Satellite Marine Applications Making Waves

Last week I was invited to talk at an evening event organised by the Society for Underwater Technology (SUT), which took place at the Met Office. It was titled 'Satellite data for marine applications' and there was a collection of local speakers who provided an interesting range of different perspectives on the topic.

The first speaker was Donna Lyndsay, European Space Agency (ESA) UK Business Applications Regional Ambassador (South West England and South Wales) who outlined ESA's funding opportunities and the range of activities that had already been undertaken; examples of these can be found here on the ESA website.

Next was Austin Capsey, Satellite Remote Sensing Technical Lead at UK Hydrographic Office. Austin is someone whom we know from Twitter and it was interesting to hear how the usage of satellite imagery has gone beyond just digitising features. The positioning accuracy of the very high-resolution optical imagery is now sufficient for referencing without additional Ground Control Points, has enabled applications ranging from capturing port construction and coastlines; to correcting older charts where the positioning of small islands, for example, may include errors; as well as disaster relief applications and satellite bathymetry. In addition to the optical missions, Sentinel-1 SAR (radar) imagery is being used alongside machine learning for the detection of hazards to shipping, which in itself is being used to improve the speed of workflows.

Martin Jones, Head of Operations at ARGANS Ltd, discussed the range of projects their company has been involved with, from the ESA SMOS ocean salinity mission to DIMITRI tool for optical satellite data inter-comparison activities. The company has a strong focus on marine applications, with plastics and satellite bathymetry being two areas of focus. Martin was followed by Chris Burnett, General Manager at TCarta, who discussed satellite bathymetry in further detail. TCarta's focus is on providing data suitable for reconnaissance, with quality assurance, through bringing together different approaches for deriving bathymetry – for example, optical plus stereo approach, which involves finding distinct features within the images and positioning them within two or more datasets, and wave kinematics where sun glint is used to help detect ocean surface wave patterns that are influenced by the bathymetry. This provides greater confidence in the derived products when independent validation is not possible.

It was my turn to talk next. I focused on the story behind our flood mapping product. We started work on this as part of a UK Space Agency Space (UKSA) funded Space for Smarter Government project looking at cost-effective flood mapping in urban areas using Sentinel-1 SAR data. After that project, we continued to develop the flood mapping product but also transitioned the approach into a water extent product that identifies all areas of water in an image and those areas of saturated ground.

This water extent product is currently being run across Africa as part of the UKSA funded IPP project - the DFMS project is funded by the UK Space Agency and led by the RHEA Group, in cooperation with the Government of Uganda. In addition, we're running the same approach across the UK and can see changes in the coastline linked to tidal state, e.g. expose of mud flats in Morecambe Bay at different tidal heights, and features such as vessels and offshore wind platforms in the water. The slides from my presentation can be found here.

The final speaker was Jonah Robert-Jones, from the Met Office, who discussed the advancements in modelling and ocean forecasting. Modelling is transitioning from coupled ocean-atmosphere and ocean-land models to whole Earth system models with all the components interlinked. In addition, the horizontal resolution is being reduced so that smaller scale oceanographic features can be captured, for example, there are currently oceanographic models at 1/4 degree globally (around 25 – 30 km resolution), with 1/12 degree (approximately 9 km resolution) for the North Atlantic, and 7 to 1.5 km for the UK Shelf seas, with the higher spatial resolution models only including physics. In the future, the global models will reduce to 1/12 of a degree, and they will need to reduce even further to capture the fine-scale features seen in shelf sea models and satellite imagery.

Thanks to Caroline Acton and Edward Steele from the Met Office for organising, it was a really interesting evening!

Thanks to Edward for the pictures too!