25 significant environmental mapping projects in Europe, the Middle East, Africa, North America and the Caribbean.

Bathymetry – study of underwater depth of lake or ocean floors. Benthic – a collection of organisms living at the bottom of the sea or lake.

Redefining Environmental Mapping

Traditionally, hydrographic mapping methods have comprised either sonar equipment on-board boats and LIDAR (laser measurement instruments) fitted to airplanes. Both measure depth ie. sea floor topography by calculating the amount of time it takes for the sound or light to travel through the water, and bounce off the sea bed and return to the instrument. Underwater photography, aerial imagery and sampling are then used to complete the benthic mapping.

"There are many disadvantages to these methods," explains Proteus Founder and CEO, David Critchley. "A fleet of boats and an aircraft along with equipment and skilled operators is a costly venture, LIDAR is impeded by poor weather conditions, and shallow water surveying can be dangerous. Consequently, data sets are infrequent and therefore quickly out-of-date."

After over 30 years in the geospatial and hydrographic industry, David Critchley set up Proteus in 2011, with a vision to transform environmental mapping through the use of satellite derived data.

A partnership with DigitalGlobe has given Proteus access to WorldView-2 satellite imagery. WorldView-2 launched in October 2009 and is the first high-resolution, 8-band multispectral commercial satellite, capable of collecting up to one million km^2 imagery per day with an average revisit of every 1.1 days. In short, WorldView-2 has the capacity for more rapid and reliable collection of accurate Earth observation data enabling precise map creation, and the ability to detect change in land use or environmental change.
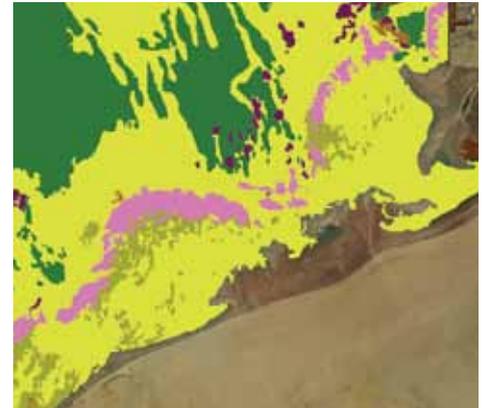
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Proteus is one of the first organisations to offer bathymetry (up to 40m depths) and benthic (up to 30m depths) mapping solutions from WorldView-2 imagery. Proteus' agreement allows the team to specify important marine parameters for example, wave height, turbidity, sea state and sun glint and the cost of imagery is fixed. By fixing the price, Proteus and DigitalGlobe eliminate the risk for customers of having to re-task the satellite for imagery which matches the project requirements.

"Satellite Derived Bathymetry (SDB) offers considerable advantages," says Critchley. "The sea bed and its environment can now be mapped from space for a fraction of the cost

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Shoreline after mapping processes

of traditional methods. The process is fast and efficient and most coastlines have already been captured by the WorldView-2 instruments. New data can be captured within four weeks from order and in most cases products are delivered in less than one month from order."

Quality assurance and control is important to turn a remote sensing dataset into a valuable customer solution. Using hydrographers trained in the field of bathymetric datasets, all customer products are verified before delivery and are compatible with Geographic Information Systems (GIS) and hydrographic applications.

Proteus is one of the first organisations to offer bathymetry and benthic mapping solutions from WorldView-2 imagery.

The sea bed and its environment can now be mapped from space for a fraction of the cost of traditional methods.

Case Study:

Landuse Mapping from Satellite Imagery

In 2013, Proteus was awarded the Ecological Classification and Landuse Mapping from Satellite Imagery project, by the Environment Agency Abu Dhabi (EAD). The goal was to map marine and terrestrial environments to a scale of 1:10,000, together within one project to provide a seamless data set that would give a precise level of detail of the coastal zone.

Commenting on the scale of the project, Anil Kumar, Director of the EAD Environment Information Management Division said. "This project is unique in its magnitude and the depth of the habitat classification. This will become a fundamental data layer for all future planning and decision making related to sustainable development for years to come."

The project methodology was designed around close collaboration between local experts in the field and satellite processing teams to ensure accuracy and continuity.

"By making our data compatible and accessible across departments, we could fulfil our key commercial principle 'capture the data once, use it many times," said Critchley. It also meant that established reference manuals for marine and terrestrial habitats, traditionally based on data collected in the field or aerial photography could now be refined to suite satellite applications.

"The Abu Dhabi project was a turning point for the business. The techniques we used were proven to be robust and repeatable, both for future epochs of mapping Abu Dhabi, and also for application in other countries."

In addition to marine environments, using Near Infra red, Red Edge and Yellow Edge bands, multispectral imagery can be used to map vegetation types and health including trees species and crop varieties and agricultural yield potential. Proteus can also deliver land coverage maps using WorldView-2 imagery, these can feed into action plans to support environment agencies in the monitoring and protection of national resources from parks and wilderness areas and classify land use across coastal water areas for urban planning.

Catapult Support

Proteus has worked with the Satellite Applications Catapult as part of their investment readiness programme, which helps lean start-ups and SMEs build their concept into a fully-vetted and investor-ready business model. This activities include working quickly to develop a scalable and investable business model, market and user testing, and rapid prototyping using the expertise and knowledge of the Catapult team.

"The business readiness process challenged our business idea and provided solutions and direction for our business model," says Proteus CEO, David Critchley. "Having a diverse team of financial experts, design engineers and SME coordinators in one building is a very powerful resource. At the end of the process, we walked out of the Catapult with an improved business model, supporting business model financials and the knowledge our business plan was viable and investable."

> "The Catapult helped us develop a business plan that was viable and investible."

> Proteus mapped 200sq km along the Red Sea coastline in 10 days, accurately extracting sea-floor elevation measurements.

Case Study:

10 Days to Map the Red Sea

The Red Sea is a rich and diverse ecosystem and known for its many offshore coral reefs and atolls. The challenges of preserving this fragile ecosystem are many, including increasing amounts of desalinated water from a growing coastal population and the expansion of oil and power infrastructure.

Sogreah, a French engineering and consulting firm, was tasked with the construction of a new power plant along the Red Sea's coastline near Jeddah, Saudi Arabia.

"The timetable for completing our Environmental Modelling Studies was extremely tight," commented Jorge Trindade, Sogreah's General Manager for the Middle East. "We couldn't wait for a bathymetric survey conducted through traditional means."

Mapping the Red Sea

Sogreah contracted Proteus to undertake the mapping project. Using Satellite-Derived Bathymetry, Proteus was able to complete the 200-square-kilometre mapping along the Red Sea coastline in just 10 days, accurately extracting sea-floor elevation measurements to depths of 20 metres with four-metre point density and at distances up to five kilometres off the Saudi Arabian coast.

"If the project had been undertaken by a boat, it would have taken six to eight months due to government permitting requirements and shallow-water navigation obstacles," commented Proteus CEO, David Critchley. "Satellite-derived bathymetric surveys are completed at a fraction of the time and cost, and within geographic locations where ecological constraints, submerged reefs or political processes can constrain the traditional hydrographic mapping methods."

"Proteus exceeded all expectation on this project with their fast turn-around and high quality deliverables," said Trindade.

Future Developments

In Autumn 2014, DigitalGlobe will launch "WorldView-3", a satellite mission with the ability to deliver high resolution multispectral imagery," says Critchley. "This is military level accuracy, the ability to access high resolution source data accurate to between 1.2 and 1.3 metres. This will be the 'Rolls-Royce' of environmental imaging, and we will be able to derive even more information from the pixels about the world's sea beds."

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