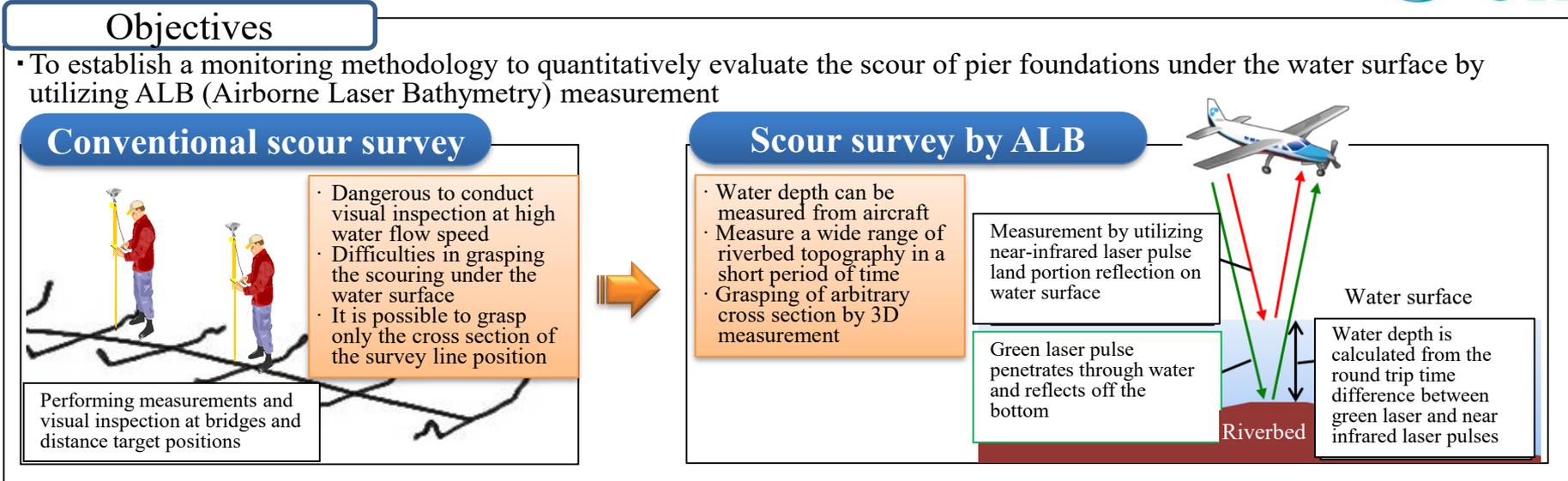


- R&D Topics : Inspection, Monitoring and Diagnostics Technologies
- R&D Theme : Understanding the scouring situation by ALB (Airborne Laser Bathymetry)
- Principal Investigator : Hiroaki Sakashita (PASCO CORPORATION)

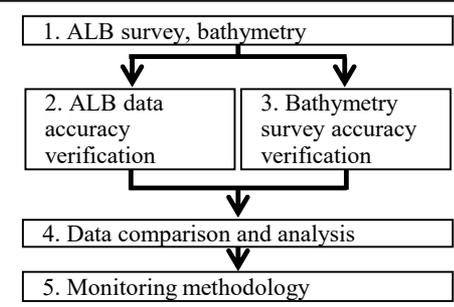


# R&D Objectives and Subjects



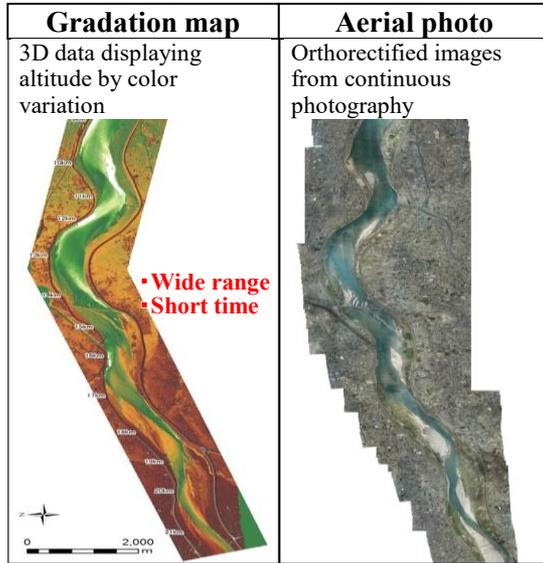
## R&D Contents (2014 – 2015)

- Comparison and analysis with conventional method (shallow survey), evaluation of ability to understand the scouring situation → Ensuring the same accuracy as in the past and implementing safe and efficient measurement of wide riverbed topography.
- Development of efficient and effective scouring monitoring methodology using ALB Effective scouring monitoring by efficiently understanding the amount of surface river bed variation in 3D shape of scouring, which was difficult previously.



## 1. 3D wide range measurement

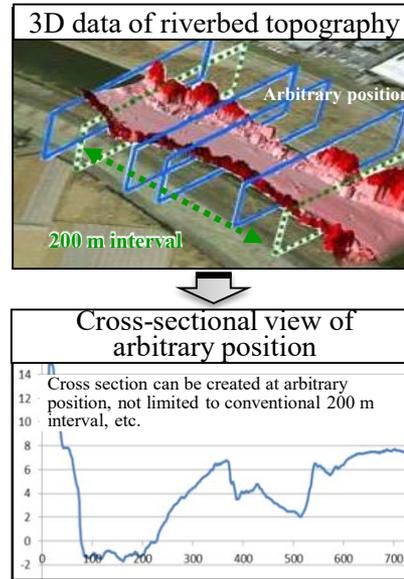
3D data of riverbed topography acquisition by ALB (aerial laser sounder) measurement.  
Simultaneous data acquisition with aerial photos.



- Realization for the 3D measurement of riverbed topography.
- No need for persons to conduct surveys (safety).
- Local equipment installation is unnecessary (efficient)

## 2. Cross section creation of arbitrary position

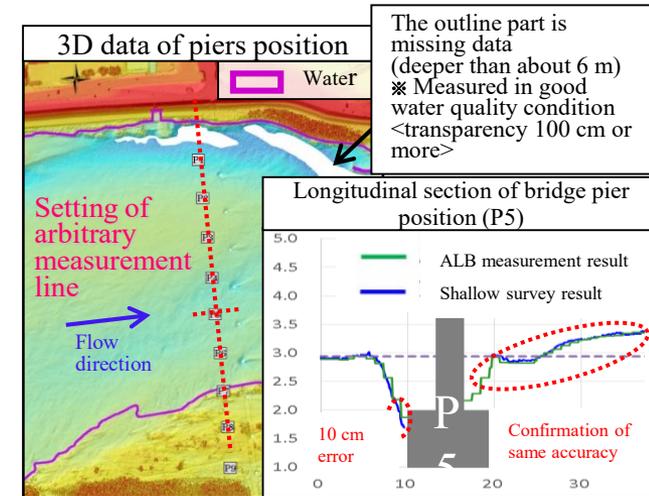
Creation of sectional view of an arbitrary position by acquiring the riverbed topography previously grasped at 200 m intervals etc. as three-dimensional data.



- It is possible to grasp the cross-sectional shape at an arbitrary position with a single measurement.
- Contributing to predict scouring risk sites.

## 3. To grasp scouring situation of the piers

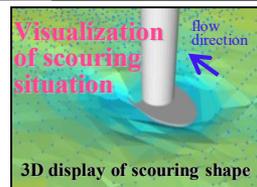
Obtaining 3D data of riverbed topography at pier locations.  
Comparison of cross section of the piers surroundings with bathymetry survey and accuracy verification.



- Accuracy confirmation equivalent to bathymetry survey.
- In present verification, it was possible to measure up to about 6 m in depth (dependent on water quality), the scouring depth error was about 10 cm.
- Study of effective countermeasures from the scouring situation.

Utilization example

“Visualization” of scouring situation by superimposing grasped scouring (3D data) and general drawing of the bridge.

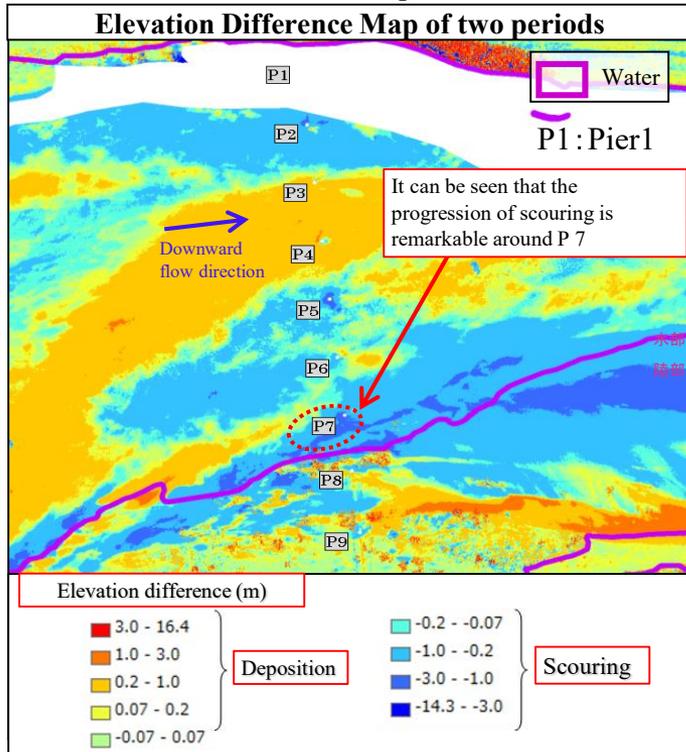


- Efficient measurement of a wide range of riverbed topography and understanding the scour of the pier with high accuracy.
- Contribution towards efficient and effective facility management.

## 4. Calculation of variation amount for two periods

Visualization of differences in river bed variation by calculating elevation difference of two periods of data.

Understanding of the scouring by the amount of riverbed variation around the piers.

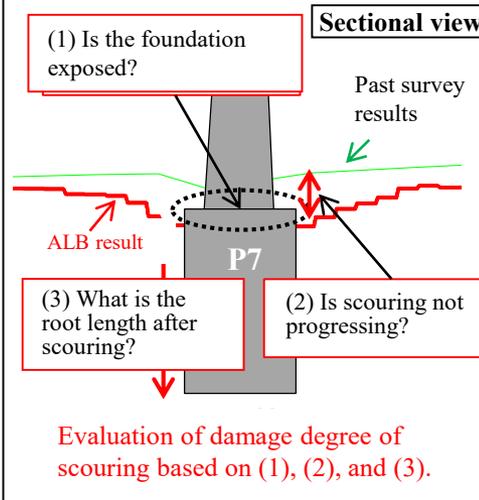


- Selectable piers with prominent scour progression (scouring progresses around P7 in the above figure).
- Study the timing of countermeasures from the progress of scouring.

## 5. Evaluation for extent of damage

Judging the degree of damage evaluation based on the grasped scoured condition and bridge periodical inspection procedure.

### Evaluation logic for degree of damage



- Determining the necessity of detailed investigation and emergency measures by judging the degree of damage.
- Utilization for judging the countermeasure classification.

## Utilization flow of the results

1. Wide range 3D measurement

2. Creation of cross-section at arbitrary position

3. Grasping scouring situation of the piers

4. Calculation of variation amount for two periods

5. Determining degree of damage evaluation

Decision by bridge manager for countermeasure classification

**•Advanced bridge management by utilization for scouring monitoring**

## Numerical target

Cost reduction by 10% in comparison with conventional scouring survey.

## Users

River manager, bridge manager, harbor / beach manager, etc.

## How to use/places of use

Scope of coverage from aerial measurement by installing laser and digital camera equipment on the aircraft.

## Sales method

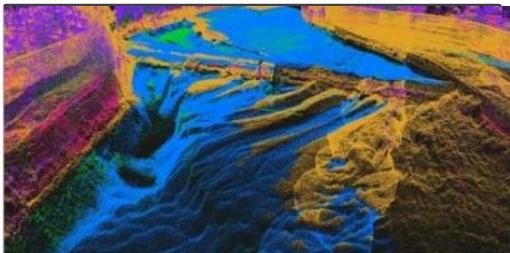
Implementation of proposal activities for ALB measurement technology targeting users.

Service ordering by manager for surveying, scouring investigation.

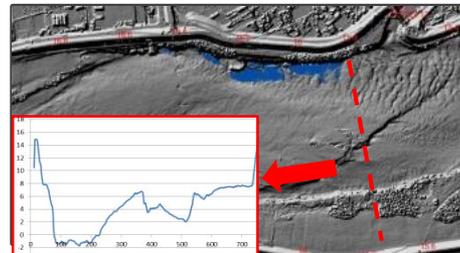
Provision of services such as ALB measurement technology and analysis and evaluation of measurement results, and profit creation.

## Services to Offer

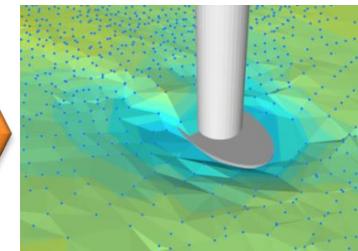
Acquiring 3D topography data for monitoring scour situation around the piers.



Acquisition of high-definition 3D topography data

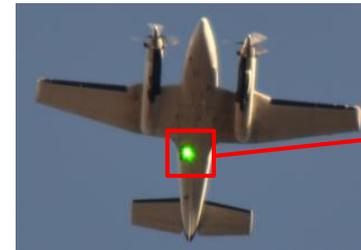


Creation of cross-section at arbitrary position



Monitoring scouring situation

Wishing to investigate bottom topography.  
Wishing to understand the scouring situation.



ALB measurement

Digital camera NIR laser

Green laser



Equipment with ALB

**Efficient comprehension of wide riverbed topography by aircraft**

**→ Utilization of scouring monitoring for the improvement of river management and bridge management**