September 2nd, 2014

SonTek

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Transect or run of river?

BRITISH HYDROLOGICAL SOCIETY 2014
NATIONAL SYMPOSIUM BIRMINGHAM

September 2nd, 2014

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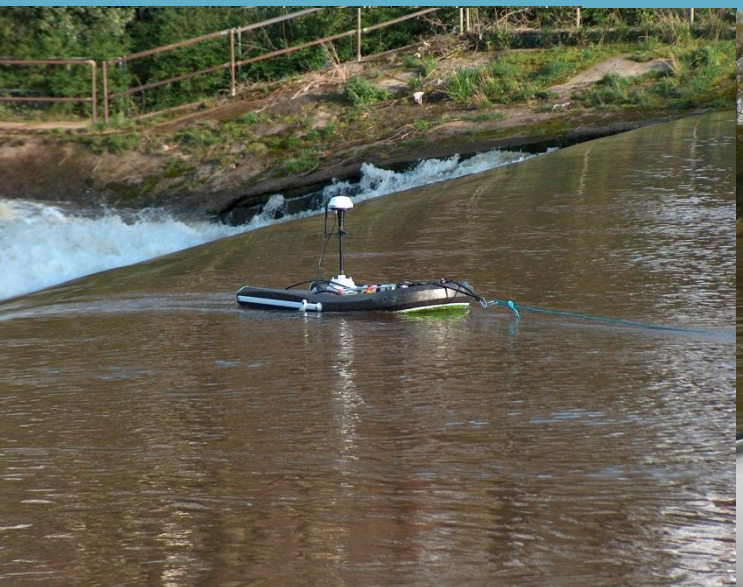
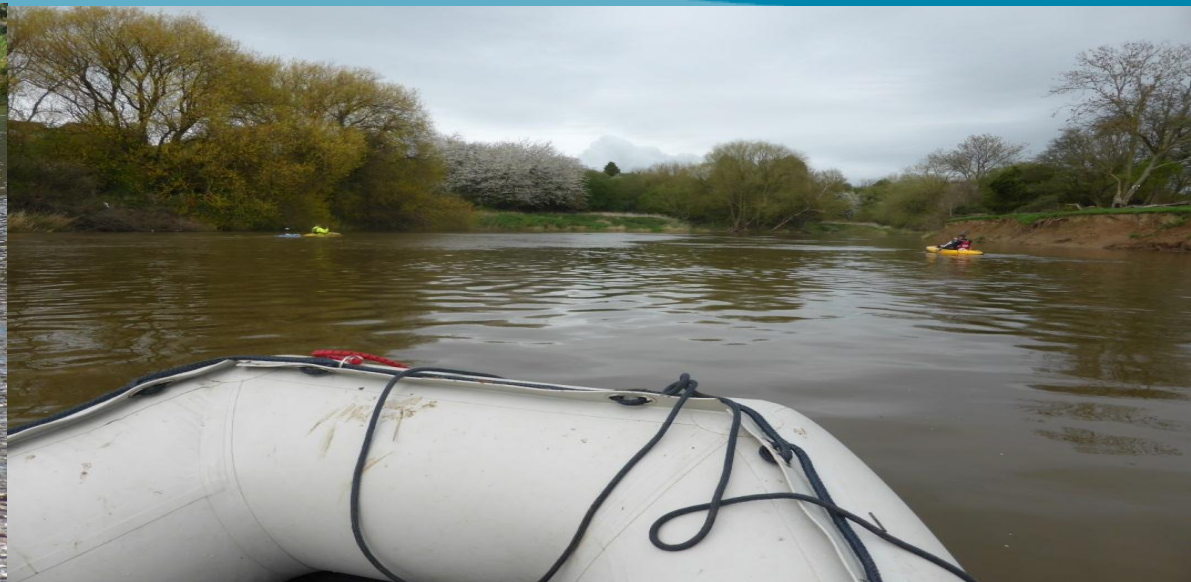
Using the latest data collection methods to understand the basic structure and functioning of river ecosystems to help establish the inter-relationship between hydrology and ecology.

A VIEW OF A 4KM STRETCH OF THE RIVER SEVERN IN SHREWSBURY.





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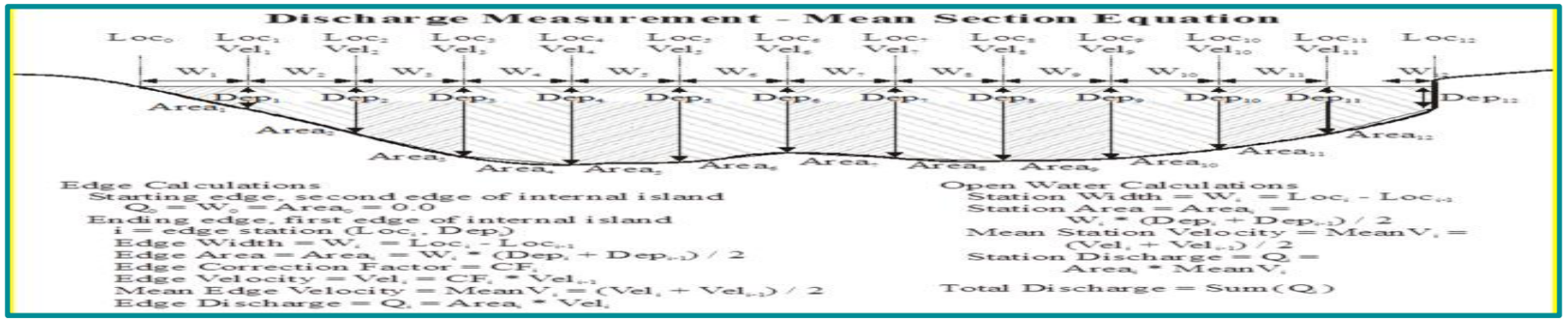
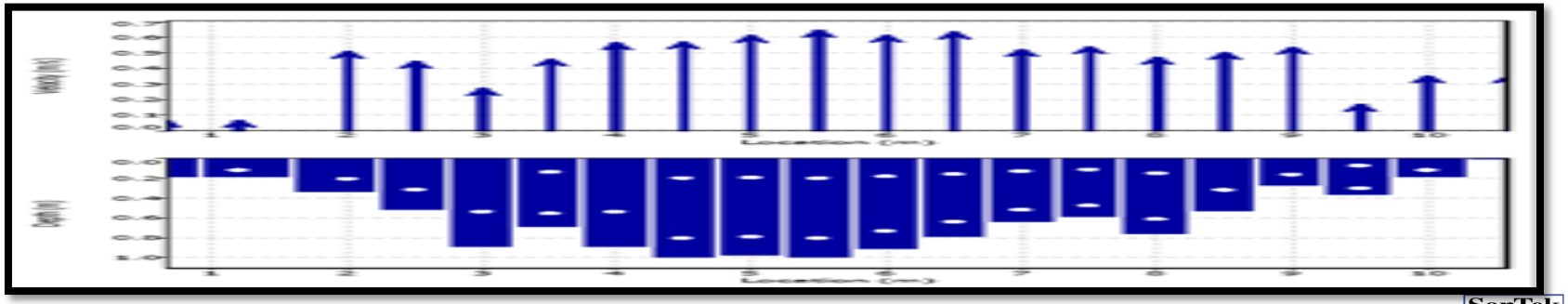
SonTek M9 in conjunction with the WaterCube

Tradition/Convention of gauging

Ease/Practicality
Requirement of discharge passing a point
Tradition





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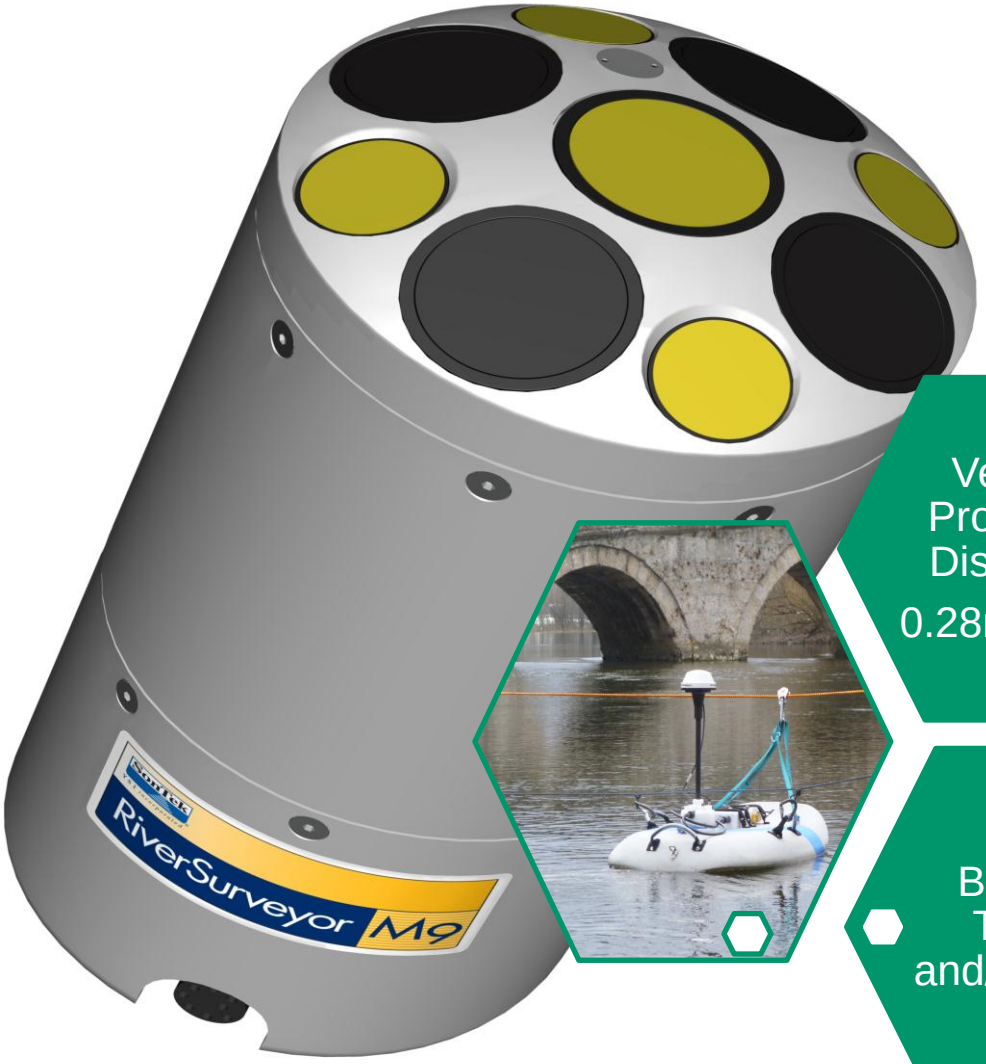
SonTek M9 RiverSurveyor



Velocity Profiling & Discharge

0.28m-40.0m

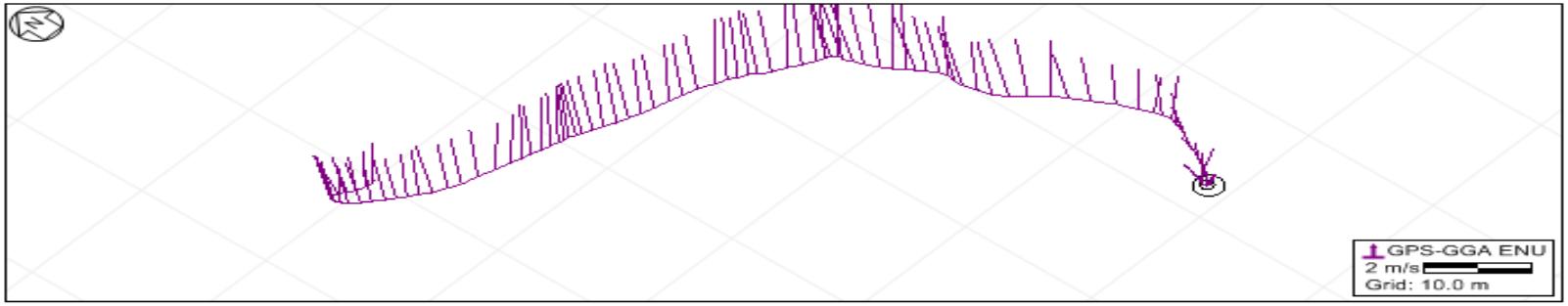
Bathymetry

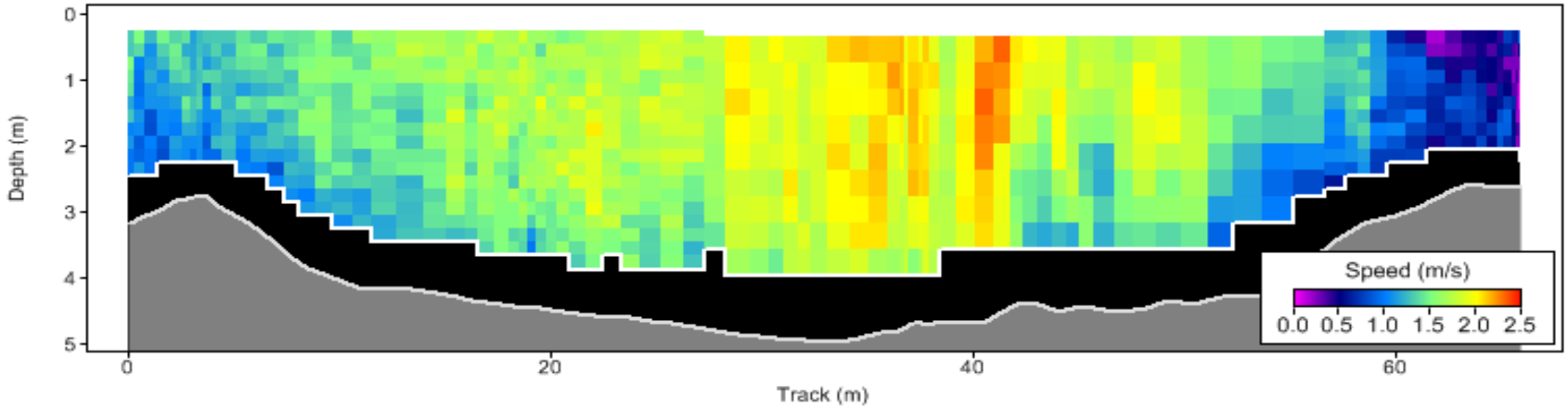
0.15m-40m

Bottom Track and/or GPS

How ADCPs ‘changed’ this

System velocity/discharge calculation
Practicality – ‘the ‘ADCP Smile’





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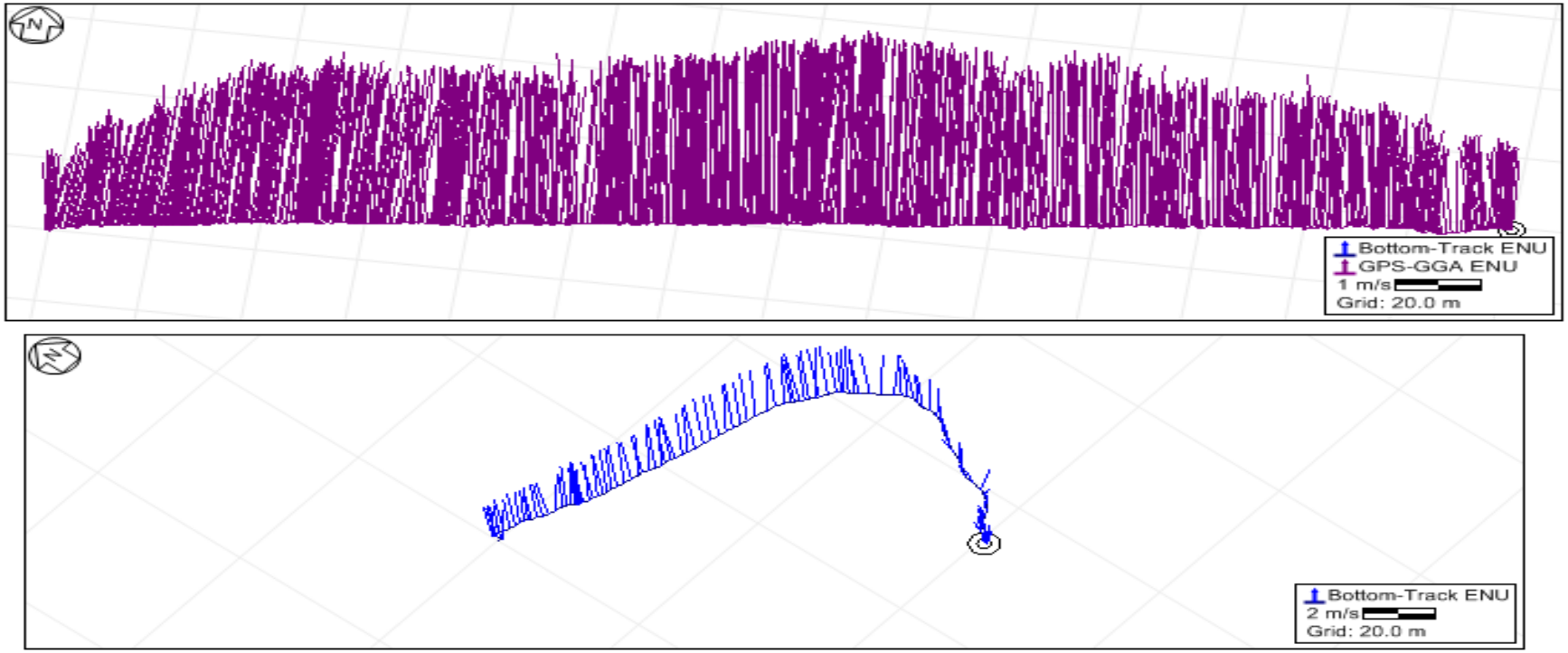
Straight transects are seen as ideal, but not necessary



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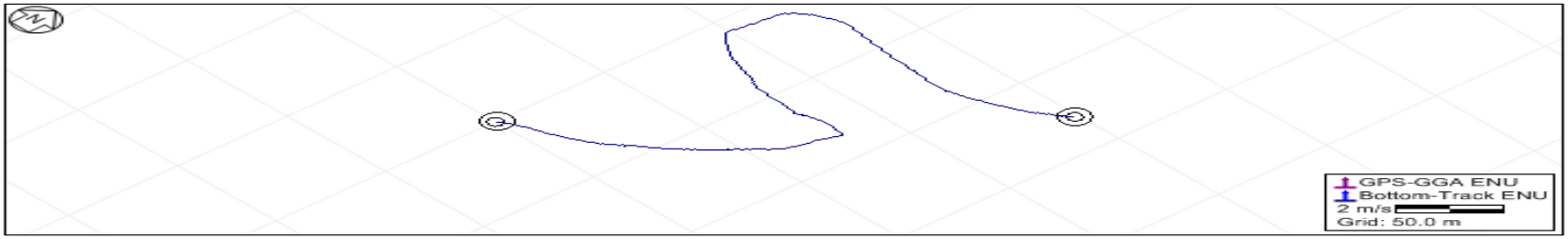
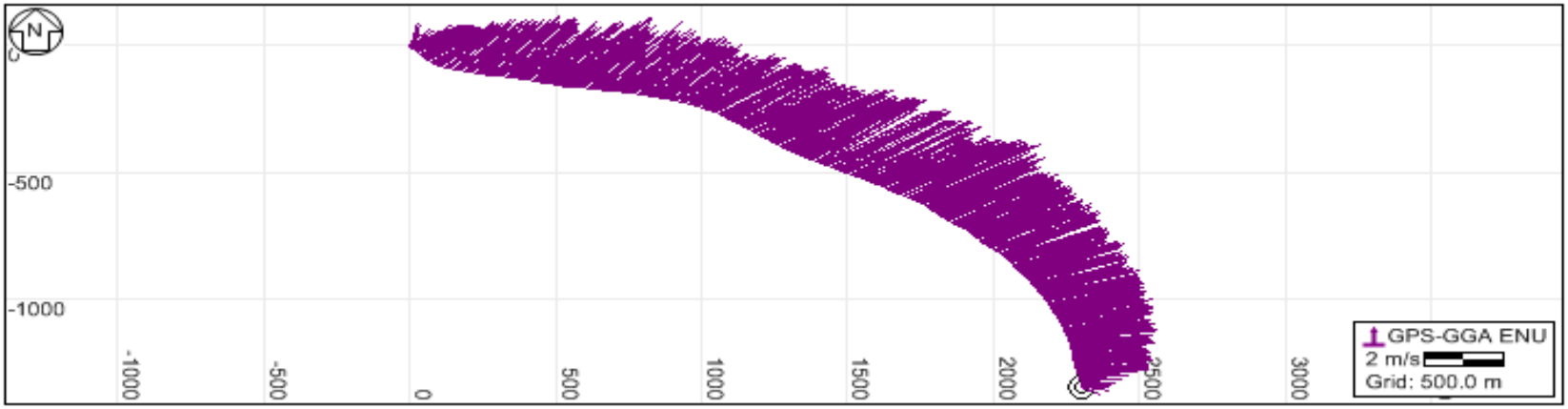
And even poor transects can give good discharge results



And actually diagonal transects commonly give better data and therefore better discharge results



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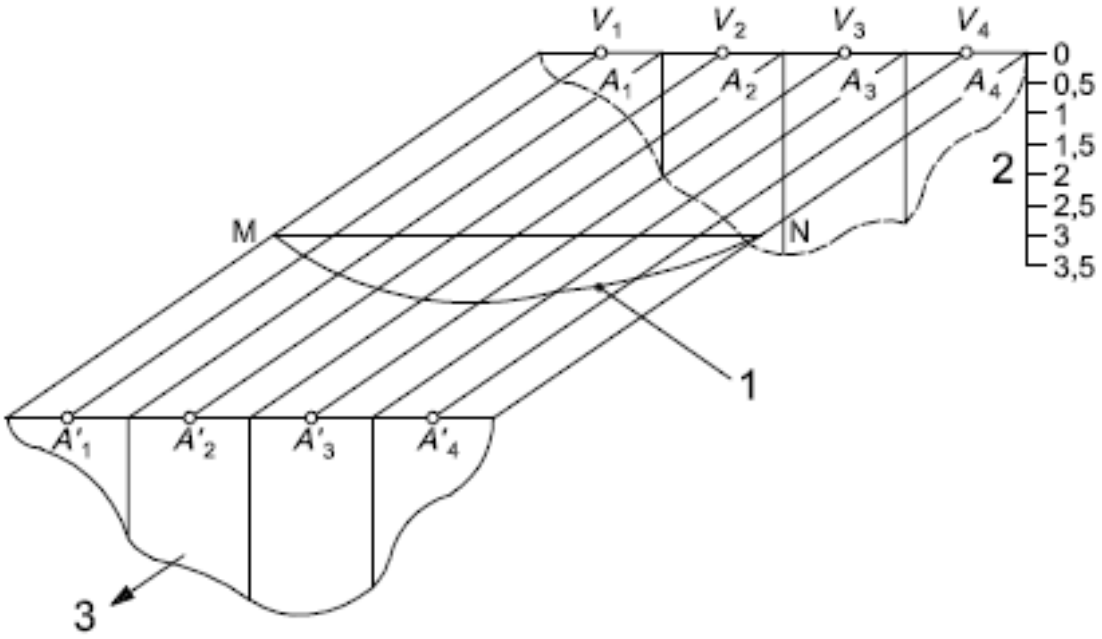
So the perfect transect isn't necessary

Is there any history to support this?

- How about the humble 'float run'



Key

1 surface velocity distribution
2 depth (m)
3 direction of flow

a) **Measurement sections and float paths**

Figure 6 — Computation of discharge from float measurements (*continued*)

Taken from ISO748

The procedure – how so we do this?

One boat/instrument running upstream and downstream

Or Multiple instruments ideally only travelling downstream

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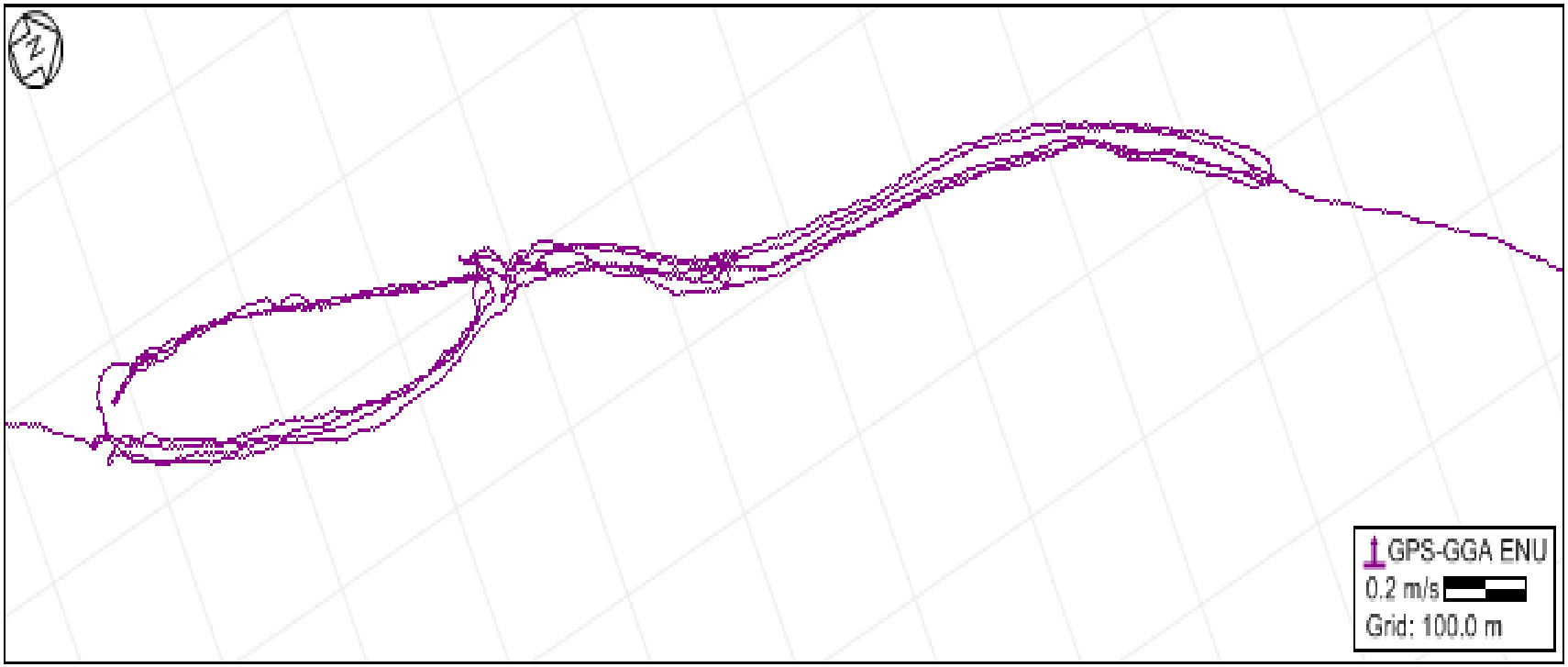
Lets run the river

So we are used to running the river, even if only in ideal conditions

Now rather than transecting the channel for our monitoring we run the river course over 10's of metres or even kilometres



Giving us

A new way of looking at and reporting hydrometric and ecological data

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So what can we get or see?

What is the WaterCube?

Run of River systems like WaterCube help provide a basic understanding of the structure and functioning of river ecosystems and establishes the inter-relationship between hydrology and ecology in the field of river science.

River disciplines include, but are not limited to:

- Aquatic and floodplain ecology
- Flood Management
- Civil and environmental engineering
- Fisheries
- Geographic Information Systems analysis
- Geomorphology
- Hydrology
- Numerical modeling
- River conservation and rehabilitation

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River Severn at Shrewsbury

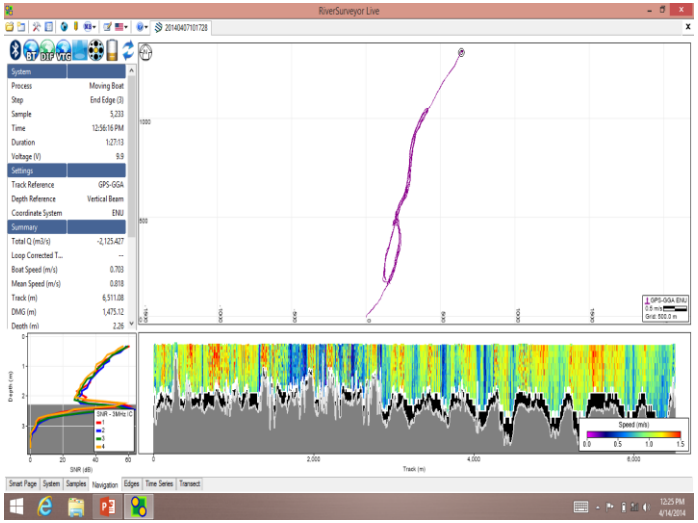
Spring (March) and Summer (July) 2014

Data Collection

2-Field day/s covering 4-Kms of the River Severn
3-SonTek M9s running parallel downstream lines
2-Kayaks (river banks & complex sections)
1-Motorized boat (center sections)

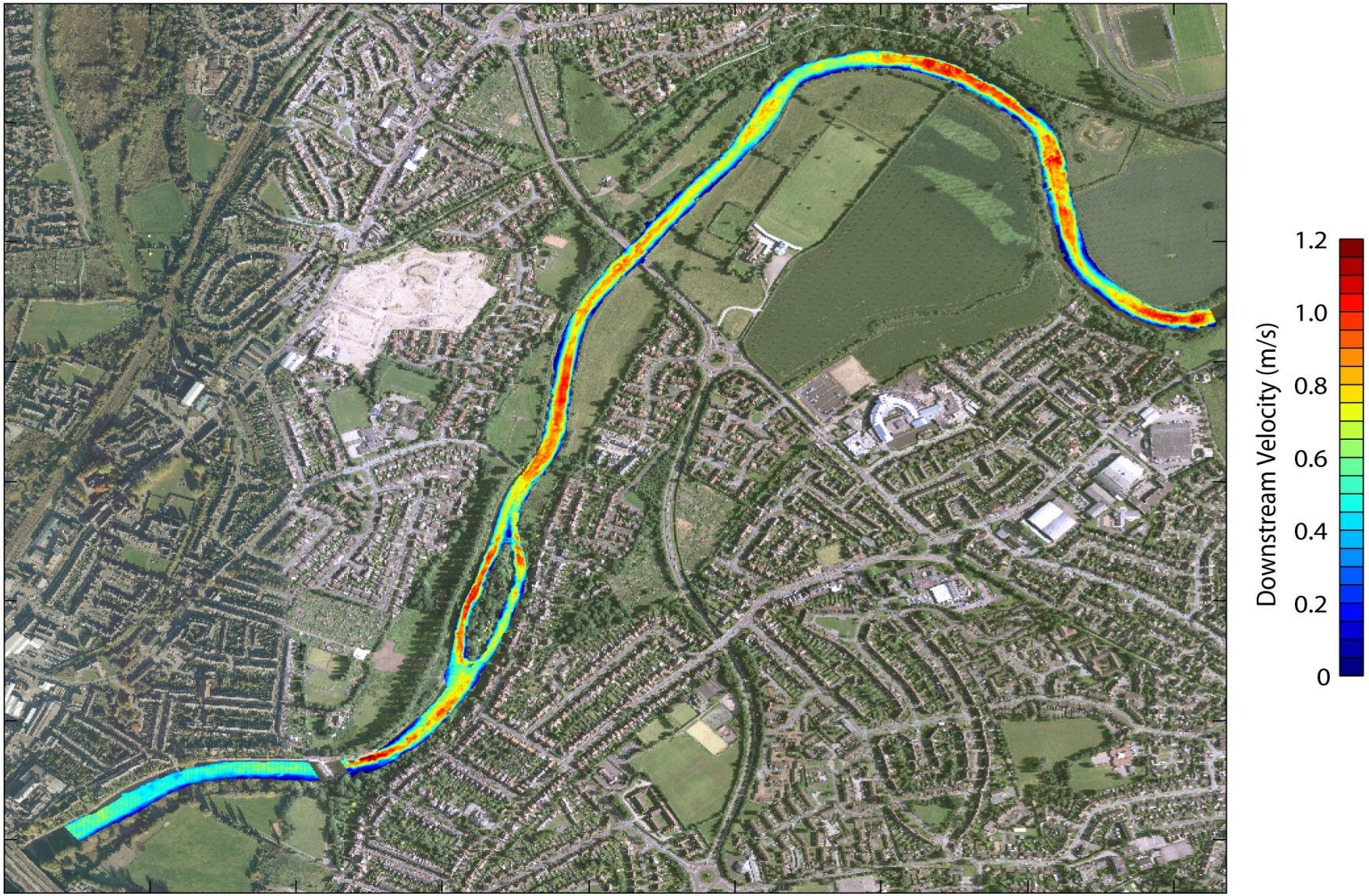
SonTek M9 Assembled Track Lines

Water Cube links multiple “track lines” from multiple measurements and multiple ADCPs for processing.



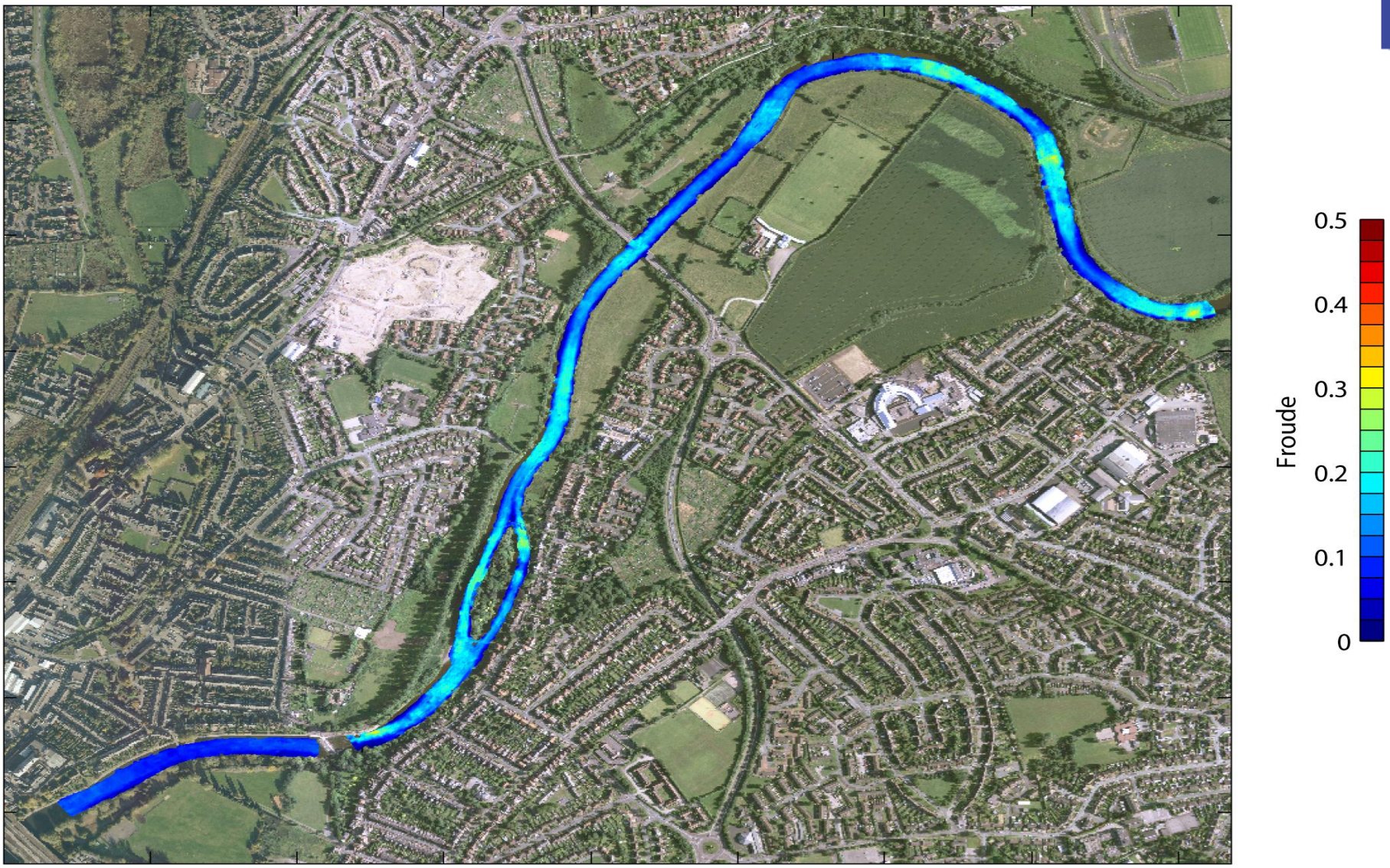
The way the river is measured by WaterCube

Downstream depth averaged velocity plot (single layer/stage).



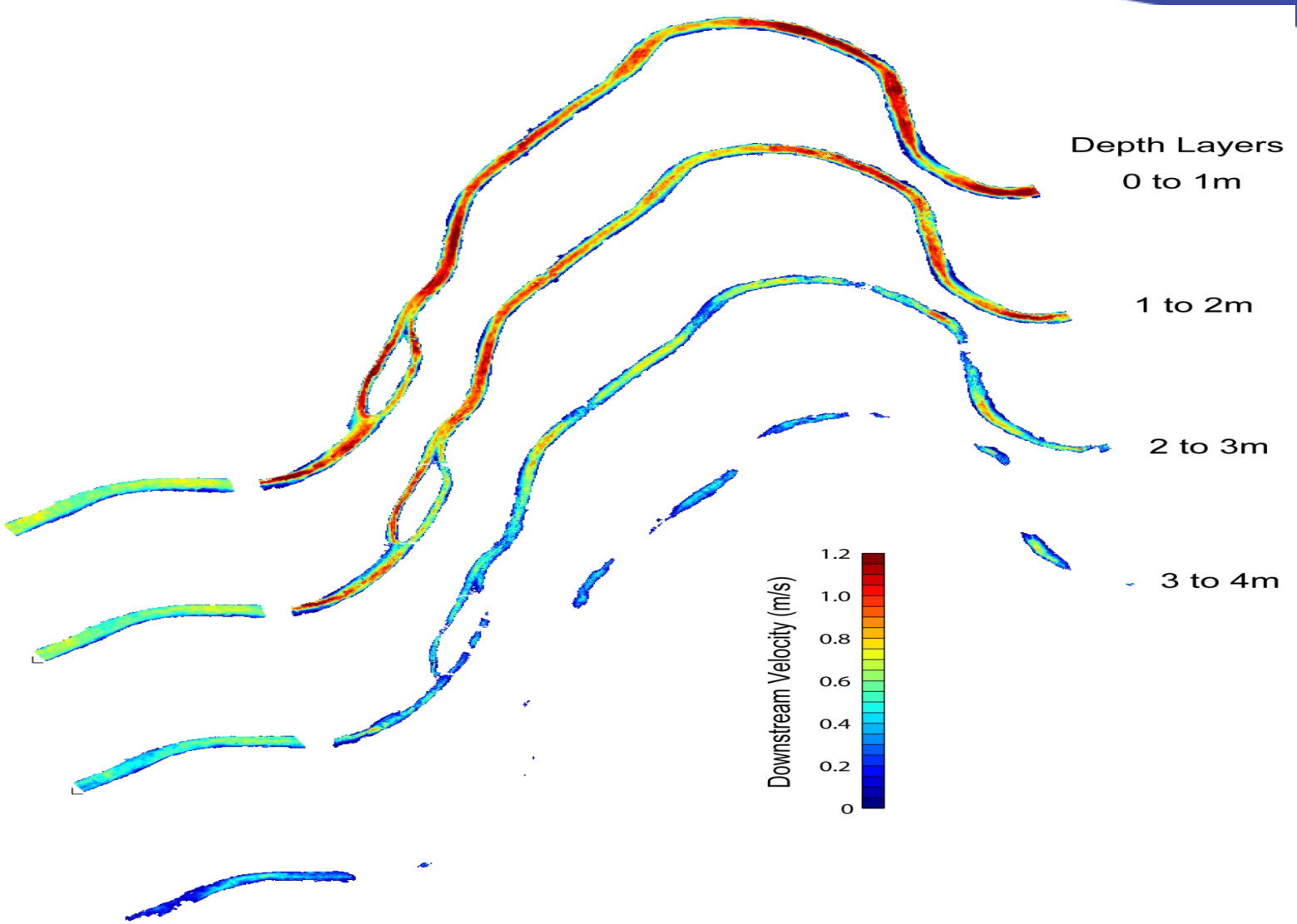
Downstream water depth

Froude

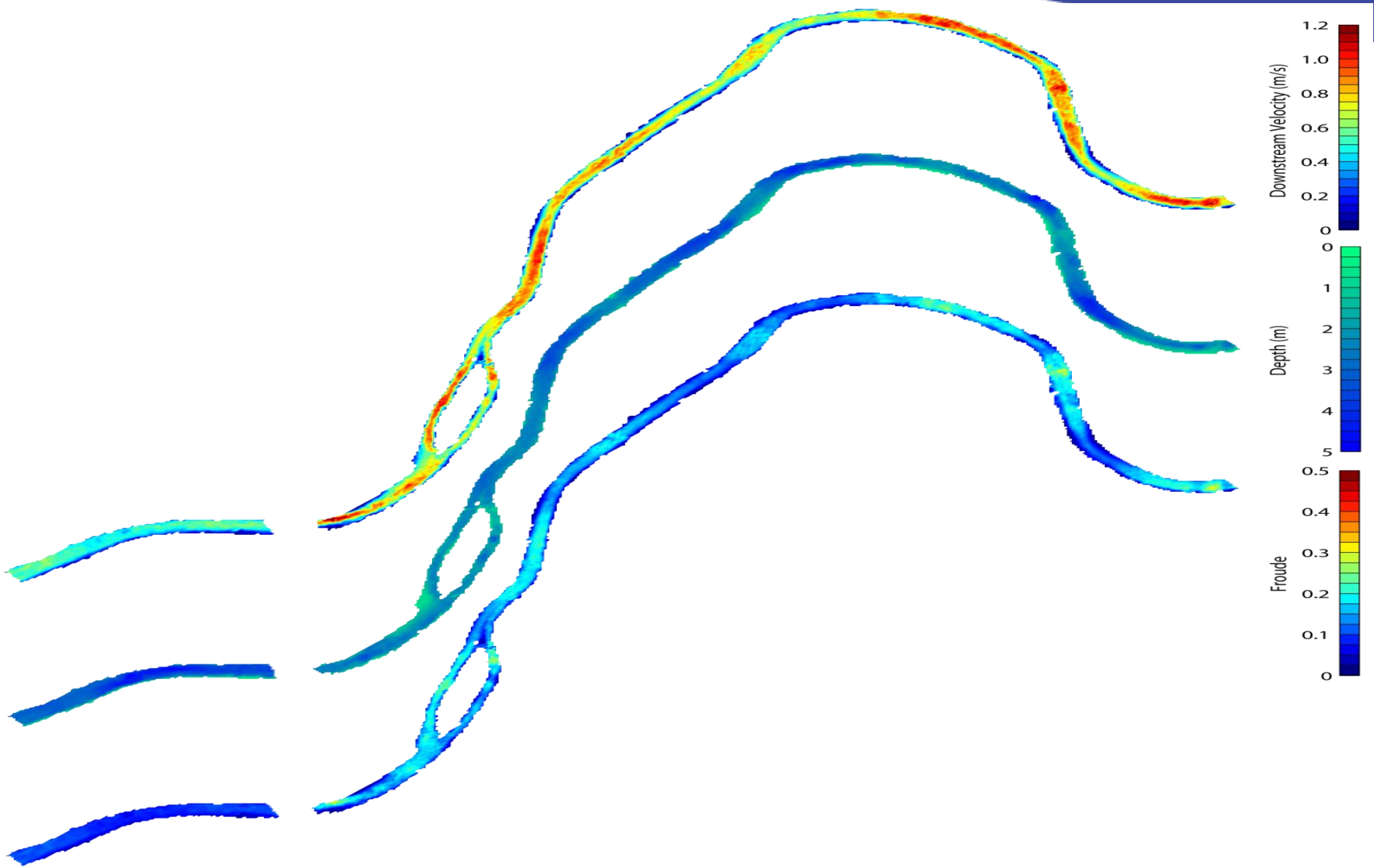


Velocity vector & magnitude slices

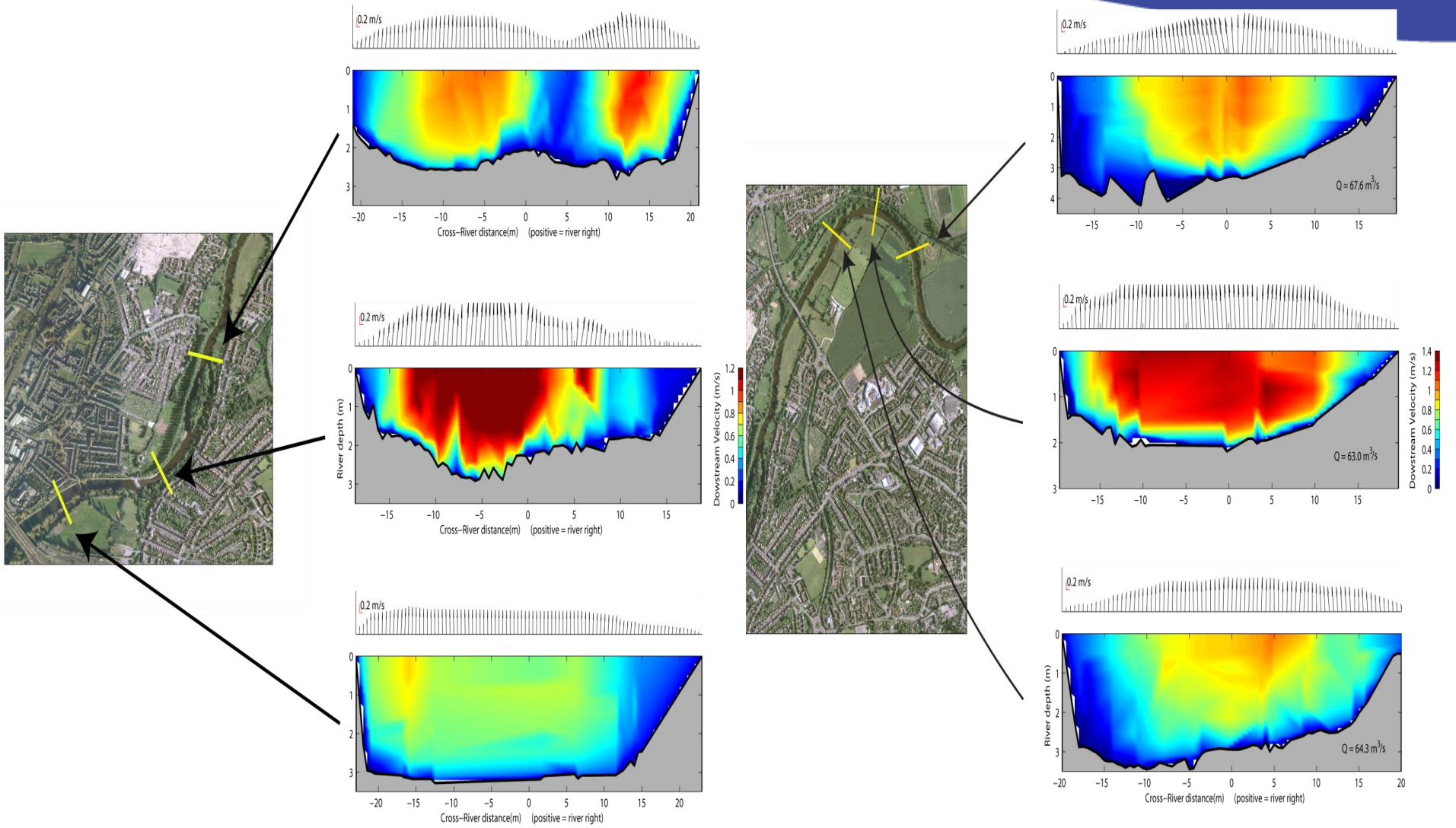
Depth specific Velocity Contour



Depth averaged Velocity, Depth & Froude



Sliced cross sections along reach – velocity & discharge

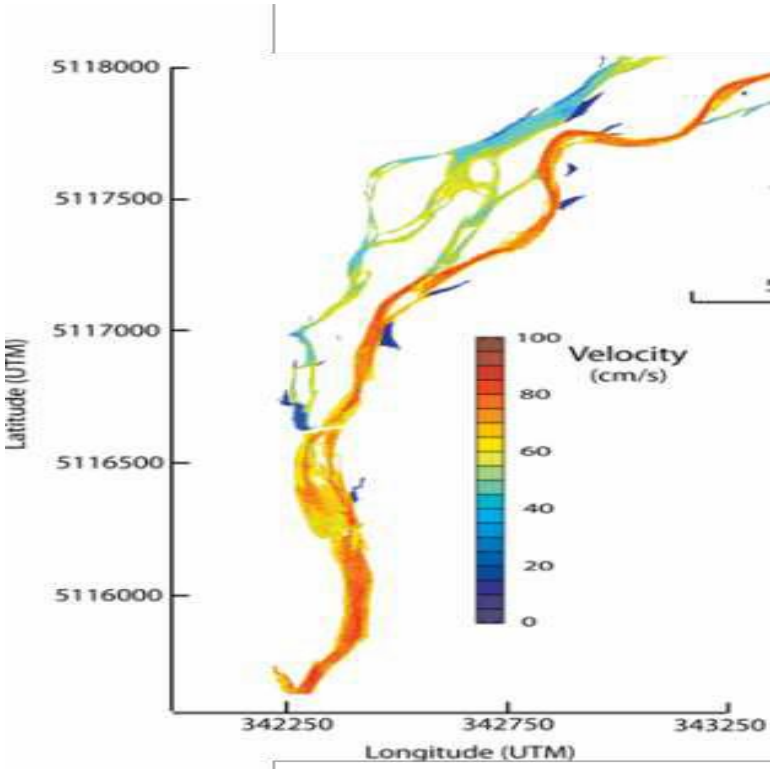


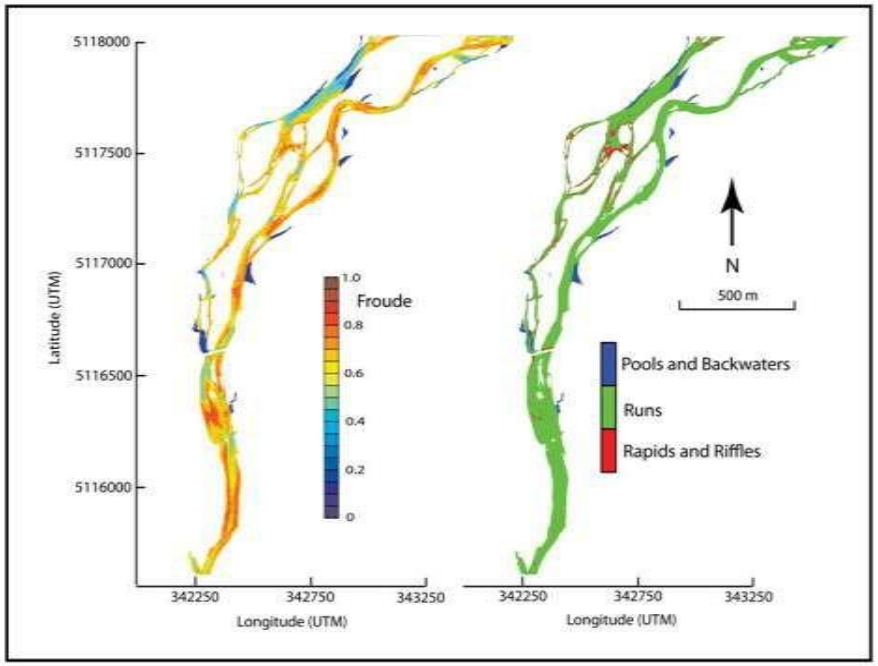
But not just depth velocity

Sliced cross sections linked with airborne Lidar DEM

Depth Averaged Velocity and M9 Bathymetry Linked with Lidar DEM

Using Multi-Spectral Satellite Imagery***





Velocity, Froude #, and River classification computed for all measured and unmeasured channel sections using a single ADCP downstream transect linked with satellite imagery.

*** this data is not from the Shrewsbury survey

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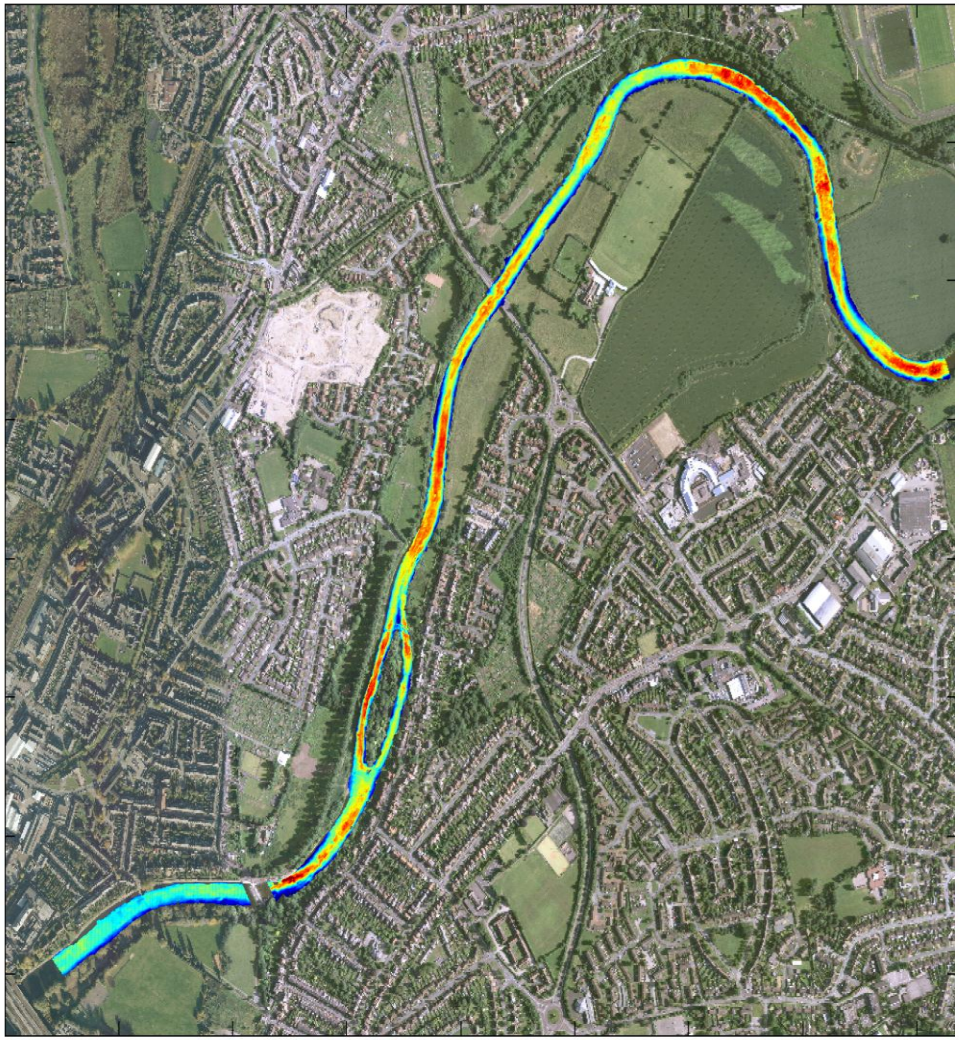
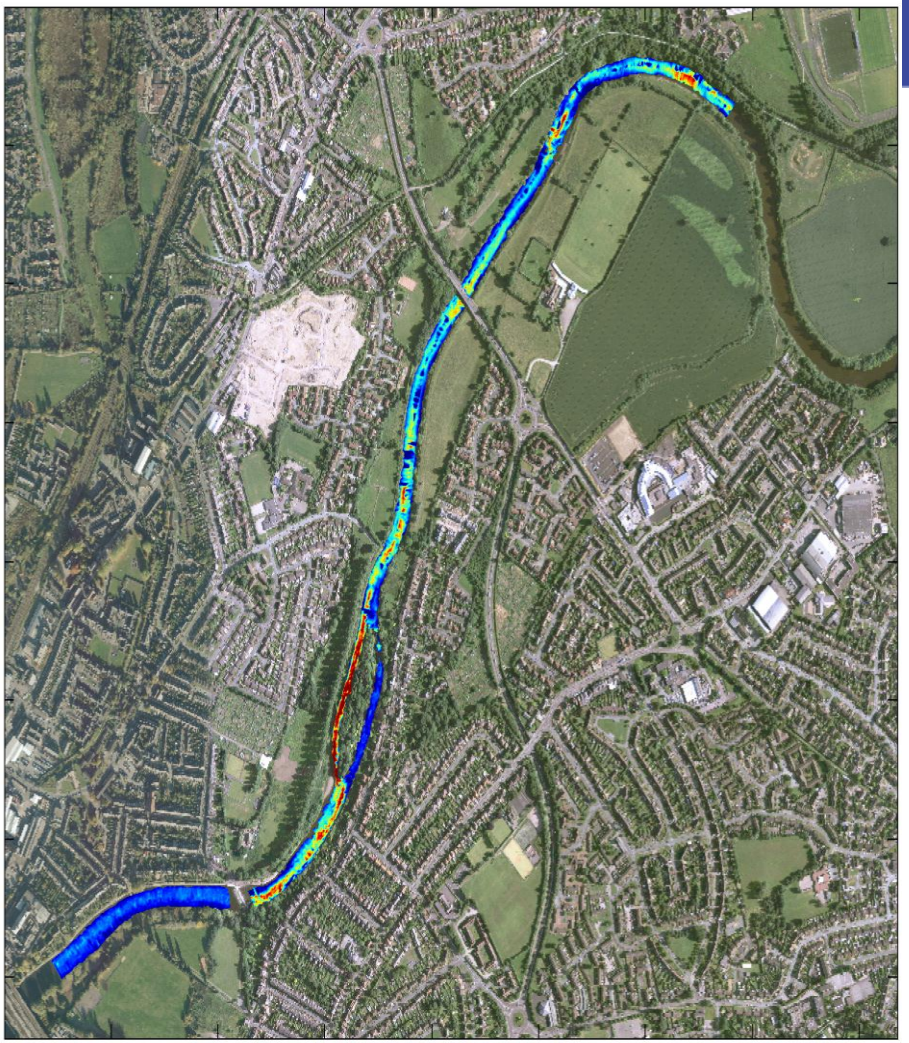
Dual Layer/Survey or Stacked data

Downstream depth averaged velocity plot dual layer/stage (stacked)

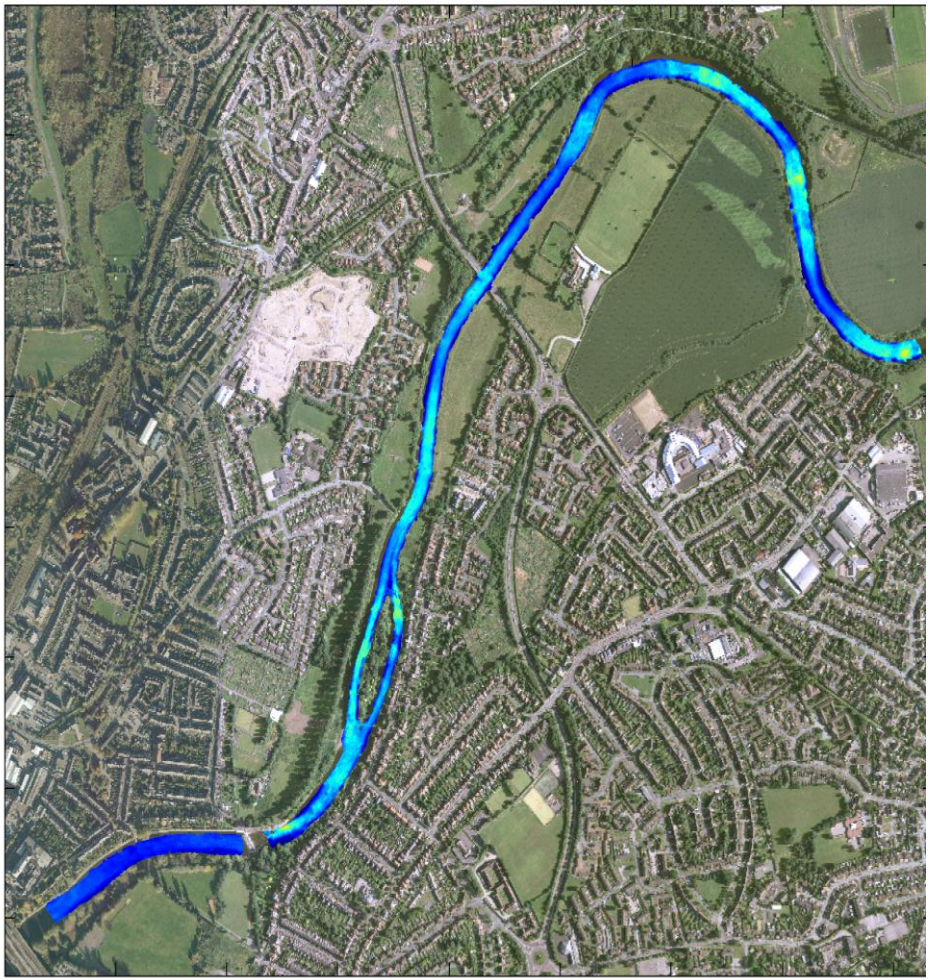


Mid Flows March 2014

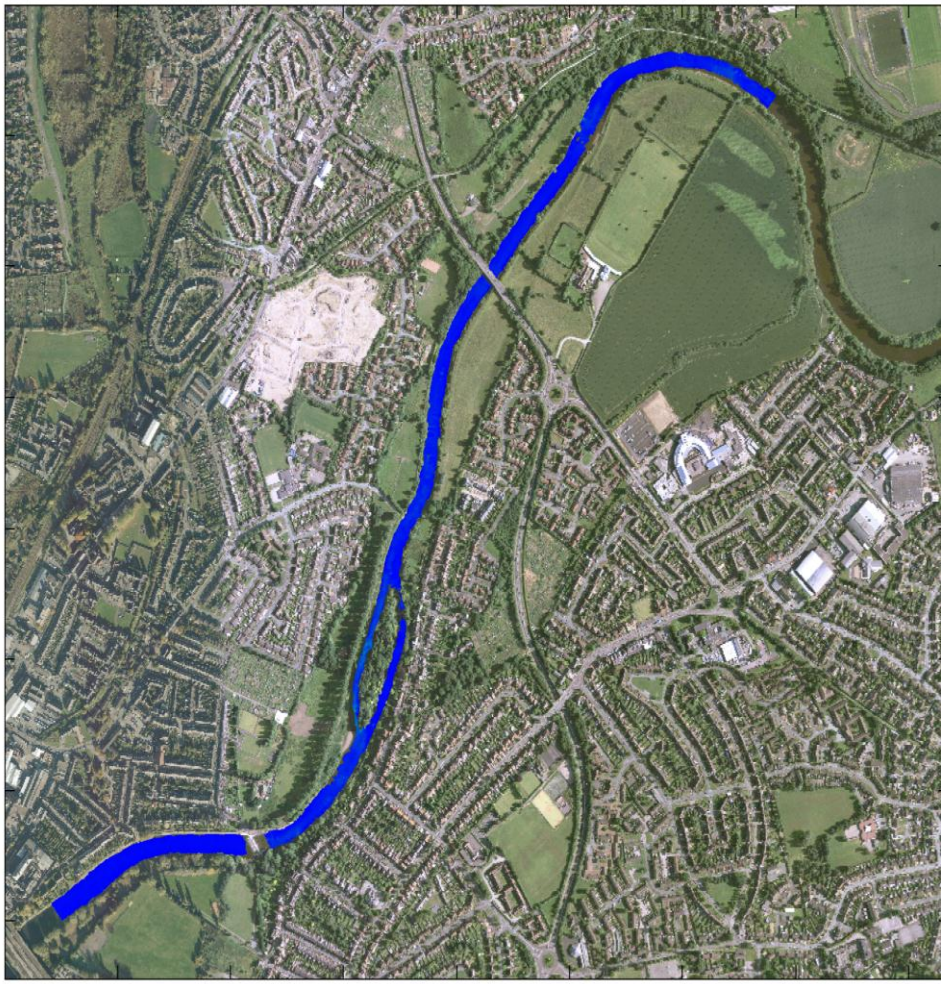


Low Flows July 2014

Froude
dual layer/stage (stacked)



Mid Flows March 2014



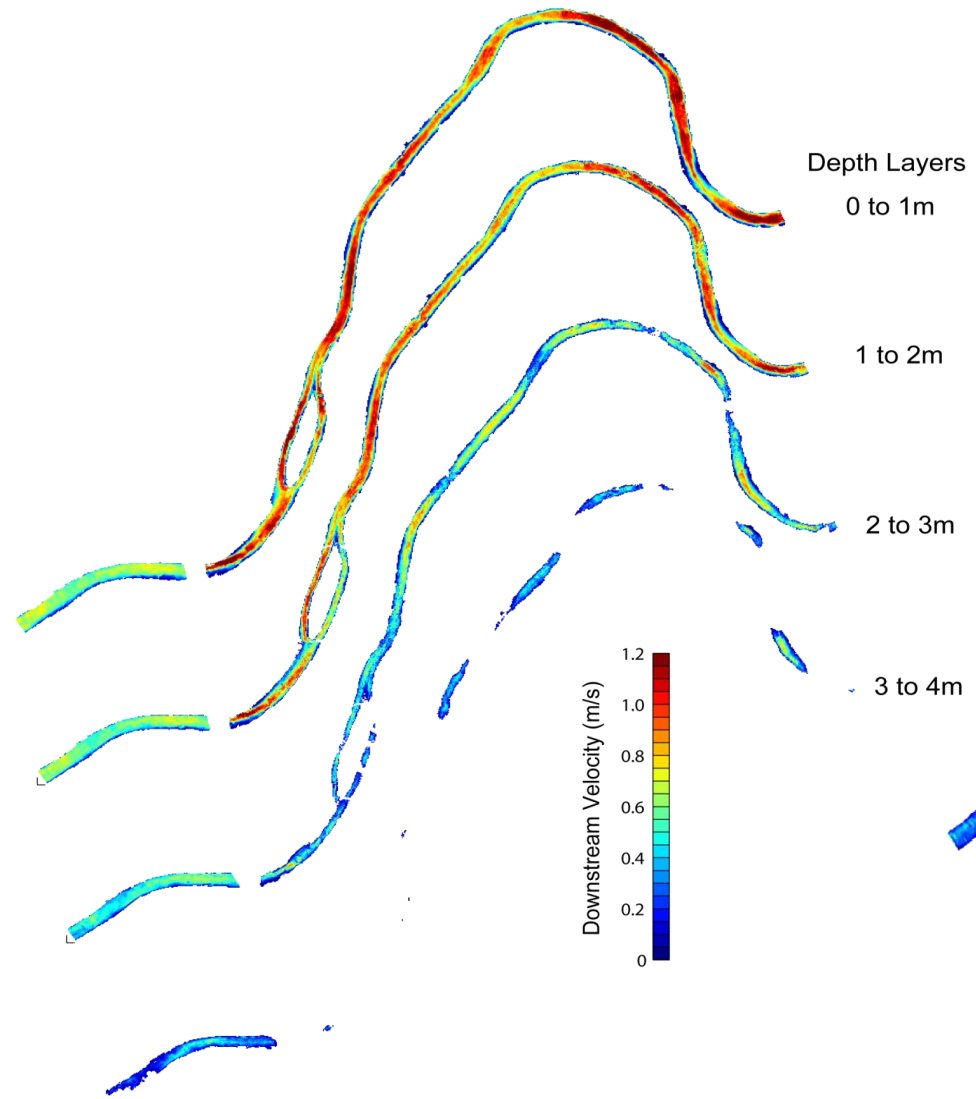
Low Flows July 2014

Velocity vector & magnitude slices dual layer/stage (stacked)

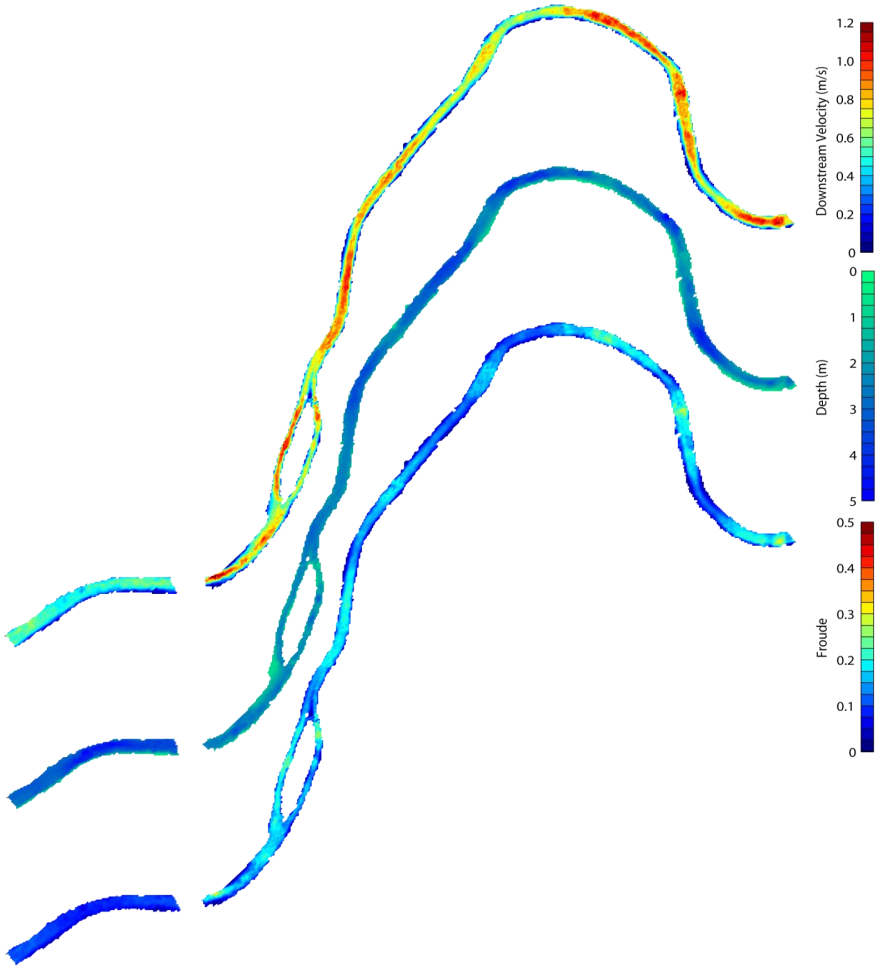
Mid Flows March 2014

Low Flows July 2014

Depth specific Velocity Contour



Depth averaged Velocity, Depth & Froude



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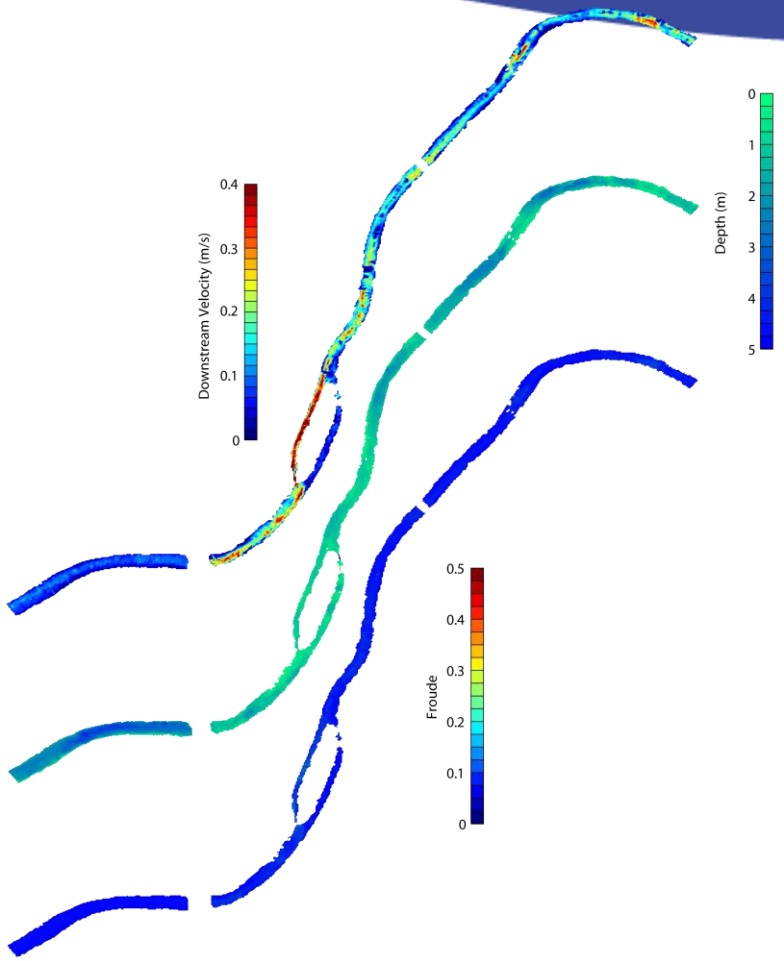
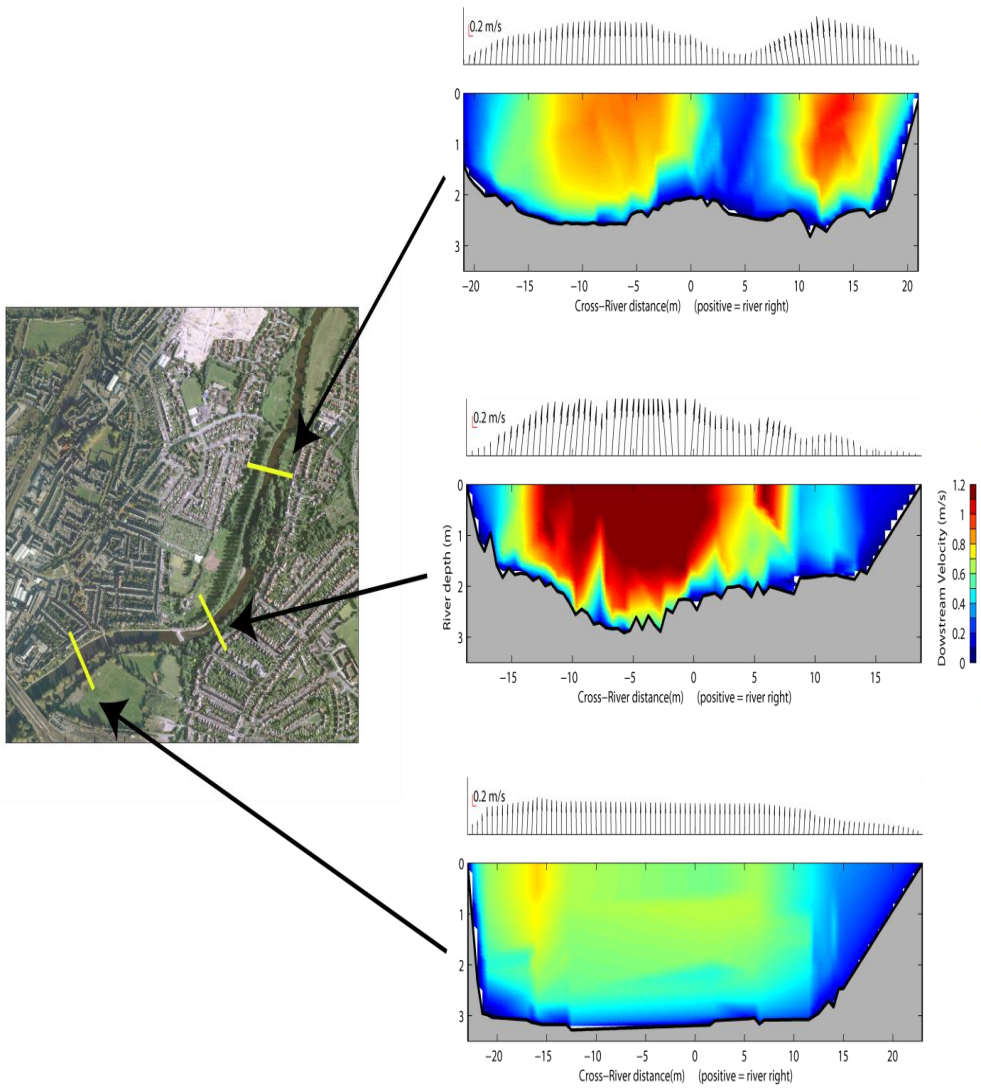
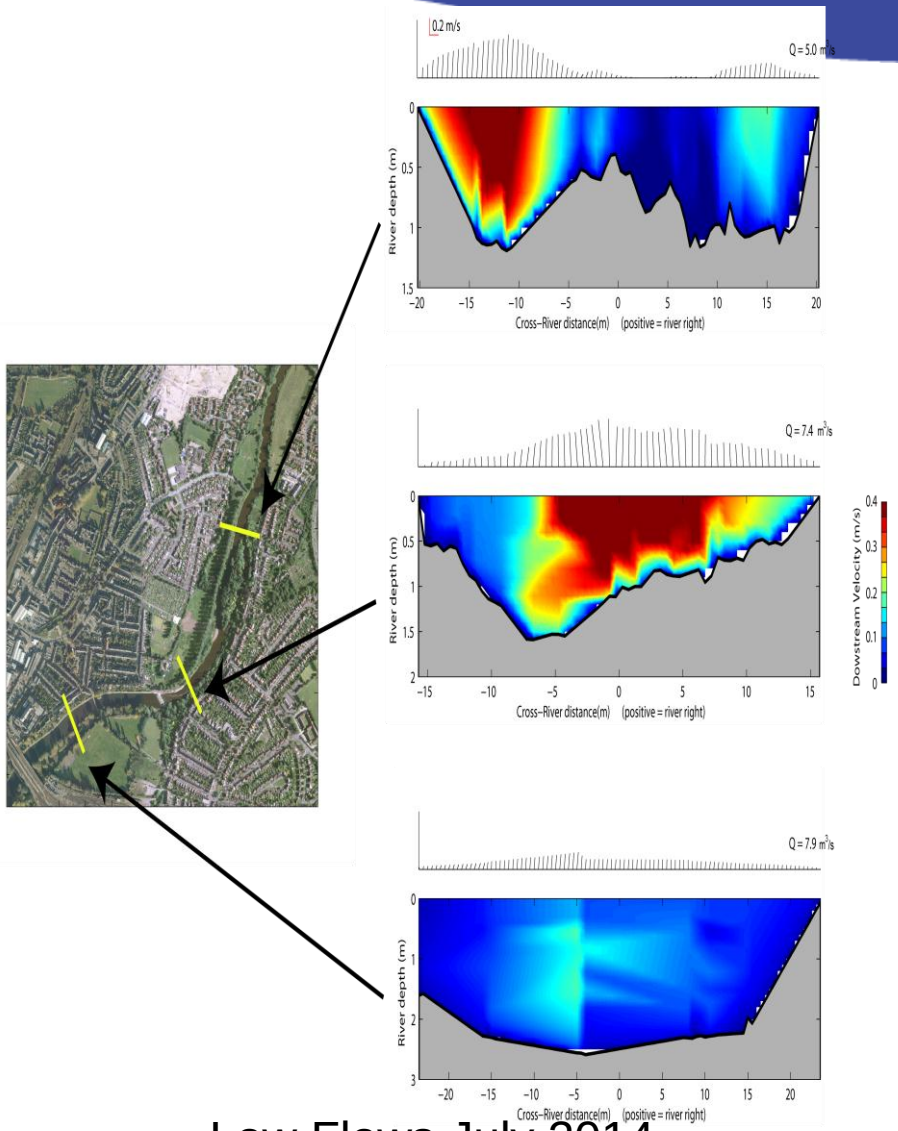


Low Flows July 2014

Sliced cross sections along reach – velocity & discharge



Mid Flows March 2014



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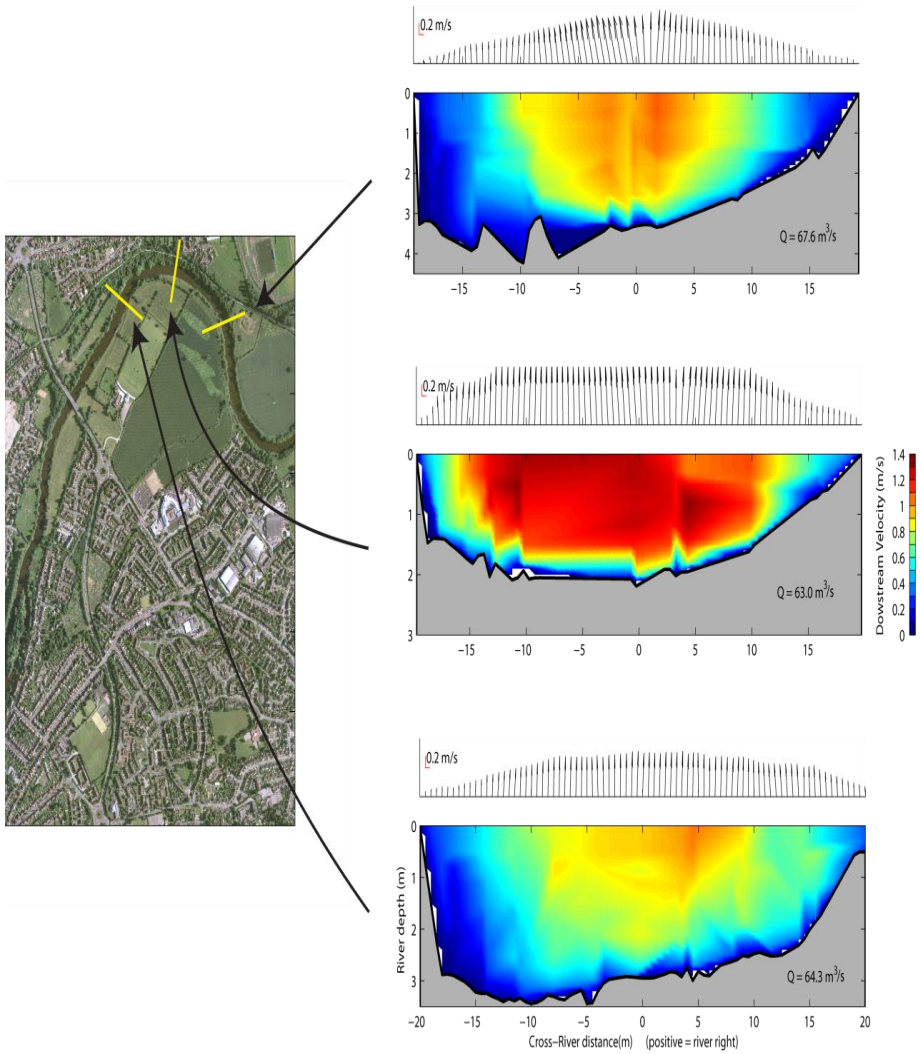

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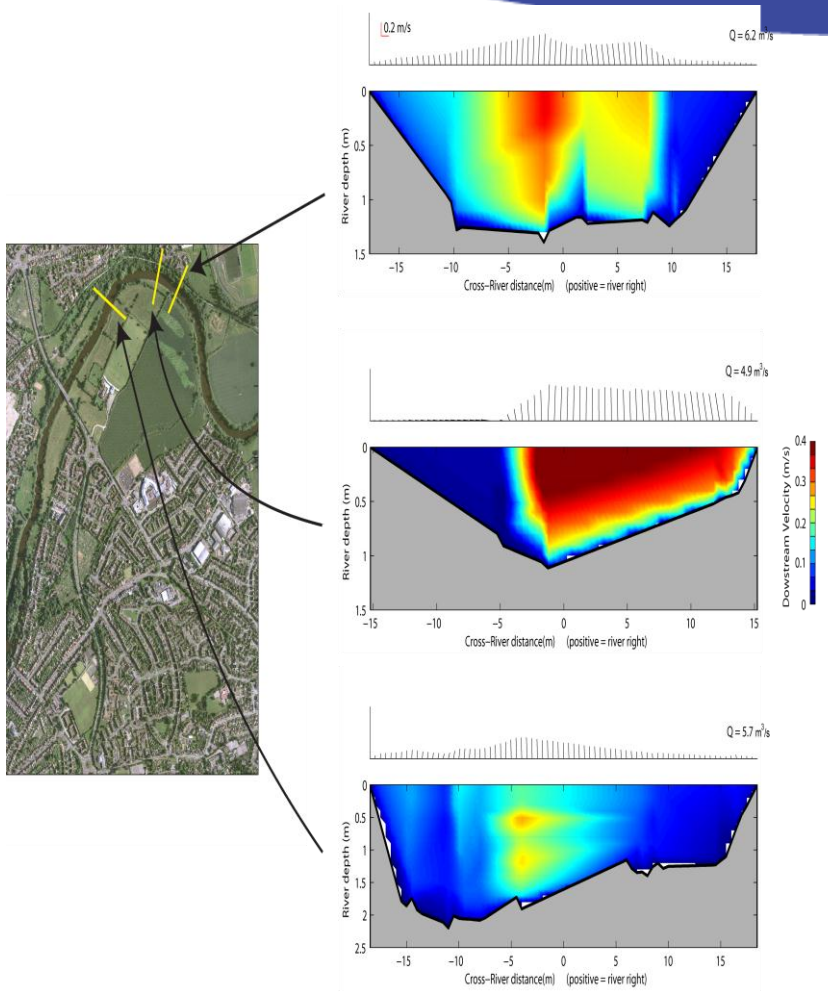
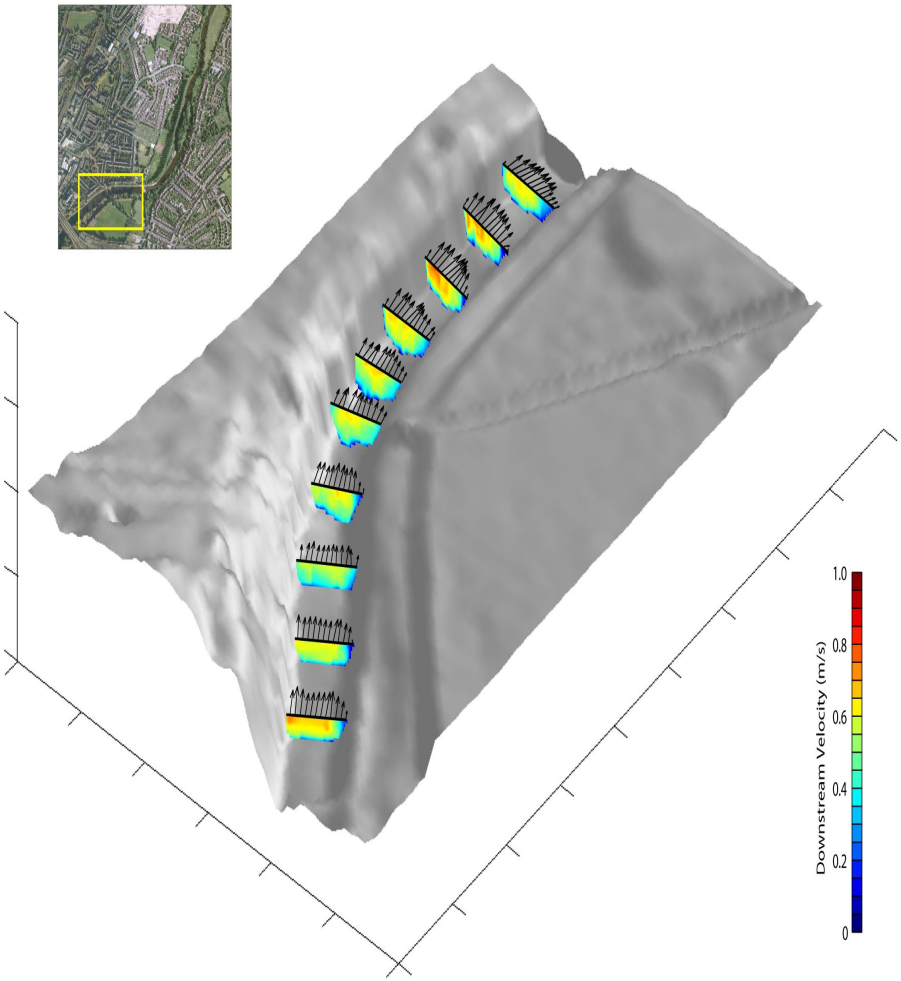
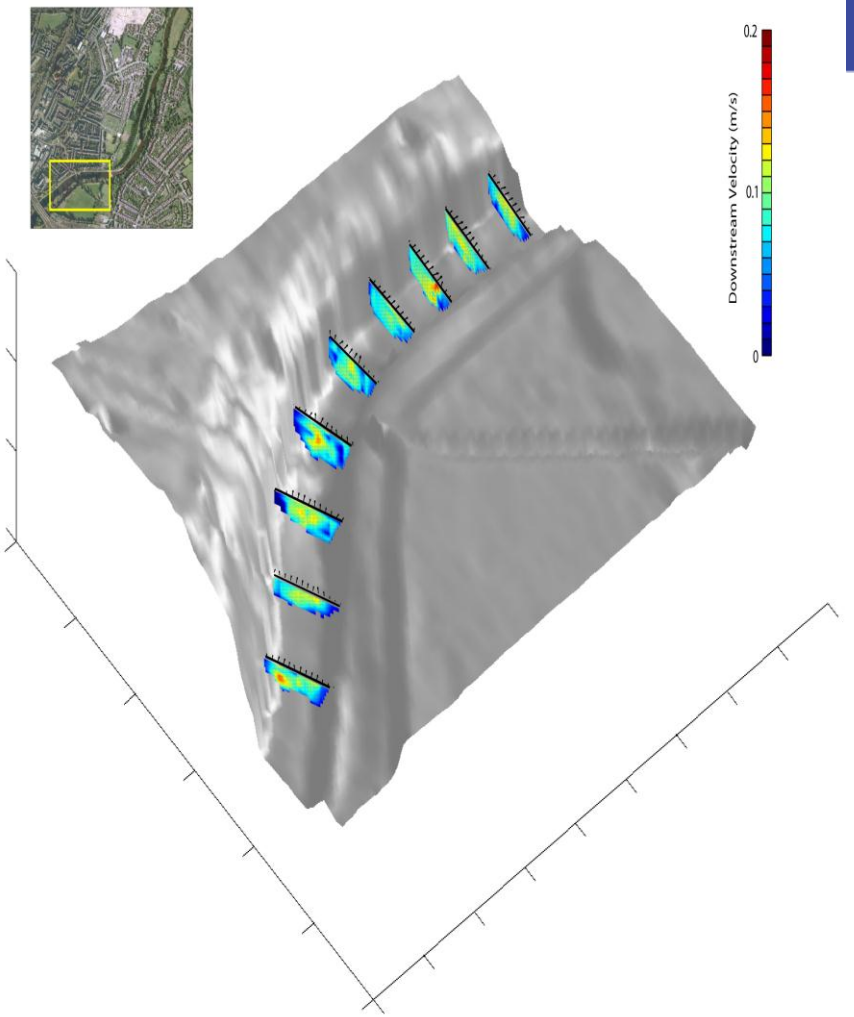


Low Flows July 2014

Sliced cross sections linked with Lidar DEM

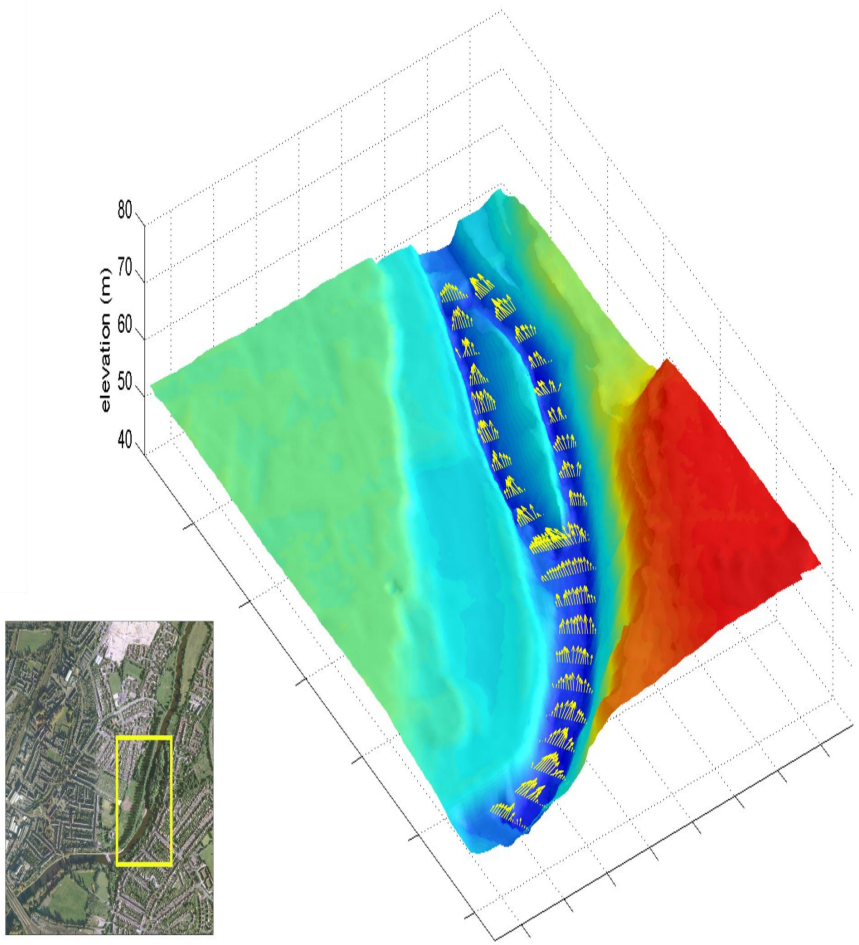


Mid Flows March 2014

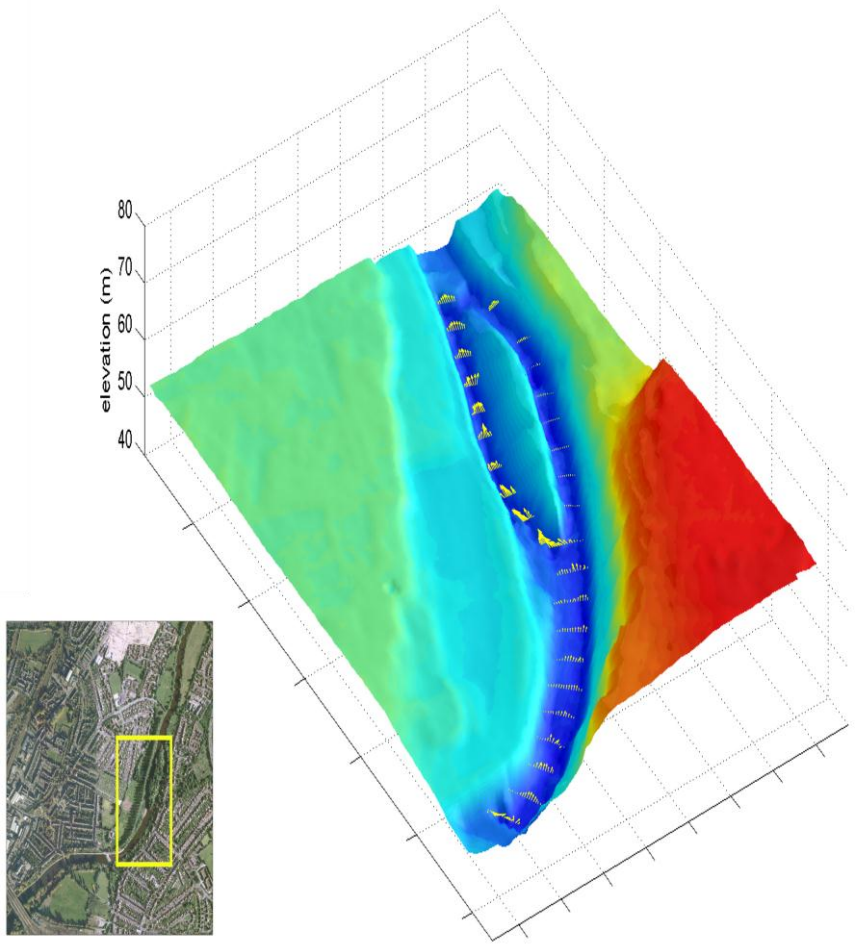


Low Flows July 2014

Depth Averaged Velocity and M9 Bathymetry Linked with Lidar DEM

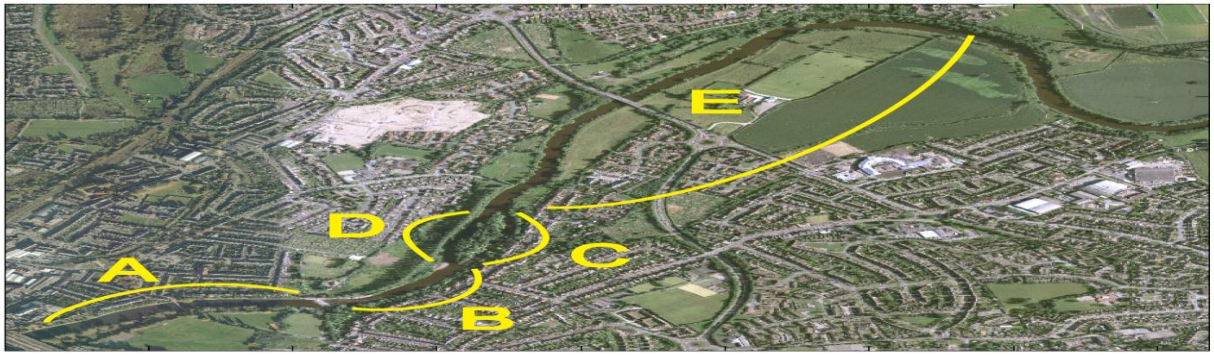


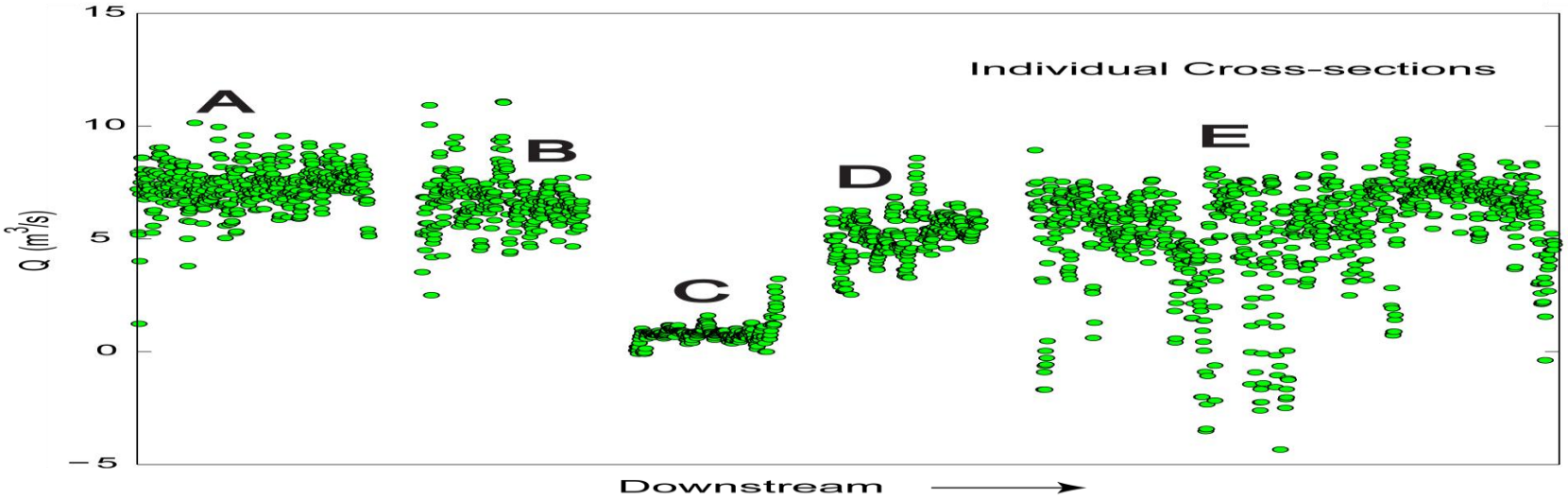
Mid Flows March 2014



Low Flows July 2014

Selecting your gauging point





But sorry, we don't have time to discuss that too.

Thank you

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