



Presented at the FIG Congress 2018,
May 6-11, 2018 in Istanbul, Turkey

6-11 May 2018

ISTANBUL

XVI FIG Congress 2018

USV, A Smart Way To Survey

EMBRACING OUR SMART WORLD WHERE THE CONTINENTS CONNECT:
ENHANCING THE GEOSPATIAL MATURITY OF SOCIETIES

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Challenges



Easy to be stranded



Dangerous

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Limitation



Inefficient and Inaccurate



Cliff area



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Dams and reservoirs



Lakes on islands within lakes



Hard to put a ship into it !

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CASE ONE

In A Heavy Traffic Channel

➤ Security challenge



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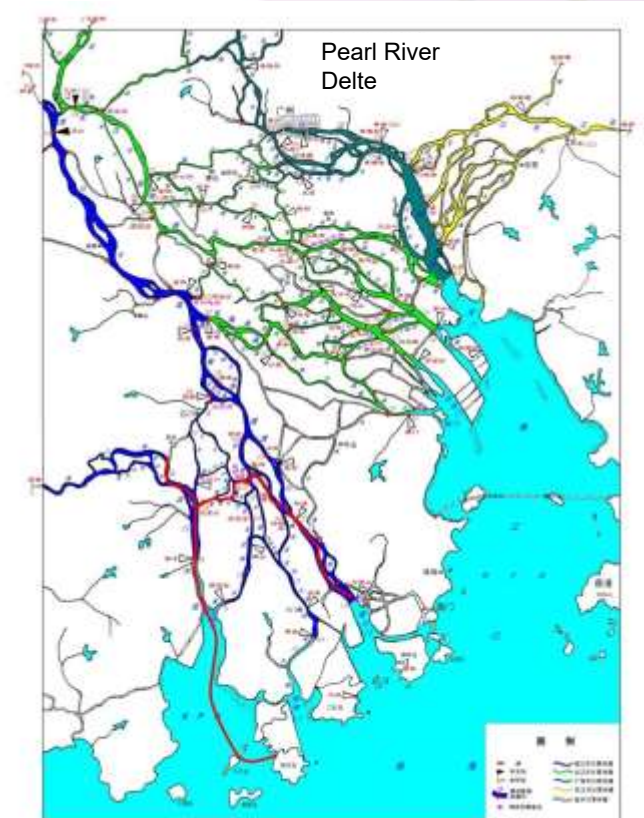
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Case in a Heavy Traffic Channel

Project background

- 89.5km long channel
- More than 10M population, 25+ big bridges
- Thousands of big factories depending on the channel
- 30+ ports, 45M cargo volume and 70,000 dockings per year
- 3000t level vessel transportation, daily 800 vessels



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Case in a Heavy Traffic Channel

Goals

- To finish a bathymetric survey within 20 cm accuracy
- The pipeline planned to cross 5 paralleled waterways

Challenges

- Cross section survey is easy to slow down the busy heavy traffic and even causing accidents
- Impossible to survey the shallow area
- High cost for periodically channel survey

Case in a Heavy Traffic Channel

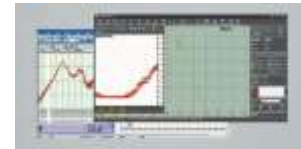
Survey Solutions——iBoat BM1 USV



- Up to 12 hours continuous working
- Auto pilot function
- Auto sail back function with multiple home points
- Water plant proof design
- Realtime camera and auto detour safety systems

Case in a Heavy Traffic Channel

Composition of iBoat Surveying System(Hardware)





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Case in a Heavy Traffic Channel

Composition of iBoat Surveying System(Hardware)

iBoat

- Vessel body
- Excellent Echo sounding module
- Positioning module
- Communication module(rover)

Ashore base system

- Control & monitoring center(PC)
- Controller
- Communication module(base)

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Case in a Heavy Traffic Channel

Composition of iBoat Surveying System(Software)

Pilot software

- Multiple home points setting function
- Planning lanes and auto-pilot engine
- Controlling/steering
- Google Map

Hi-Max hydrographic software

- Sounding and GNSS receiver control
- Surveying automatically
- Efficient post processing service
- Multiple universal format



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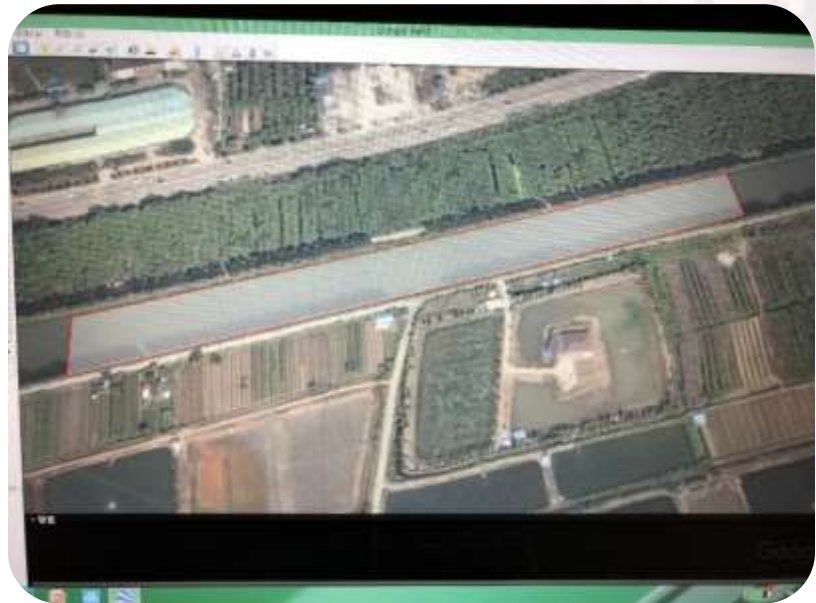
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Case in a Heavy Traffic Channel

First things first—project planning



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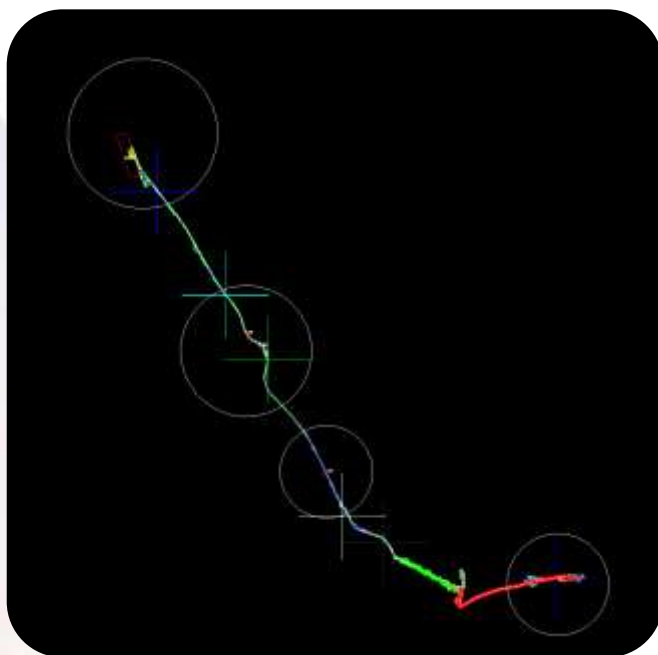
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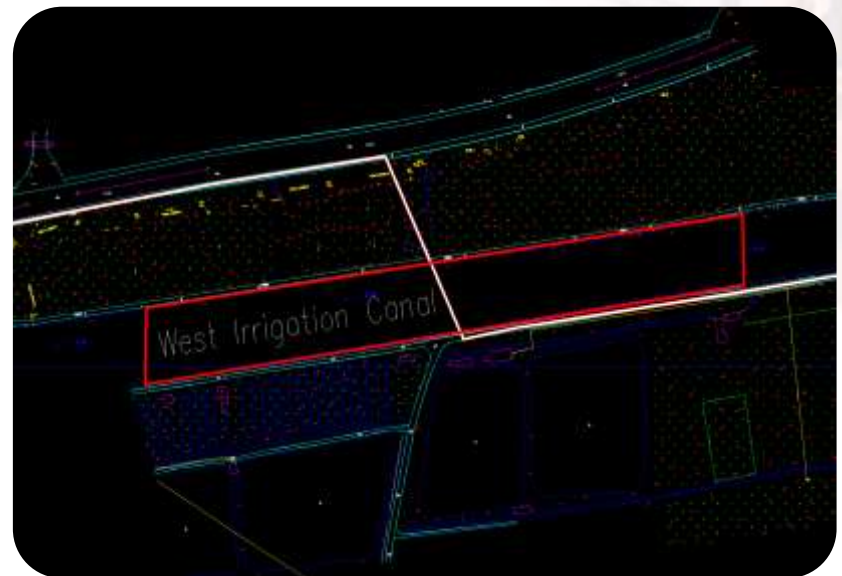
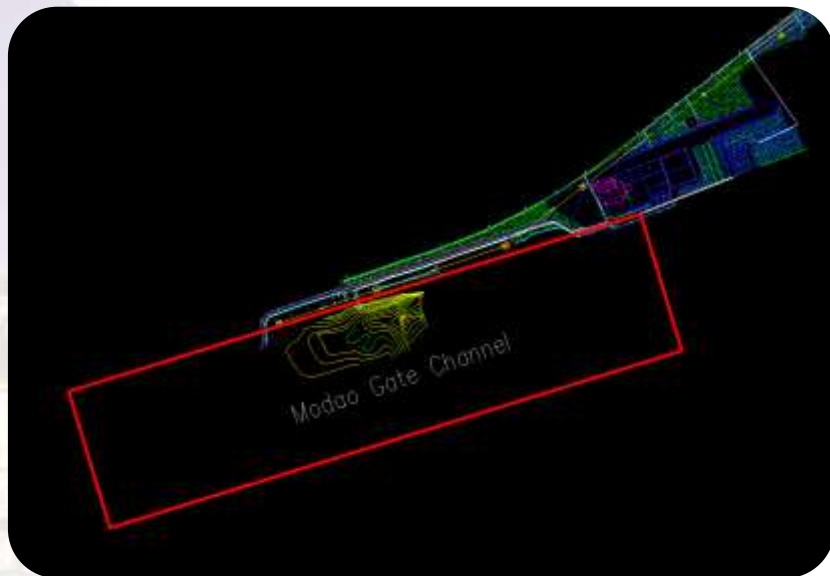
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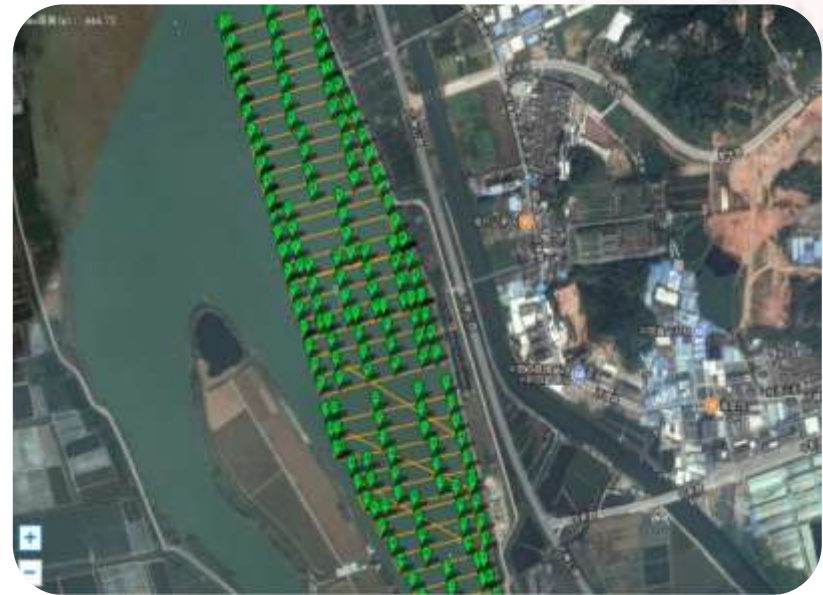
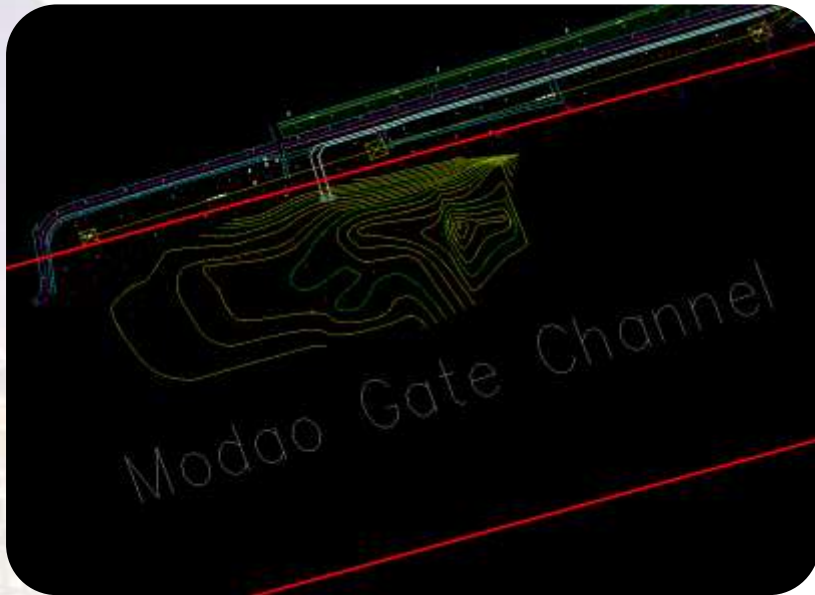
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Case in a Heavy Traffic Channel

First things first—project planning



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Case in a Heavy Traffic Channel

Boat deployment



- ✓ Portable size of iBoat BM1 is convenient to be transported to survey zone.



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Case in a Heavy Traffic Channel Setting up base controlling system

- ✓ Handy deployment of base and quick configuration of auto survey mode.
- ✓ Flexible switchover between manual and auto mode in case of emergency.



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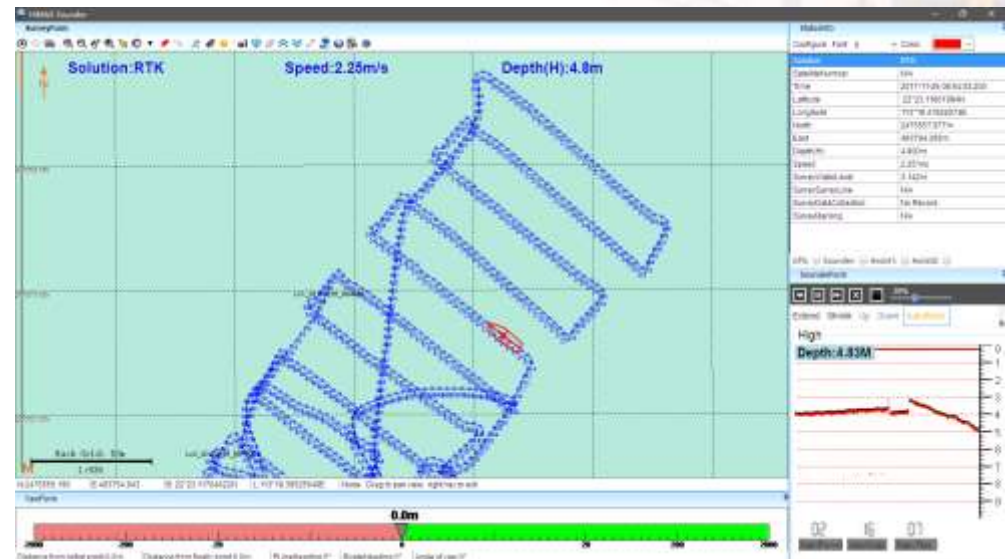
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Case in a Heavy Traffic Channel Surveying



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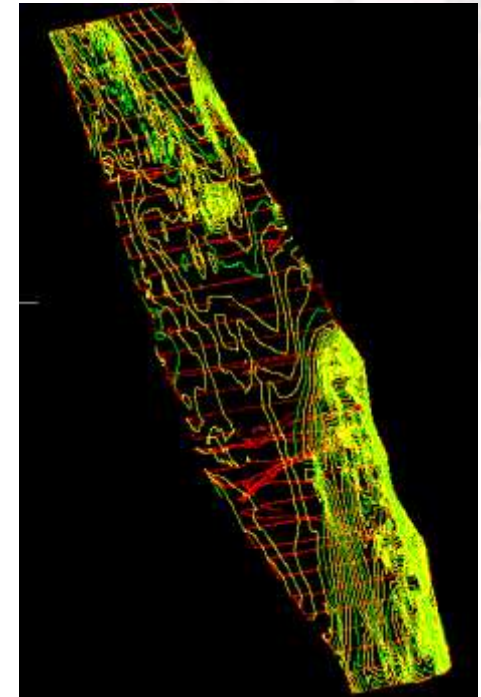
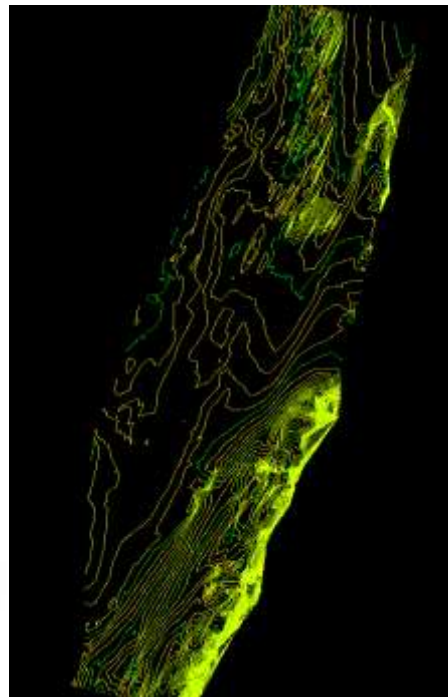
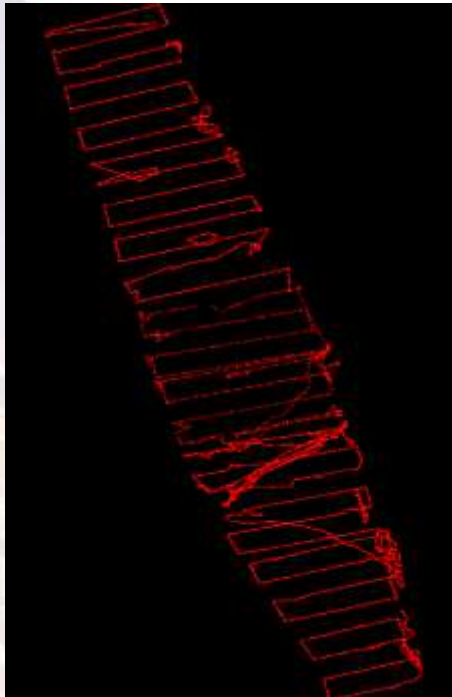
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Case in a Heavy Traffic Channel

Post processing & Result



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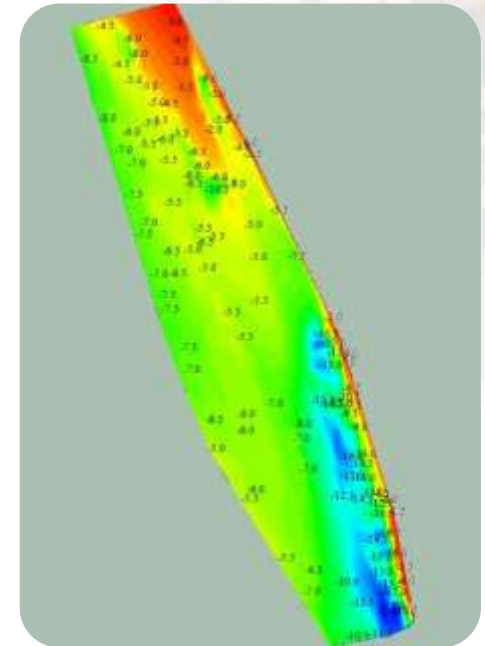
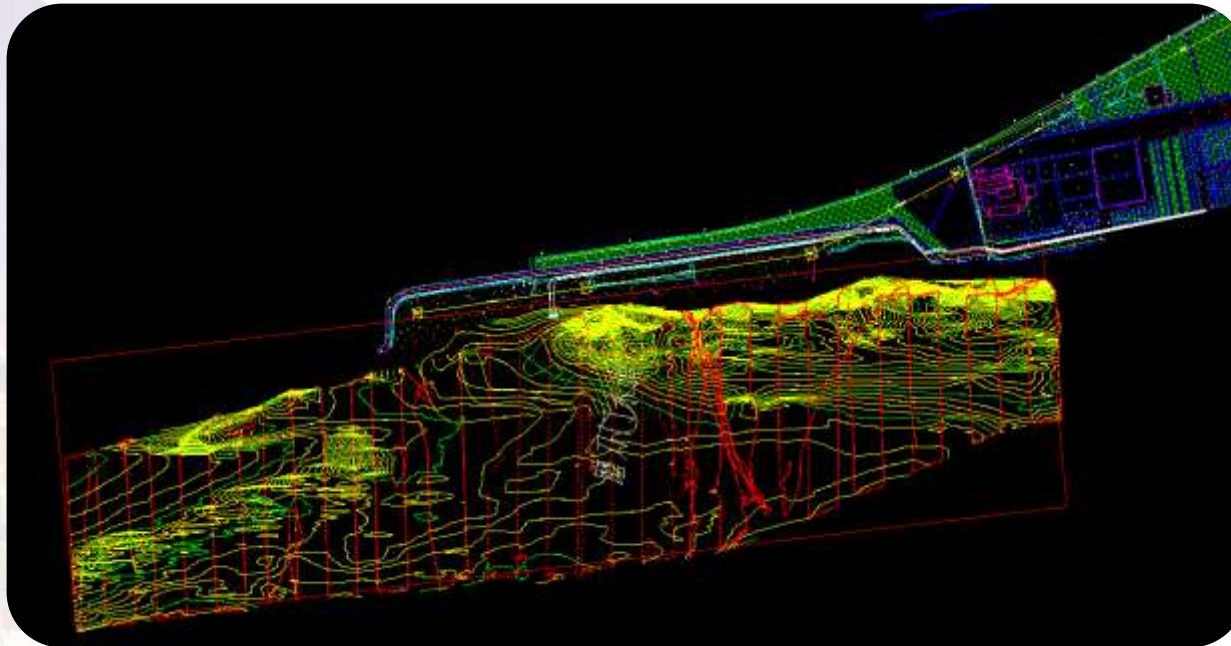
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CASE TWO

In Hun River

- Time mattered
- Danger of being stranded



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Project Background

Channel Survey Project in Liaoning Province—Hun River

Application Background:

- Alliance with Institute of Geomatics in Liaoning Province
- Underwater topography survey at the scale of 1:2000 in Hun River
- Numerous shoals and dams
- With USV project completed on schedule

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Project Background



Key Words:

- 80 Km long
- 20m—interval of cross sect
- 1000Km survey mileage

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Case in Hun River

Complicated survey condition



- ✓ Numerous dams
- ✓ Block between upstream and downstream
- ✓ Crowds of shoals in the downstream
- ✓ Shallow water and thick mud with much water grass



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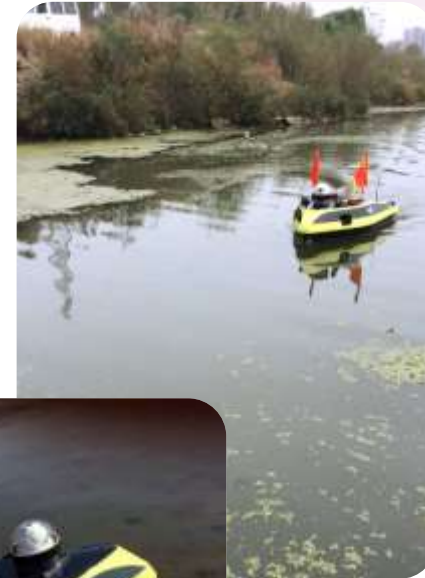
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Case in a Heavy Traffic Channel

Solve the headaches

- ✓ Protected from twining of water plants and rubbish.
- ✓ No pressure to sail on shoals with shallow draft.



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Case in a Heavy Traffic Channel

Manual control

- ✓ Manual survey in specific terrains with flexible propellers
- ✓ Auto-return to safe point while low battery or dropped signal



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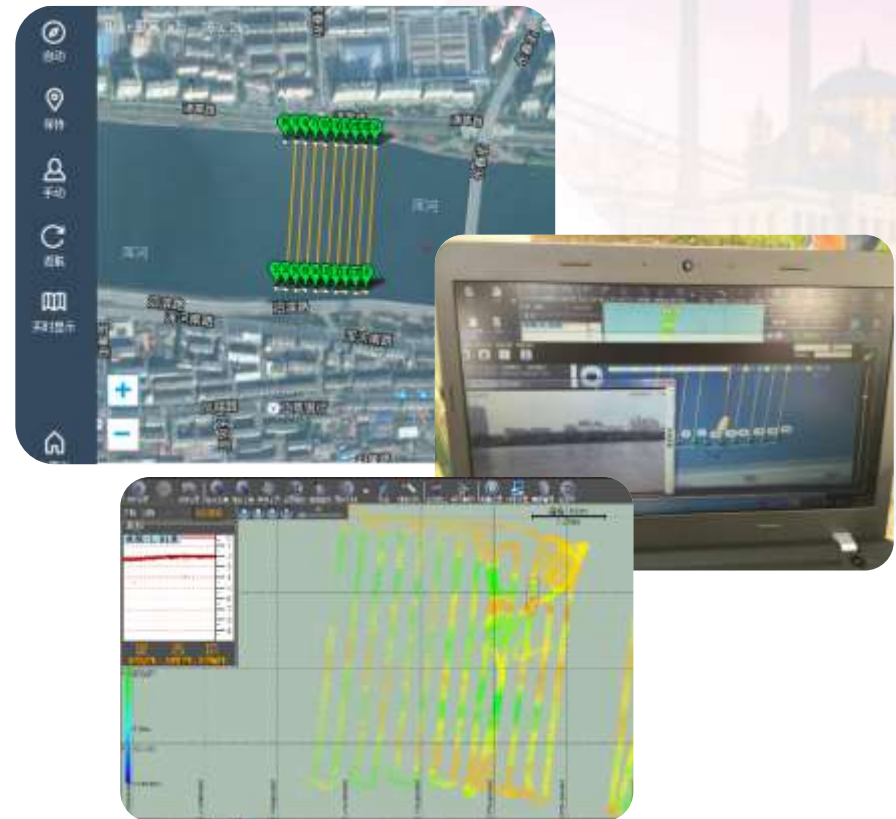
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Case in a Heavy Traffic Channel

Efficient work

- ✓ Plan line designed at your demand and automatic task execution
- ✓ Real-time data transmission of Positioning data, Sounding data and Boat status.



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Case in a Heavy Traffic Channel

Efficient work



✓ Real-time monitoring by HD video

✓ 360° Camera and ultrasonic obstacle-avoidance

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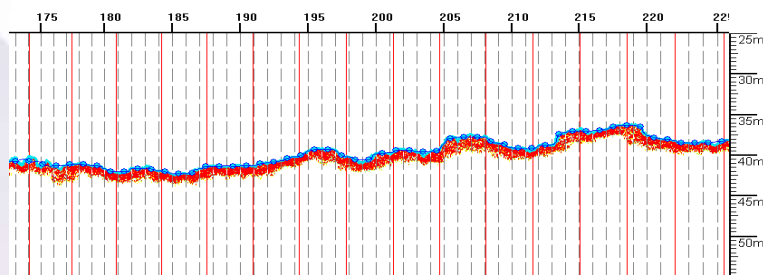


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Case in a Heavy Traffic Channel

Post processing



Tide Correct

Tide File Area Set Tide Correct

Mode: Tide Stations

Name	North(m)	East(m)
<input type="checkbox"/> Statio... 0	0	0
<input checked="" type="checkbox"/> Statio... 1	4	
<input type="checkbox"/> Statio... 0	0	0

File Name	Status	Record Time
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<input checked="" type="checkbox"/> Ln3_20160225...	Correct ...	2017-04-25 10:40:20.372 - 20
<input checked="" type="checkbox"/> Ln2_20160225...	Correct ...	2017-04-25 10:27:22.616 - 20

Data Correct

Geodetic Correct Delay Correct Height Correct Draft Correct Velocity Correct

Please input Coord-system settings

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Ellipsoid Projection Convert Plane Height

Source Ellip: Krassovsky 1940

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1/f: 298.3

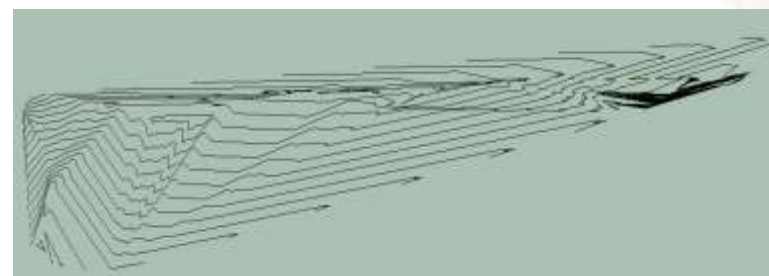
Target: WGS 1984

a(m): 6378137

1/f: 298.2672236

Select the file needs to be corrected:

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<input checked="" type="checkbox"/> Ln3_20...	Correct Succ...	2017-04-
<input checked="" type="checkbox"/> Ln2_20...	Correct Succ...	2017-04-



- ✓ Correct the false depth points by analog signal
- ✓ Manually sample feature points to get reliable proof



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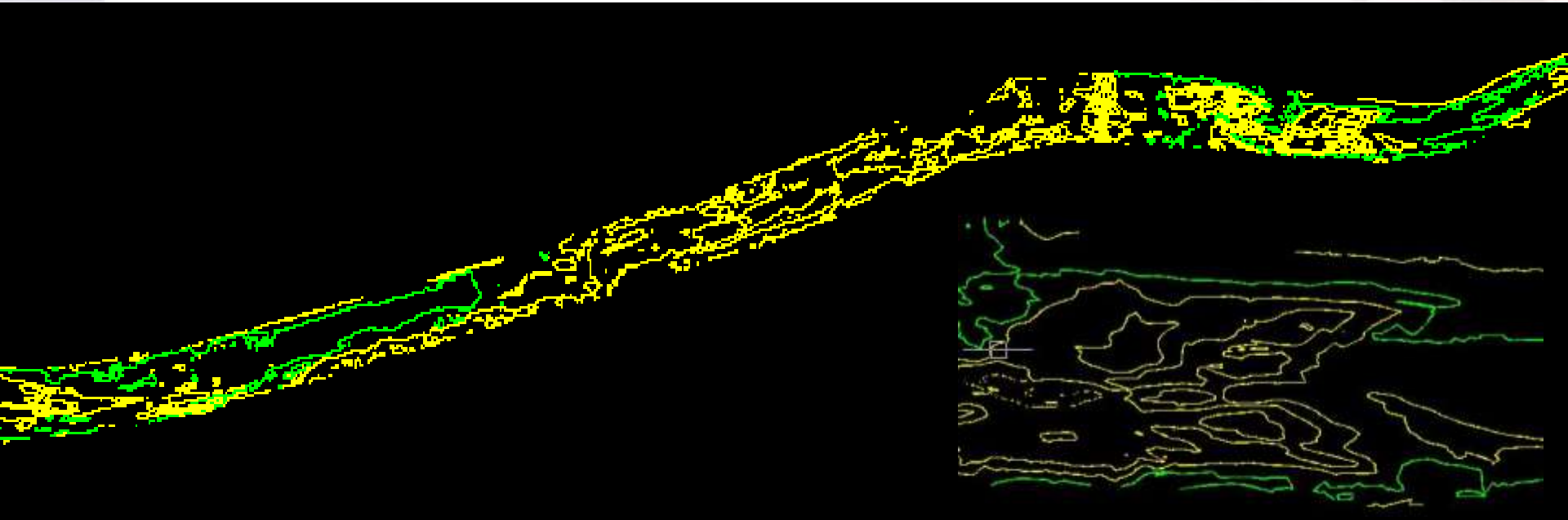
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Case in a Heavy Traffic Channel

Result



Thanks to the reliability and efficiency of iBoat BM1,
the Hun River hydrographic project was completed successfully !

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CASE THREE

Integration

- Water and
- underwater integration



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Case III Integration

Project overview

- Wujiang River in Guizhou Province expansion project :



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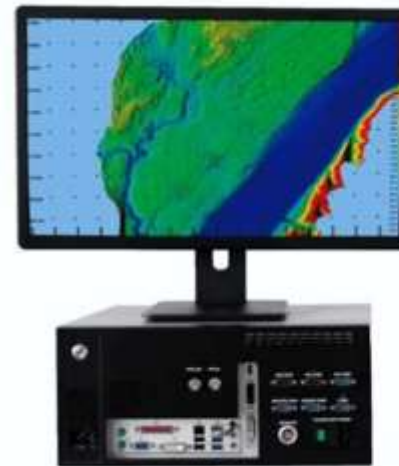
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Case III Integration

Device Installation

- Multi-beam installation :



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Case III Integration

Device Installation

- Mobile mapping system installation :



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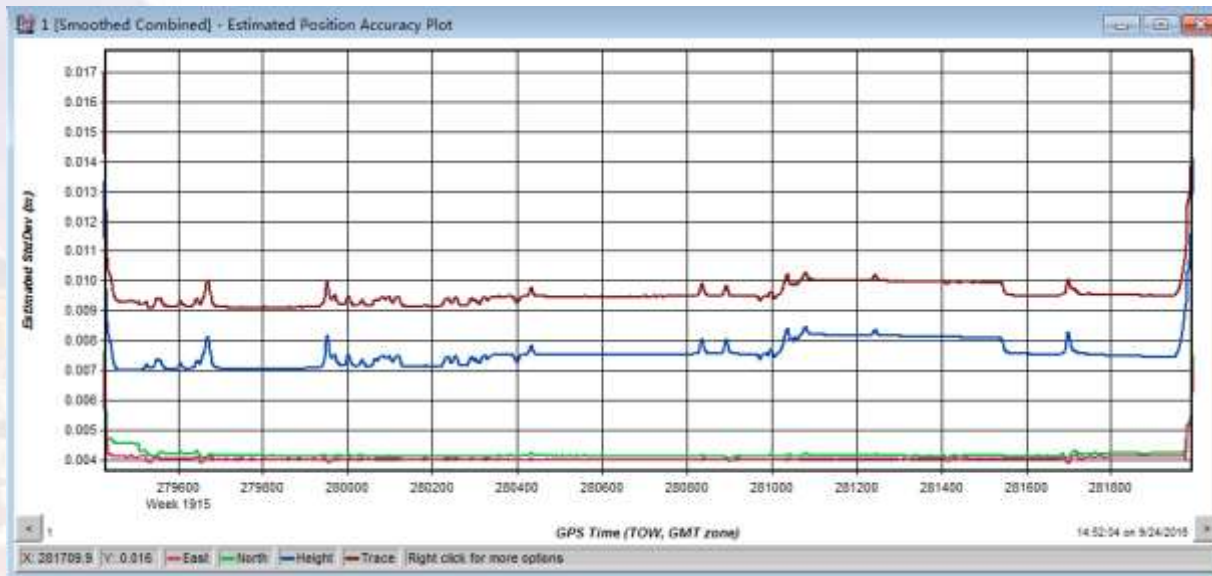
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Case III Integration

Data preprocessing

- POS solution : IE Calculation



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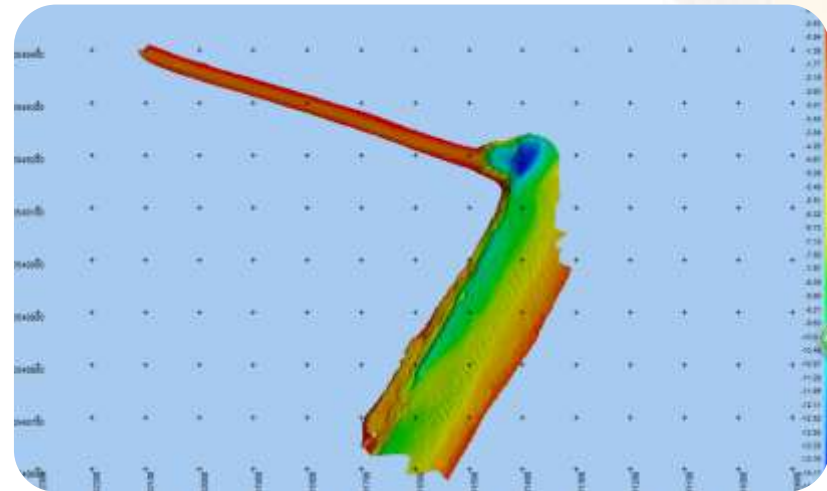
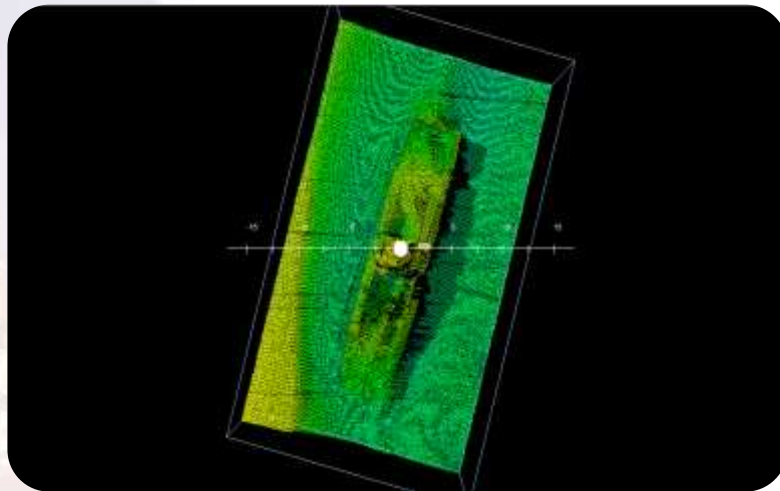
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Case III Integration

Multi-beam Data Processing

- Software : PDS2000
- Elevation : RTK Surveying without tidal observation



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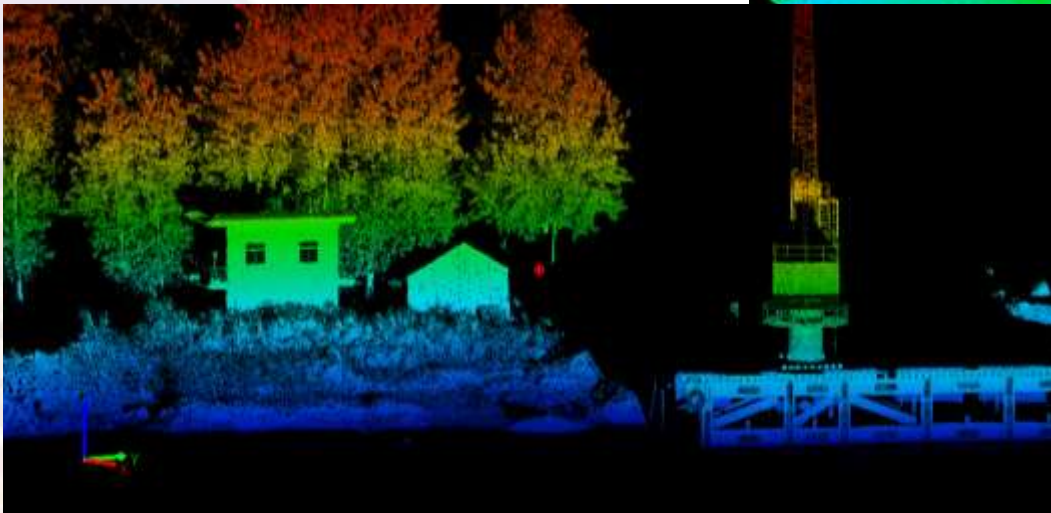
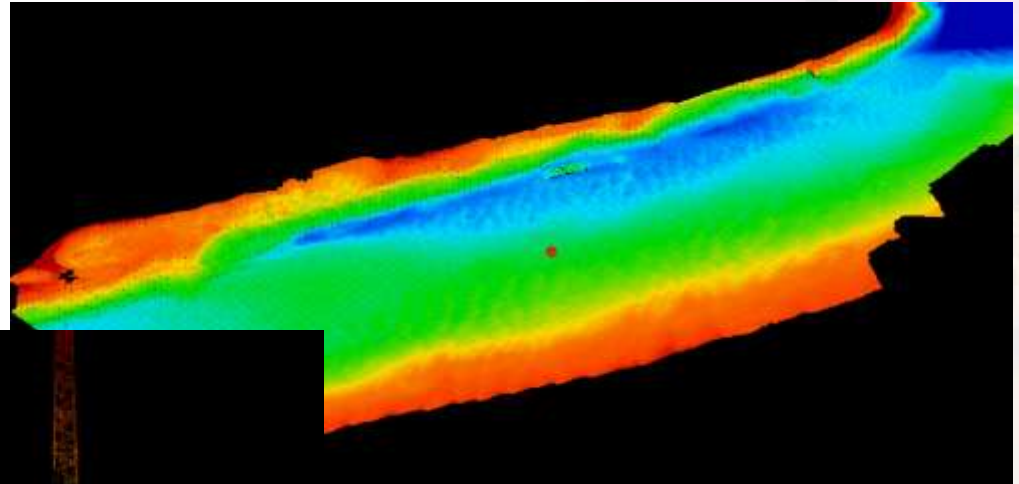
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Case III Integration

Point Cloud Data

- Point cloud display on both sides of the river



- Underwater point cloud display

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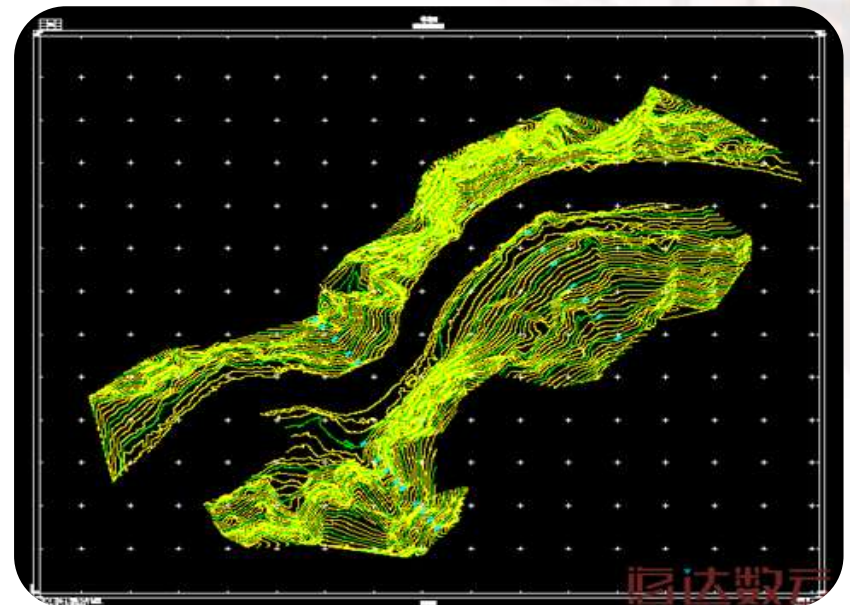
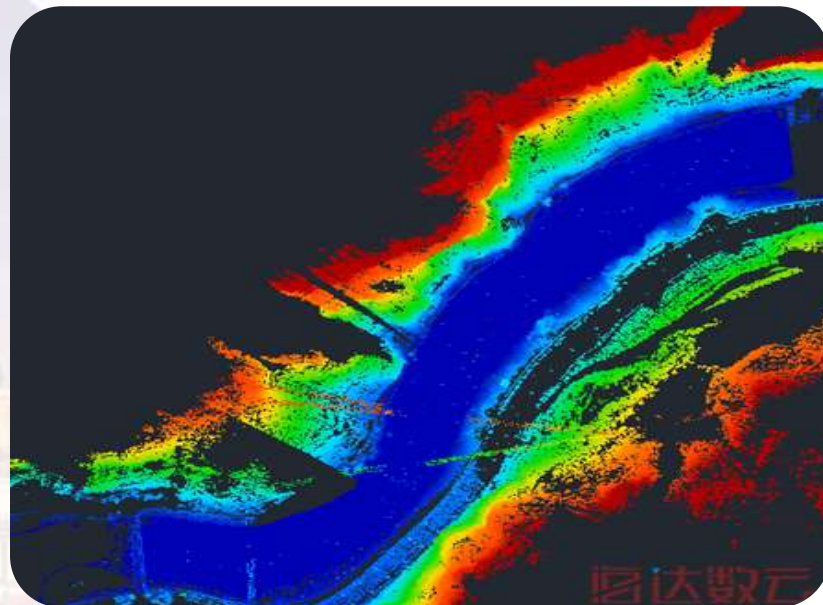
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Case III Integration

Project Result



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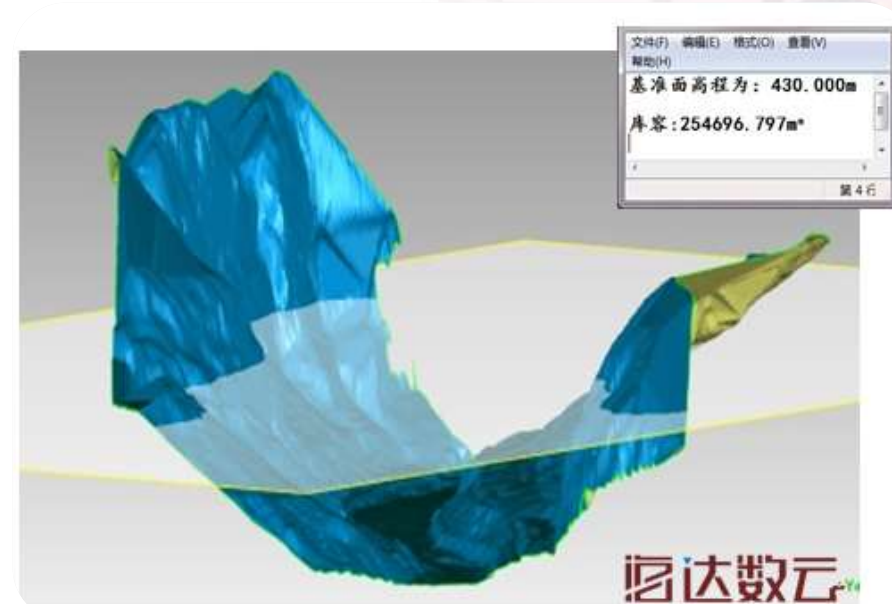
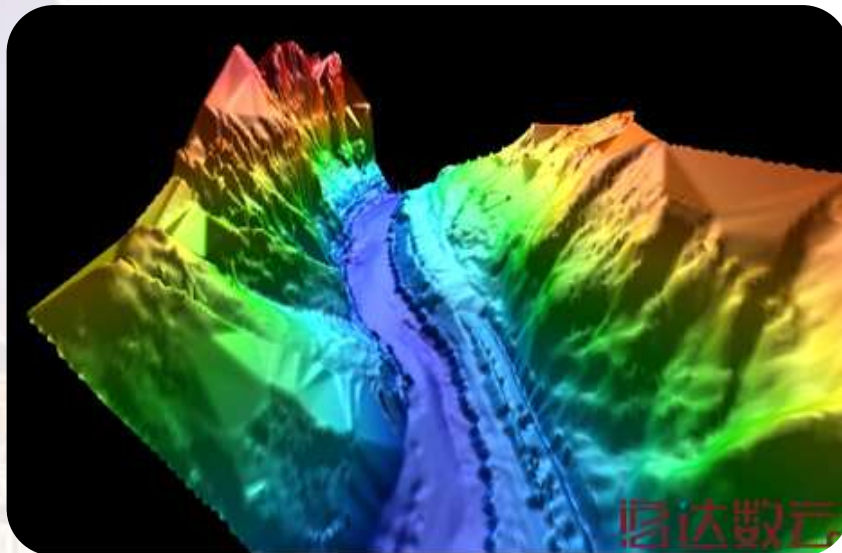
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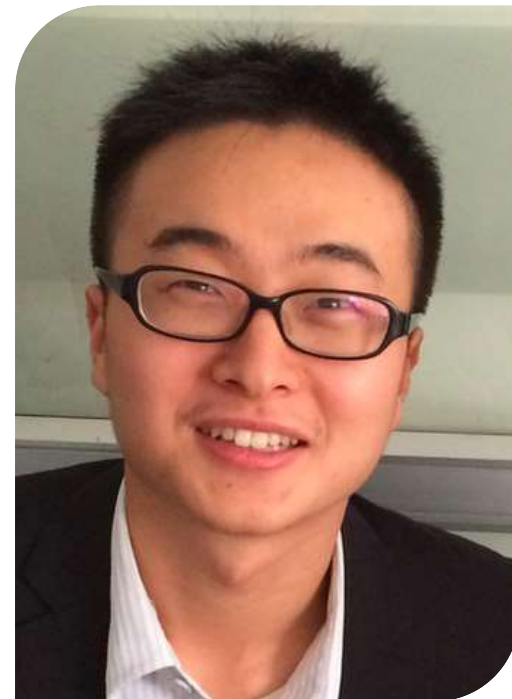
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Presenter

Adin Lee

- Senior Product Manager
- Technical Supervisor
- Email: adinlee@hi-target.com.cn



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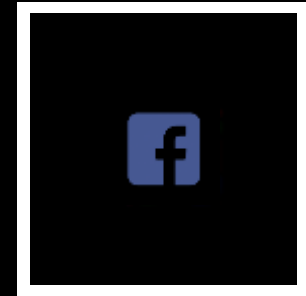
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