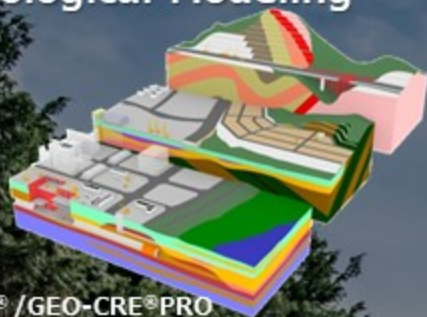


**Find the best answer to the future
of people and the earth.
To realize a sustainable society.**

3D Geological Modeling



**GEO-CRE® /GEO-CRE®PRO
OCTAS® Modeler**

OCTAS Modeler is a system to support the utilization of subsurface information. It helps to grasp the positional relationship of the borehole logs and create various 3D models including borehole, soil, bearing layer, and terrain.

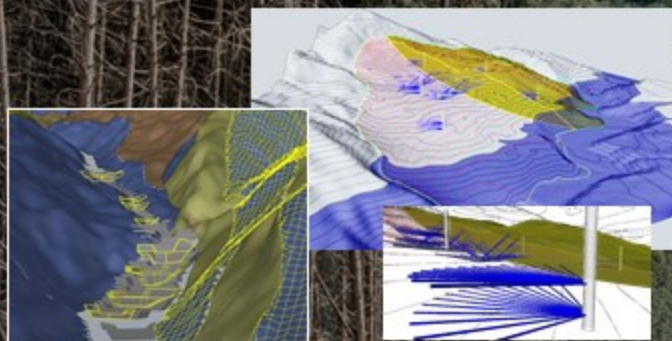


Inclinometer

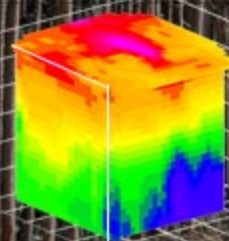


Clino-pole

Tilt sensor for Sediment disaster



3D Geophysical Survey



McSEIS-AT

McSEIS-AT is an epoch-making microtremor exploration system that can measure S-wave velocity structures in three dimensions.



oyo corporation

7 kanda Mitoshiro-cho, Chiyoda-ku, Tokyo
101-8486, JAPAN
<https://www.oyo.co.jp/english/>

Optimization of Landslide Countermeasures -Groundwater Drainage Work- by Using 3D Technologies

Evaluating and verifying arrangements of groundwater drainage facility utilizing information of 3D analysis and exploration

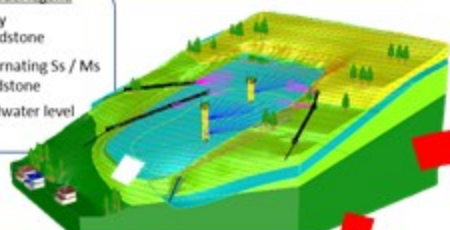
Examining, Predicting and Evaluating in 3D

Plan · Design

3D modeling of landslide / Groundwater drainage facility

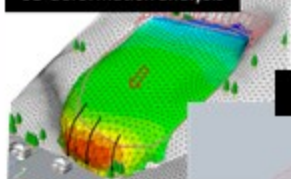
3D model legend

- Geology
- Sandstone
- Alternating Ss / Ms
- Mudstone
- Groundwater level

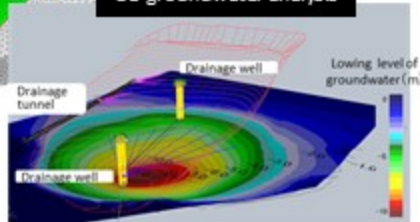


Prediction analysis on countermeasure effect

3D deformation analysis



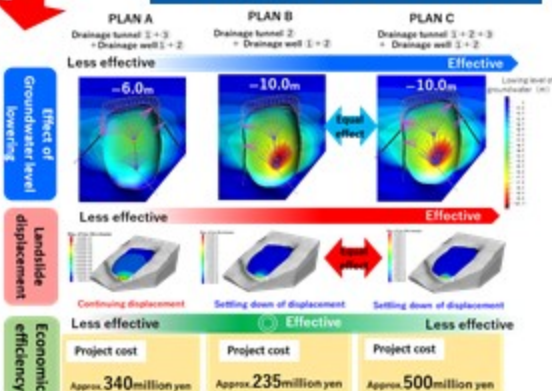
3D groundwater analysis



Examination of 3D layout for facility



Evaluation of cost effect

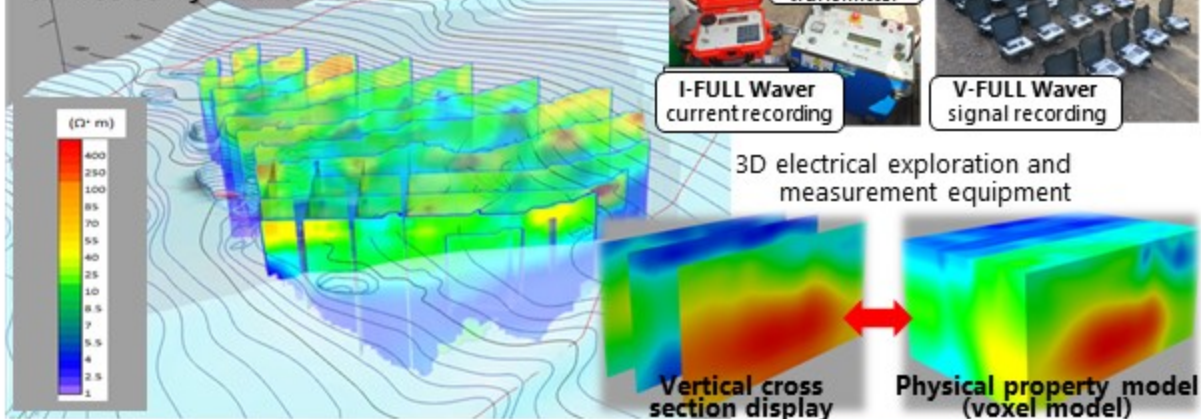


Verifying of Effect

Measuring and Verifying in 3D

Visualization of resistivity distribution by using 3D electrical exploration technology

3D resistivity distribution



By using the differential analysis (4D information) before and after the construction of the countermeasures, 3D verification of the effective range of the countermeasures is also available.

Examination of arrangement of drainage system using 3D analyses on landslide

Confirmation of countermeasure effect using 3D geophysical exploration

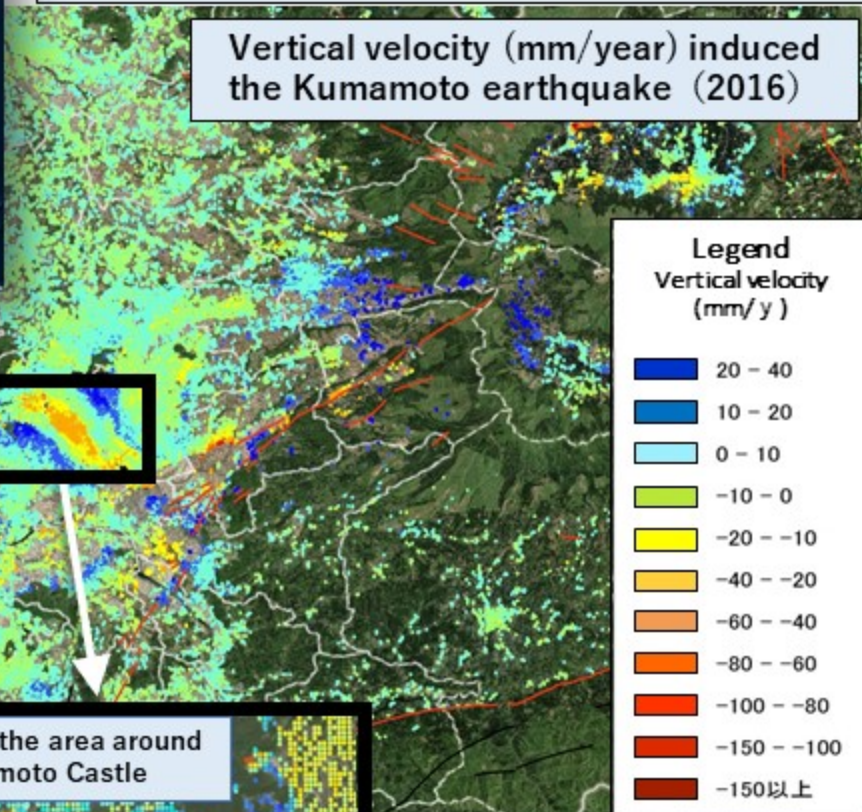
Historical deformation by InSAR analysis

Database of surface deformation all over Japan

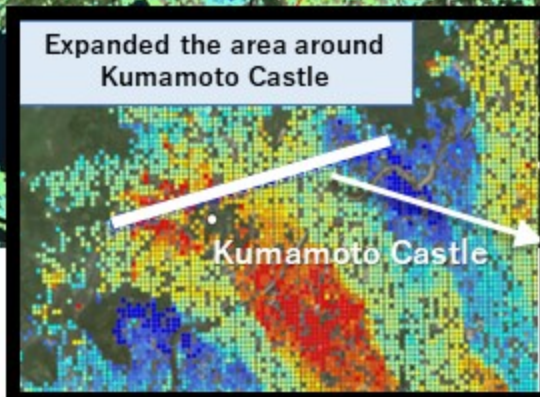


- ◆ Analytical method : SqueeSAR®
- ◆ Analysis items : 2 deformation (LOS direction) of Ascending and Descending
Vertical and east-west component decomposed by using double geometry (30 million points defined)
- ◆ Analysis period : 2015/1-2018/6
- ◆ Satellite : Sentinel-1 C-Band (Resolution 5m×20m)
- ◆ Variable extraction point density : Approximately 5,000 points / km² in urban areas

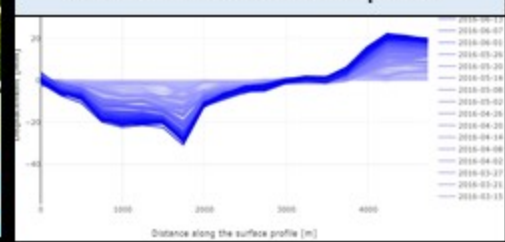
Vertical velocity (mm/year) induced the Kumamoto earthquake (2016)



Expanded the area around Kumamoto Castle



Cross section of vertical component



SqueeSAR® is a proprietary multi-interferogram technique of TRE ALTAMIRA (Ferretti, 2014; Ferretti et al., 2011).

Wide area ground change management proposed by OYO

- The forecasting of deformation in the future by historical deformation and engineering.
- Infrastructure management by wide and high - density monitoring.
- Used to monitor fluctuations in difficult-to-access areas
- Risk assessment; selection of priority monitoring and inspection points
- Non-contact observation of restricted areas

Hazard Mapping Sensor

~Remote monitoring of slope and water level~

Surface Inclinator "Clino-Pole"

Contributes to the **efficient maintenance of slopes** by detecting the tiny displacement of the slope accurately.



<Application>

- Monitoring of the displacement of the landslide, riverbank and dam site.
- Safety countermeasures of slopes along the roads and highways

<Features>

- Accurate data collection **without being affected by temperature**
- **Efficient installation** (make a $\phi 26$ hole with 1m depth)
- Measuring parameters; degree (x,y) and temperature ($^{\circ}\text{C}$)
- **Remote setting and upgrading a firmware by FOTA**
- **5 years durability** with internal lithium battery

<Cloud service>



Flood sensor "Kan-switch"

Contributes to the **efficient countermeasures** by detecting flooding remotely and promptly alerting to the administrator.



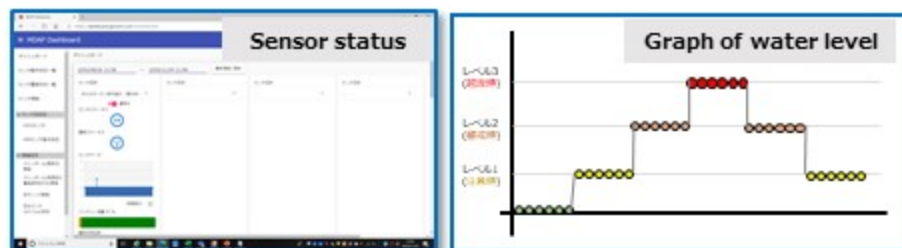
<Application>

- Detection of the inundation inside the levee
- **Monitoring the water level of the river concerning flooding**

<Features>

- Automatic notification of the flooding information is by e-mail to the administrator once the sensor detects water.
- 3 sensors availability with 1 communication unit at maximum, and each sensor can detect the water level corresponding to the its installing positions.
- **Remote changing** setting and upgrading a firmware by FOTA
- **5 years durability** with internal lithium battery

<Cloud service>

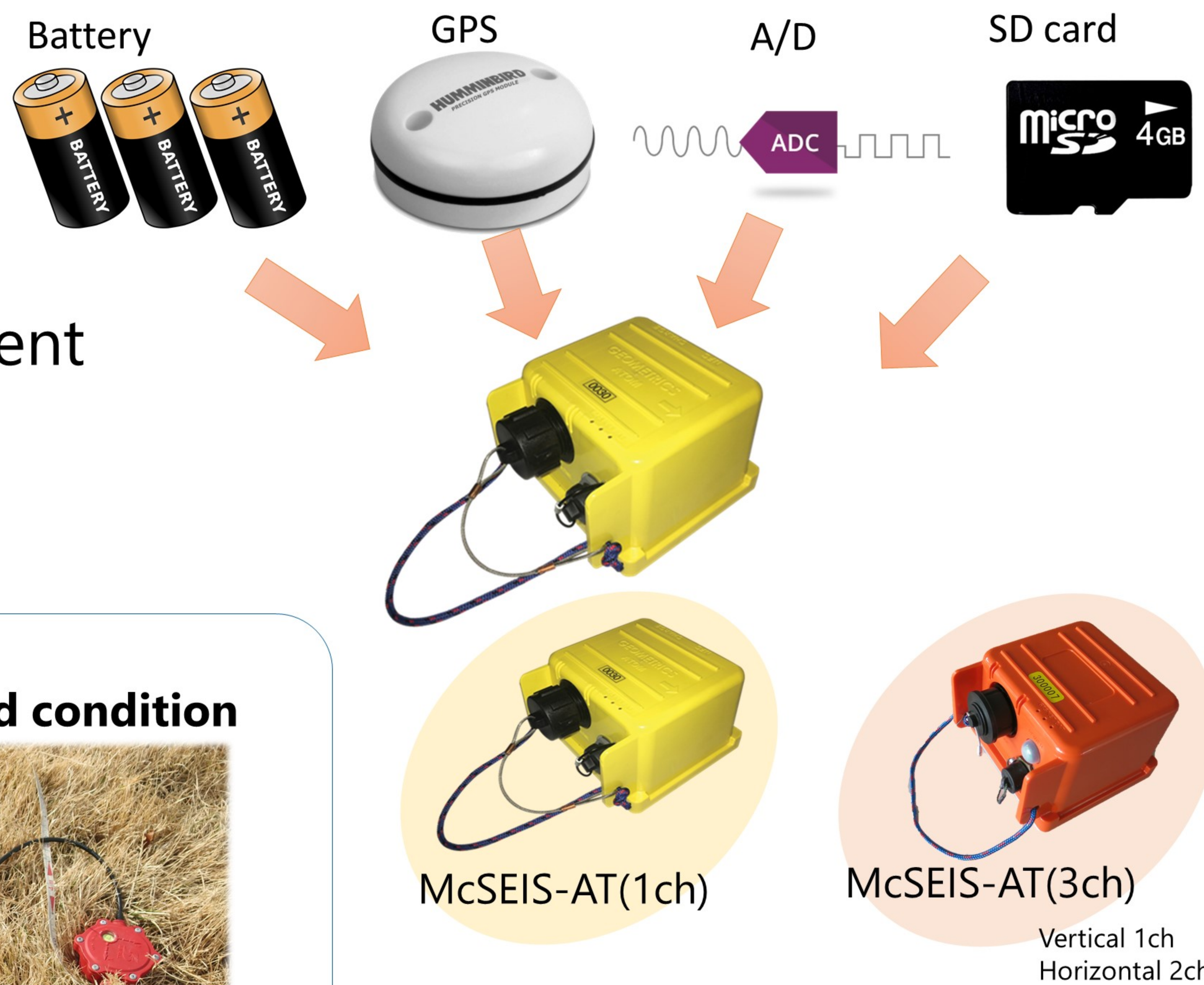


OYO

Cableless Seismograph McSEIS-AT (1ch, 3ch)

Feature of McSEIS-AT

- Efficient measurement by Cableless system
- Time synchronization by GPS
- 70 hours continuous measurement
- Data collection by Wi-Fi
- Wide range of application by combination with 1ch & 3ch



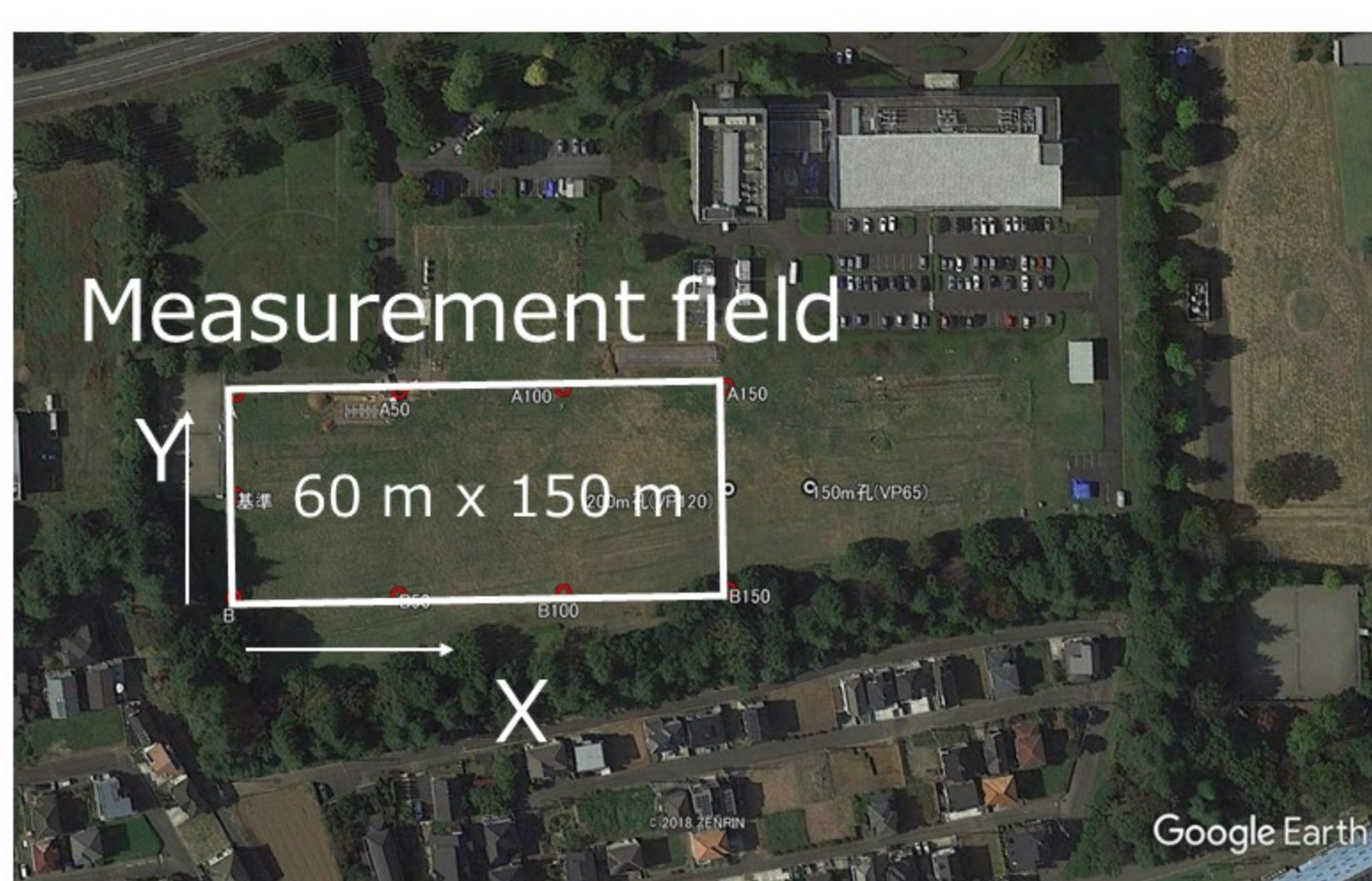
Available for the deployment
on both soft and hard ground condition



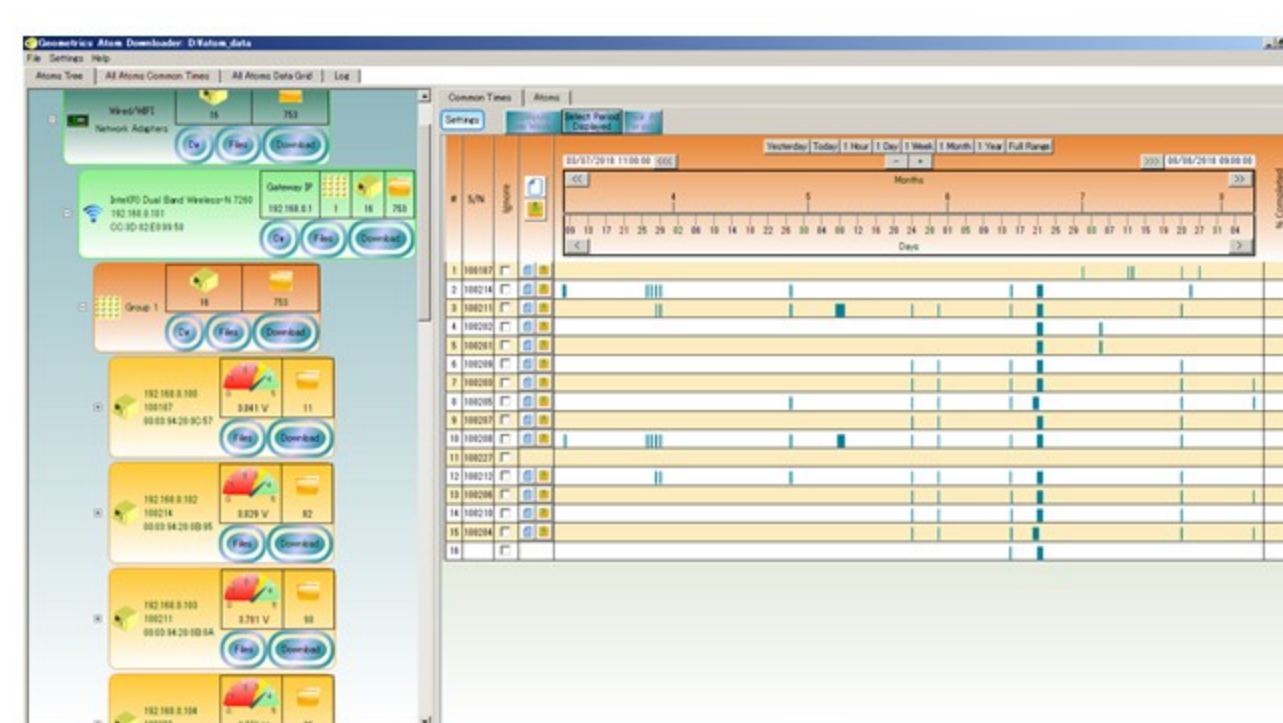
Specification of McSEIS-AT

Components	1ch, 3ch
A/D	24 bit
Gain	0,12,24,36 (dB)
Sample rate	0.25, 0.5, 1,2, 4, 10 (ms)
Input impedance	20 (kΩ)
Data collection	4GB SDcard
Dimension	L: 142 x W: 140 x H: 102 (mm)
Weight	1.6 (kg)

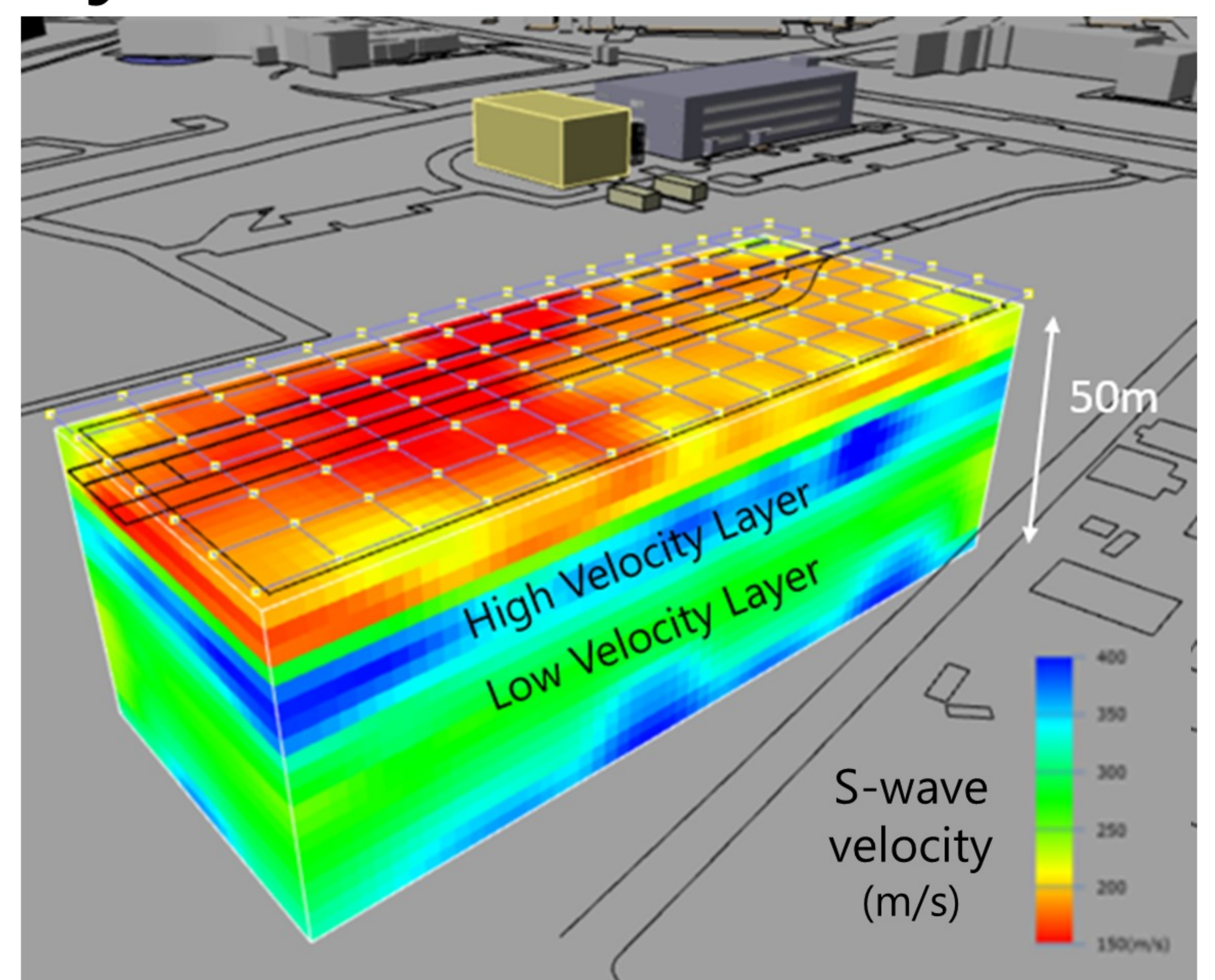
Procedure from the measurement to the data analysis



① Deploy McSEIS-AT



② Collect data by Wifi



③ Interpret 3D data
(3D S-wave velocity model)