Using satellite altimetry to measure water height in estuaries, rivers and lakes

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Benefits of using satellite altimetry

- Allows the processing of historical data - up to 40 years of data available.
- Can be monitored without having to visit the site regularly - ideal for remote or difficult to reach locations.
- Financial savings through not having to maintain physical equipment or record *in situ* measurements.
- Data is available direct to your email inbox in a variety of formats.
- Map large areas, rather than single points.
- Provides an alternative, and so reduced reliance on physical infrastructure.

How radar altimeters operate

- Short bursts of microwave energy are transmitted from the satellite towards the Earth's surface > the return strength of the reflected energy is recorded as a time series, with time delay equating to height above the surface.

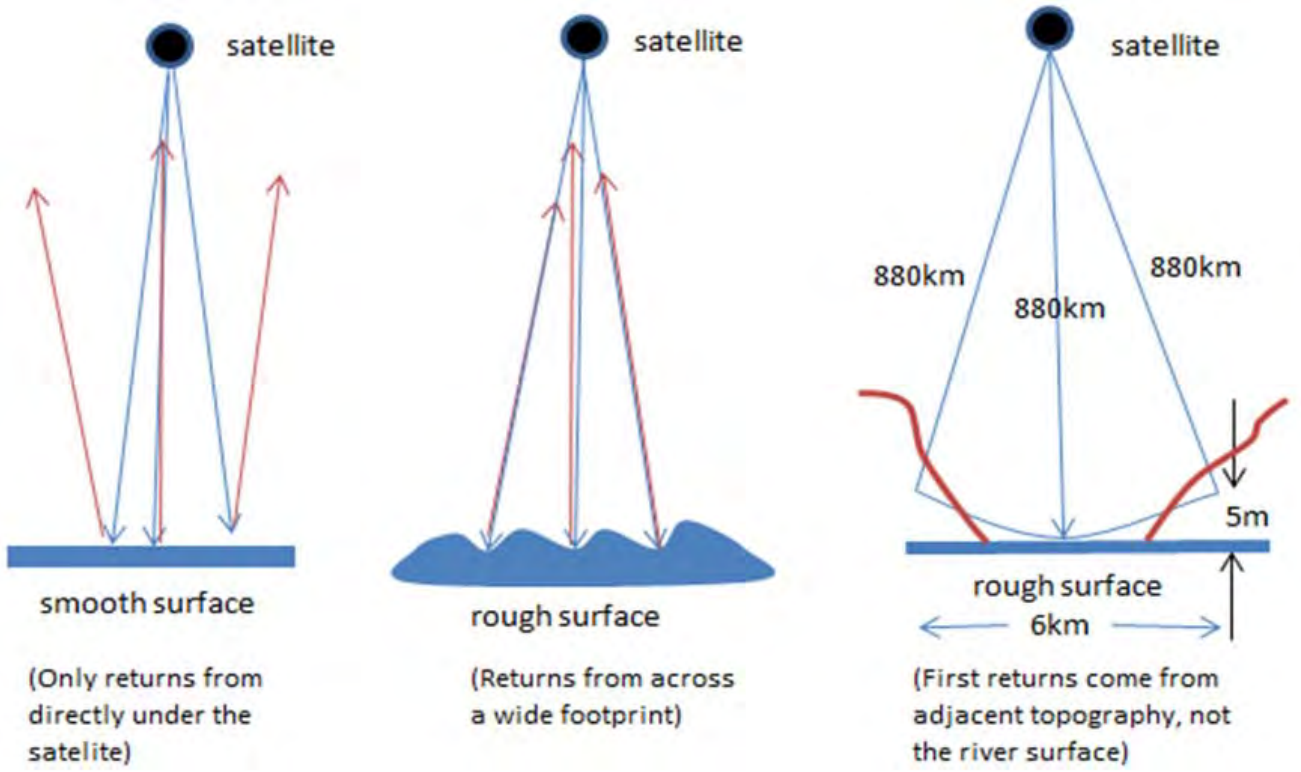
- From an altitude of 880 km an echo takes approximately 5 ms to travel to the Earth's surface and back, therefore a burst of 20 pulses takes about 100 ms.

- For ocean applications the 20 returns are normally statistically amalgamated, generating a mean height every 0.6 km minimum; normally closer to 1 km.

- However, individual points of data can be processed - can be helpful if the surface height changes rapidly.

Calculation of radar altimeter heights

The width of the energy beam associated with each waveform covers a footprint of about 2-5 km diameter by the time the pulse hits the earth's surface.



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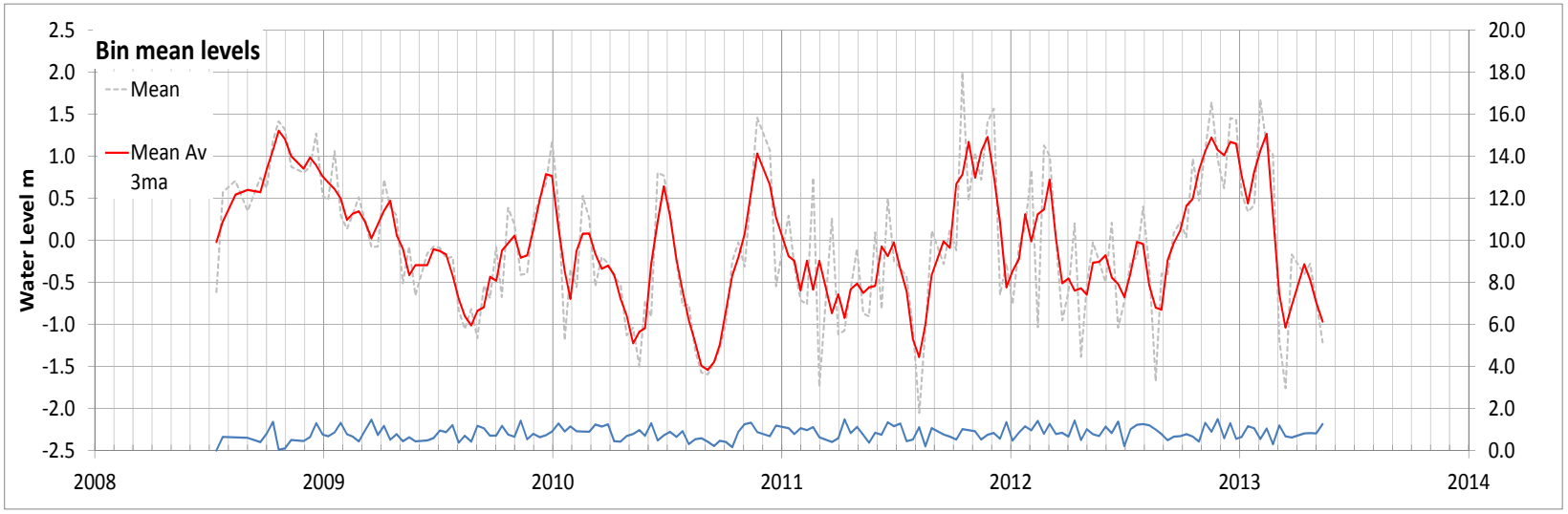
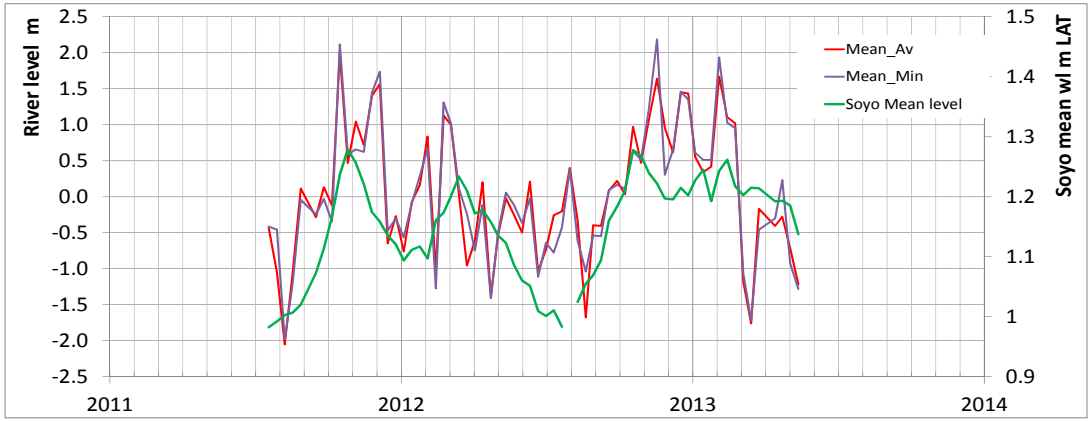
Water height calculation in the Congo using Jason-2





Top: Pixalytics processing

Bottom: Pixalytics plus *in situ* (green)

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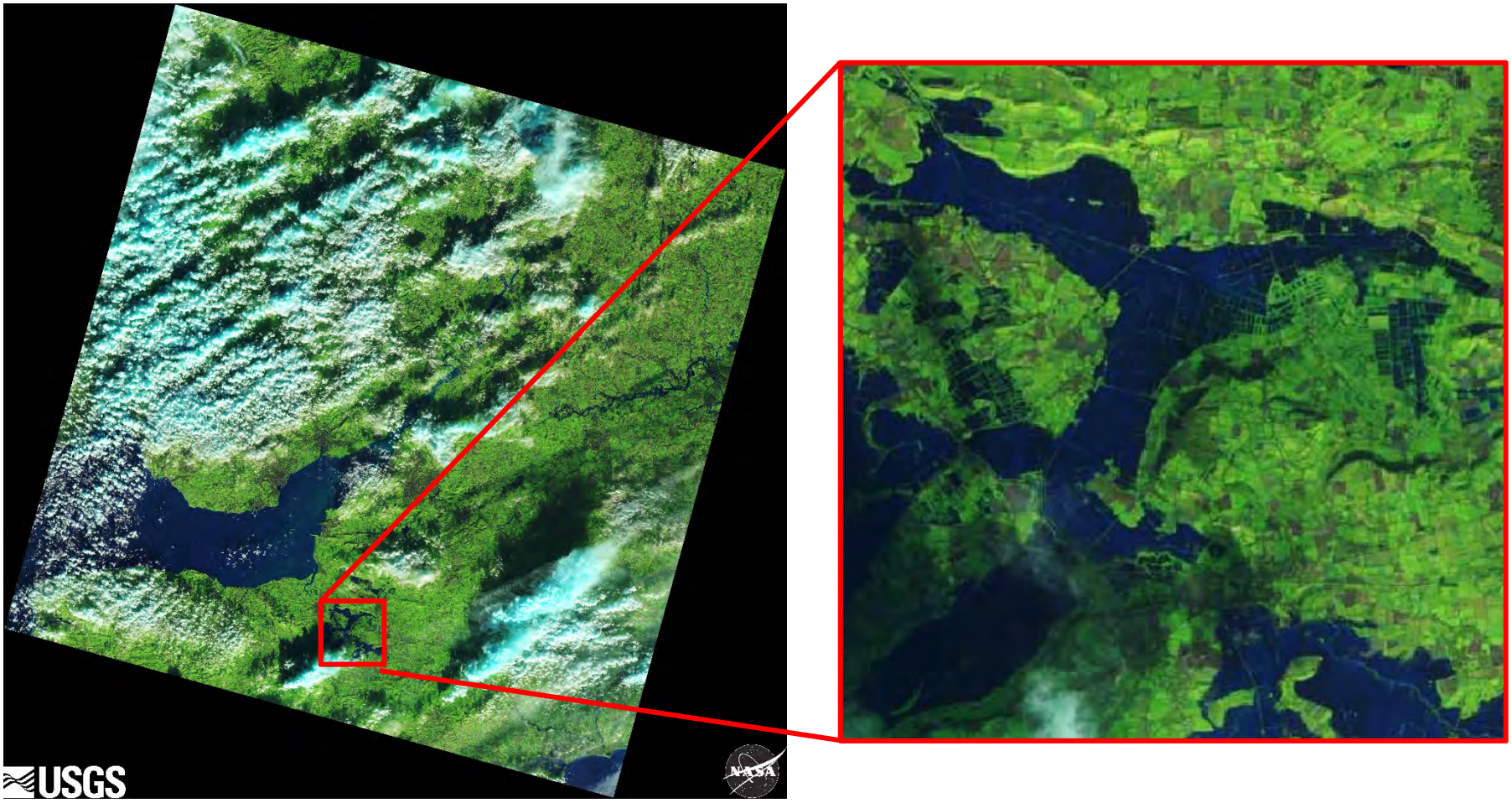
Flooding within Somerset, Landsat 8



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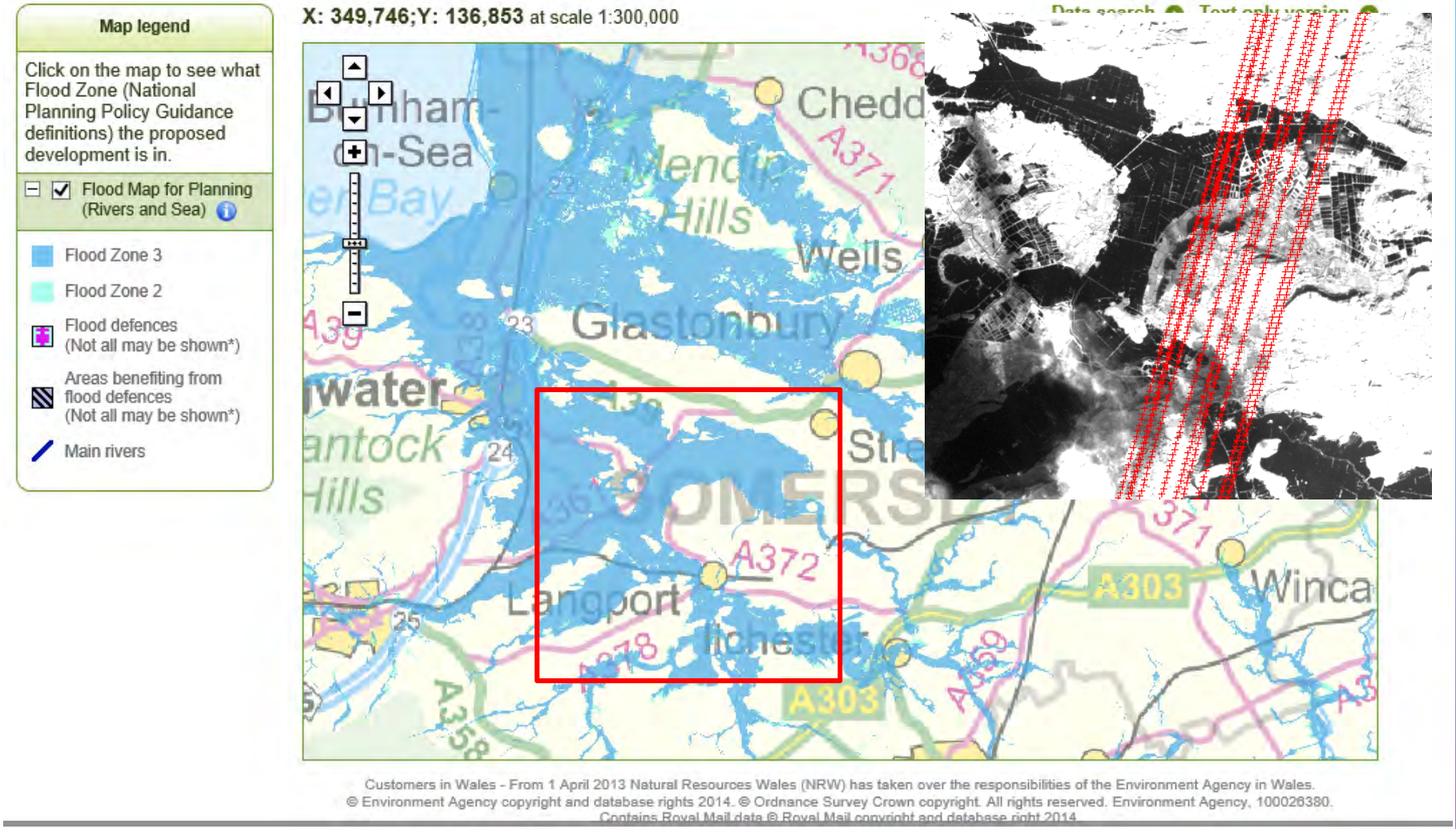
Flooding within Somerset, SARAL/AltiKa track locations



http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0&y=355134.0&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=floodmap#x=349746&y=136853&lg=1,&scale=5

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Flood height mapping using SARAL/AltiKa: plots for different locations

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Conclusions

- Research has shown the potential for altimetry to be a virtual water gauge, giving an alternative to physical infrastructure.
- The altimetry data can provide:
    - Historical water heights.
    - Information for remote locations.
    - Maps areas, rather than points.
- Operates globally within satellite track constraints.
- Offers significant time and money savings, by not needing to install, monitor, visit or maintain physical water gauges.

Thank You

Acknowledgements: Landsat data courtesy of USGS and ESA, with Jason and SARAL/AltiKa data courtesy of AVISO. Original work in the Congo conducted with Rob Nunny, Ambios.