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Developments in remote sensing technology enable more detailed urban flood risk analysis.

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Spaceborne remote sensors have been allowing us to build up a profile of planet earth for many years. With each new satellite launched we see the capabilities improve: new bands of data, higher resolution imagery, the ability to derive better elevation information. The combination of this geospatial data to create land cover and usage maps, all help inform catastrophe modelling systems.

From Landsat 30m resolution to 2.44m QuickBird multispectral imagery; from 1m radar data collected by TerraSAR-X which enables rapid tracking of the rise and fall of a flood event, and will shortly have a twin satellite launched enabling elevation data creation; we are spoilt for choice in available data. However, just what is cost effective? It is always a question of choosing the appropriate level of input data detail for modelling, depending on the value of the risk.

In the summer of 2007, the cost of the flooding in the UK was approximately £3bn and affected over 58,000 homes and businesses. When it comes to flood risk, we have traditionally considered rising river levels and surge tides, but with climate change and variations in our own construction behaviour, there are other factors to be taken into account.

During those summer 2007 events, the Environment Agency suggested that around 70% of the properties damaged were the result of pluvial flooding, where high localised rainfall events overload localised drainage infrastructure, causing widespread flooding of properties and infrastructure.

To create a risk model that is able to simulate such an event requires much more accurate source data than can be provided from satellite or radar. As these flood events cause considerable damage within relatively small, complex urban environments, therefore new high resolution remote sensing techniques have to be applied to better model these events.

Detailed terrain data of England and Wales, plus cities in Scotland, have been produced by combining terrain measurements from the latest digital airborne sensors, both optical and lidar, to produce the input layer for surface water flood modelling. A national flood map product has been created. The new product utilises sophisticated modelling techniques, perfected over many years, which harness graphical processing power. This product will prove particularly valuable for risk assessment decision support within insurance/reinsurance, property/environmental, utilities, risk management and government agencies.

However, it is not just the ground elevation that determines the behaviour of surface water. By combining height information (surface and terrain) with high resolution aerial photography and colour infrared imagery, a high definition land cover mapping dataset (LandBase) is being produced, which provides a precise measure of sealed versus non sealed surface. This will allows even more sophisticated modelling of flood scenarios.

Thus, the value of airborne survey data can be demonstrated by flood risk analysis down to individual addresses in urban areas.

However for some risks, an even more detailed survey may be justified.
In order to achieve this, Infoterra is testing new 360˚ mobile lidar technology. Collecting lidar data from a moving vehicle allows each street to be mapped in very high detail, allowing precise information about the location, size and shape of features such as kerbstones, gullies, road camber and building threshold level to be captured quickly and accurately. These data can then be used to model the problem of overland flood risk at the scale of individual properties. Whilst at present it might be impractical to undertake such detailed modelling for all properties, these techniques can certainly be used to improve the flood risk analysis of key locations.

This paper will demonstrate how these new high resolution remote sensing techniques can be combined to provide a new resolution of detail to aid urban flood modelling.