

# JAMSTEC trial of 11,000m UROV



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**JAMSTEC**

<http://www.jamstec.go.jp/>



30th Anniversary Meeting

**International Research  
Ship Operators 2017**

# Today's presentation consists of four main topics

## Main Topics

1. Background technology of UROV system
2. Outline of UROV11K system
  - Development purposes and specification
  - Operation
3. Advanced technology as underwater 4K camera and 100G optical transmission system
4. Sea trial in the Mariana Trench
  - Vehicle reached the deep sea floor (**10,901 meters**)

# Topic 1. Background technology of UROV system

## WHAT IS "UROV" SYSTEM ?

- UROV (Untethered Remotely Operated Vehicle)
- 1 mm diameter fiber optic cable type ROV system
- History of development have began in JAMSTEC since the 1990's

example UROV : 7000 m class "UROV7K" (1998)

## WHAT IS CHARACTERISTIC ?

- Cable system become compact  
"Spooler" can store 10 km of fiber optic cable with 1 mm diameter like fishing reel



Dimension : 1m(L) × 20cm(D)  
weight in Air : 13 kg  
Optical cable : 10,000 m

1 mm diameter optical fiber

UROV7K (1998)

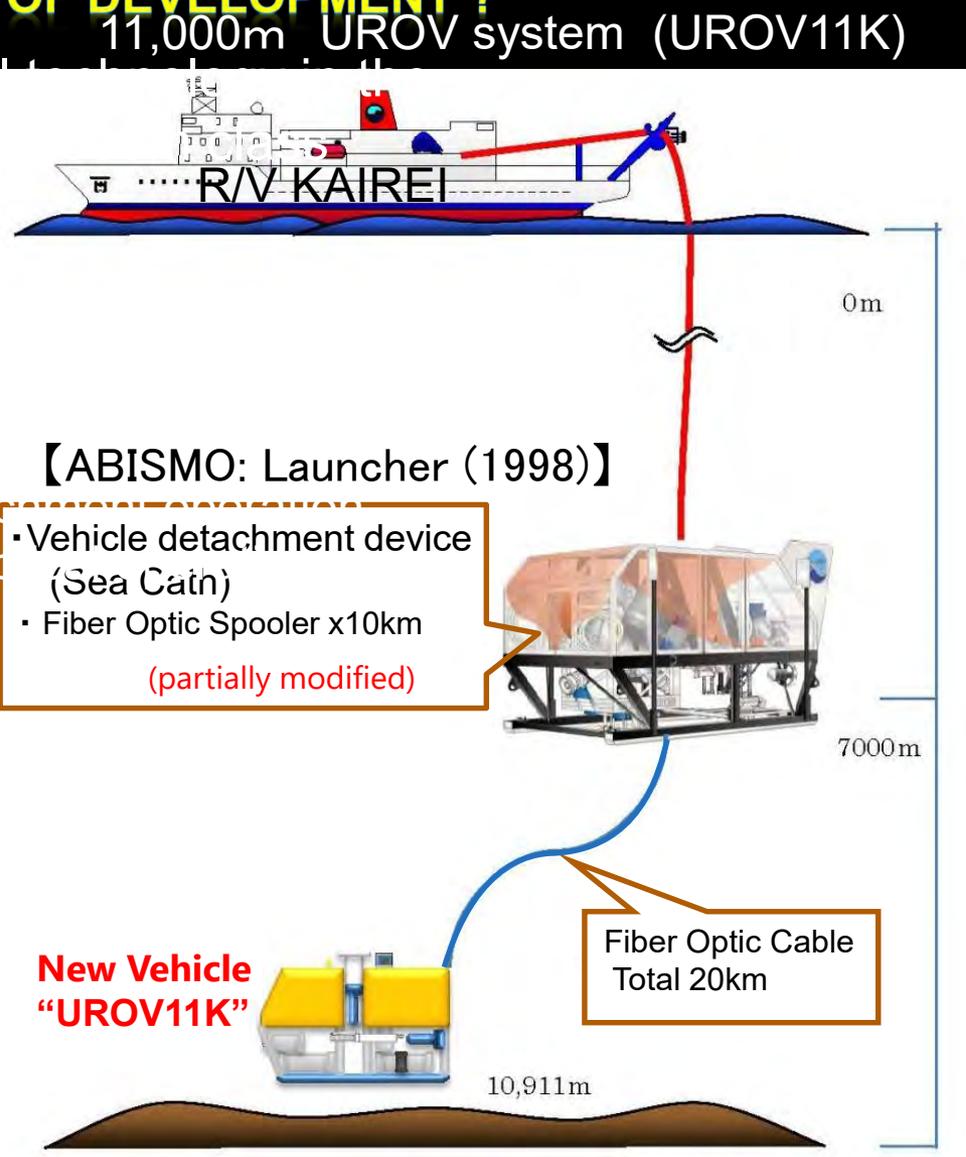


- Vehicle can swim freely without cable tension

# Topic 2. Outline of 11,000m UROV system (UROV11K)

## WHAT IS PURPOSE OF DEVELOPMENT ?

- To test elemental technology for the development of UROV "KAIKO"
- 4K real-time transmission
- To test the full-depth UROV method
- underwater detachment
- full-depth fiber optic



## WHAT IS RESEARCH

- Geoscience survey observation in the

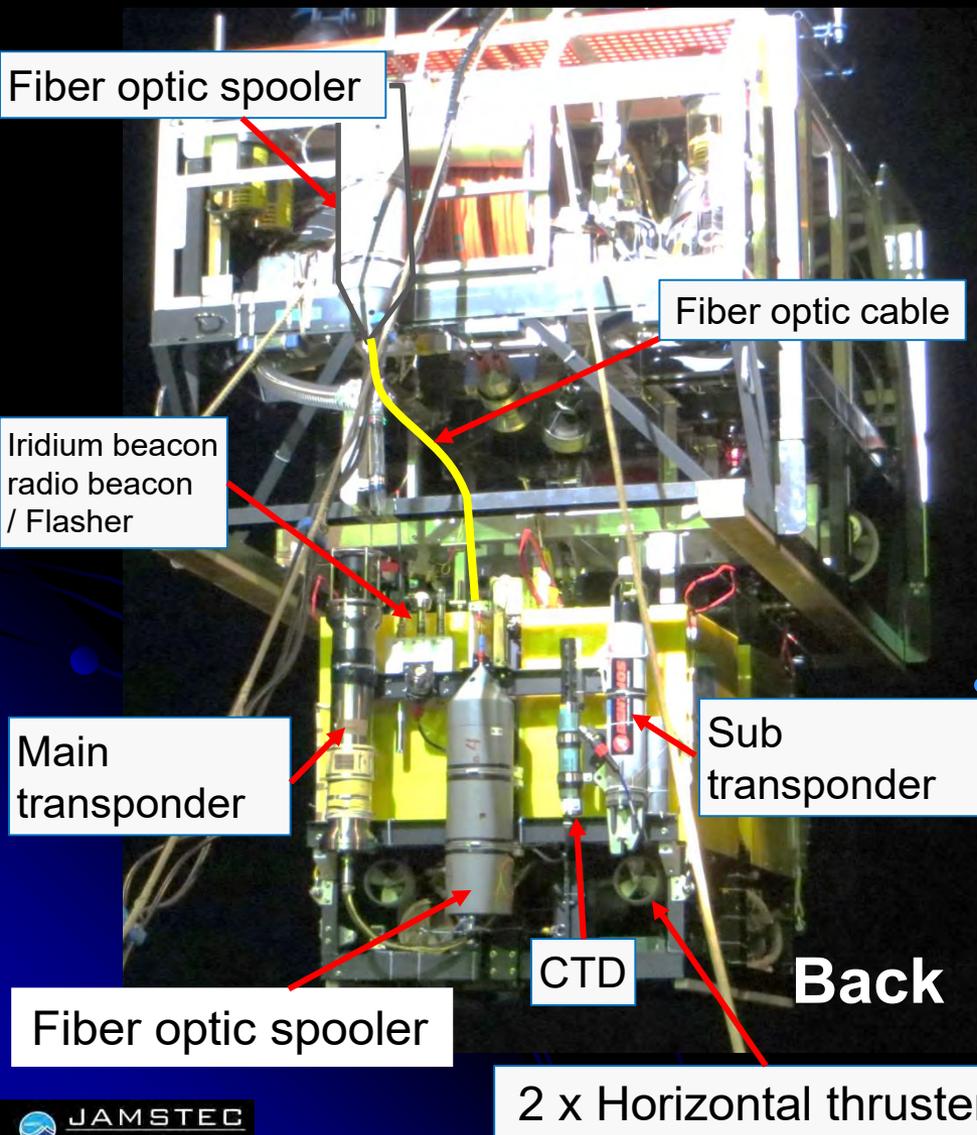
## OUTREACH ACTIVITY

- Cooperation of provincial special TV program

# Topic 2. Specification of UROV11K system

## ABISMO LAUNCHER

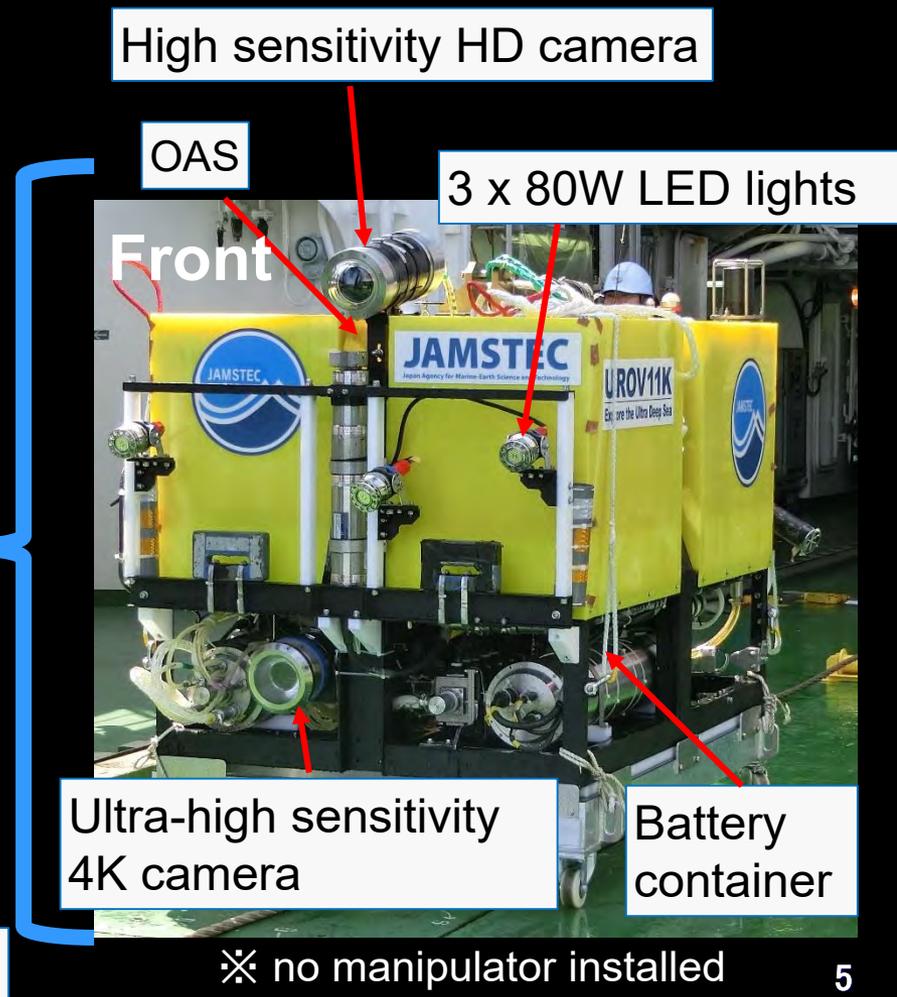
3.3m × 2.2m × 1.9m, 2 tons



## UROV11K VEHICLE

Dimension

1.7 m(L) × 1.2 m(W) × 1.4 m(H), 1.2 tons



## 1. Launch / Descend



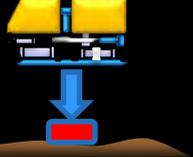
## 2. Detach vehicle at 7000 m depth



## 3. observation



【 UROV11K vehicle 】



Neutral Buoyancy  
(by released ballast)

## 4. Ascend

【 R/V KAIREI 】



【 ABISMO launcher 】



【 UROV11K vehicle 】



10,900 m

releases ballast

Cut off a fiber optic cable

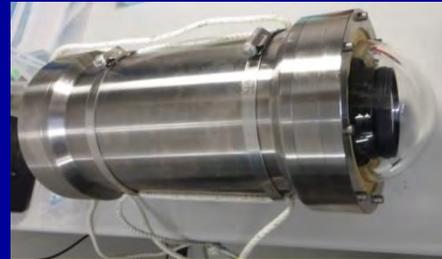
## 5. Recovery Launcher / vehicle



# Topic 3. Overview of Advanced technology

## ULTRA-HIGH SENSITIVITY 4K CAMERA SYSTEM

Parts made by 3D printers



4K camera unit:  
SONY UMC-S3C

Dimension 395mm(L) × 170mm(D)  
Weight 20kg (in air) 11kg (in water)

4K camera feature

- Ultra-High 409,600 ISO Rating
- 4K resolution 3840 x 2160 pixels
- 10x Optical Zoom
- 10 Gbps optical transmission

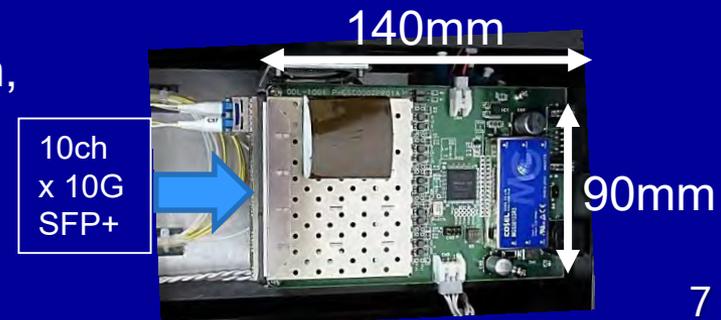


Sea floor video image of 10,900 m depth of the Mariana trench

## COMPACT 100G DWDM OPTICAL TRANSMISSION MODULE

- Optical transmission speed up to 10Gbps x 10ch, total 100Gbps is possible.
- Compact size

Dimension: 140mm(L) × 90 mm(W) × 30mm(H)  
LASER wavelength : 1550 nm



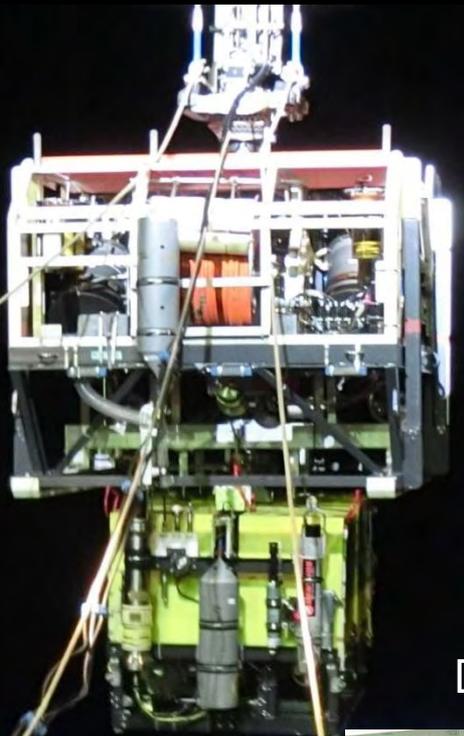
# Sea trial in Mariana Trench (KR17-08C)

May 14, 2017 Dive No.7

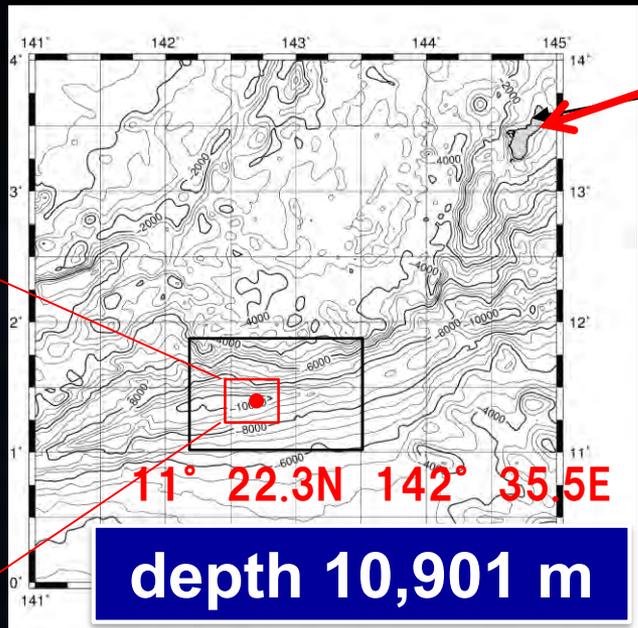
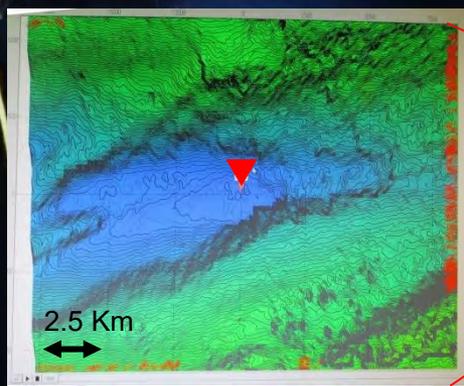
6.5 hours

- 4:18 Launch
- 7:15 7,000 m reached
- 7:57 Vehicle released
- 10:53 reached the sea floor (10,897m)  
Observation
- 11:22 leave the sea floor (10,901m)  
released the ballast and ascend

22:00 (around)  
Vehicle stopped ascending at 5,320m depth



Dive point



**GUAM**

**depth 10,901 m**



# Sea trial in the Mariana Trench

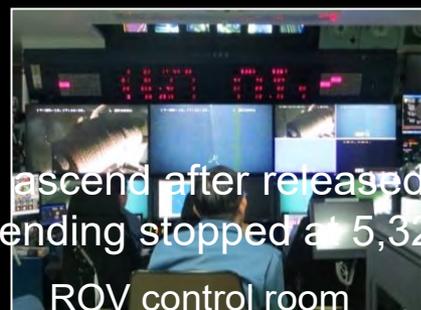
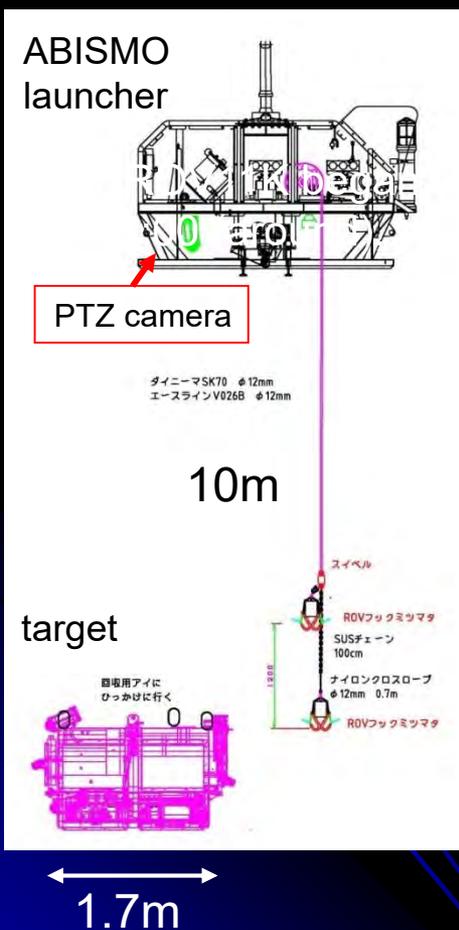
May 14, 2017

Dive No.7

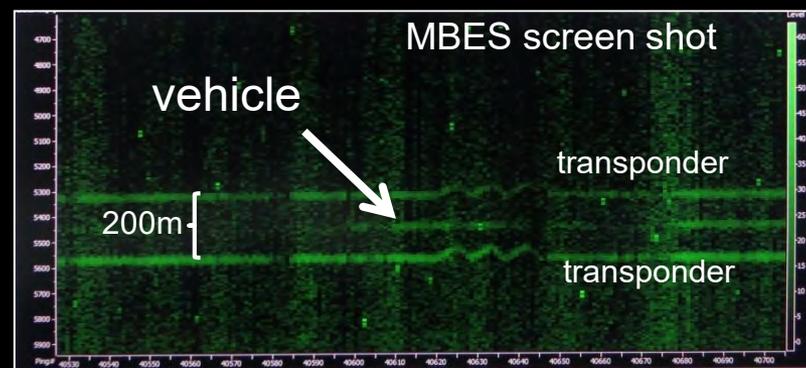
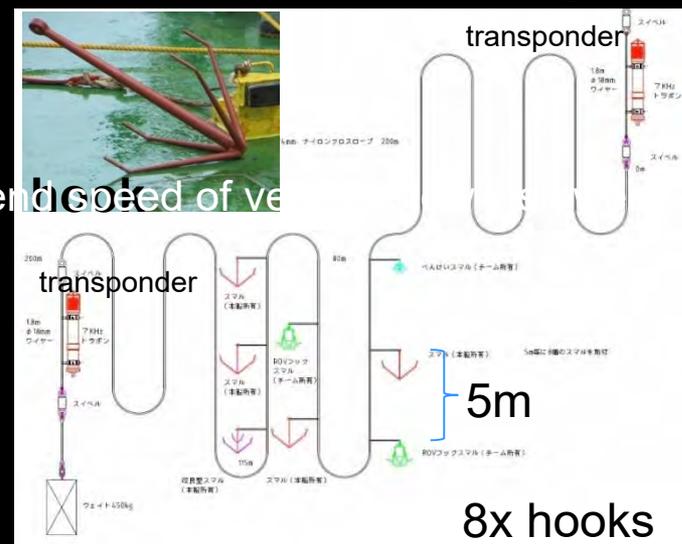
Video movie of sea trial

# Search operations for missing vehicle

## 1. Search operation on May 16



## 2. Search operation on May 18



We searched for missing vehicle, but vehicle couldn't be recovered from 5,320m depth.

We are looking into the cause of the accident.

# CONCLUSIONS

## Results of sea trial in Mariana Trench

- UROV11K vehicle was succeeded to reach the sea floor (10,901 **meters**) by using "UROV system".
- Small creatures on the deep sea floor were taken by real-time 4K video transmission.

Sea cucumbers ... over 30, Benthic amphipods ... 7, ( Fishes ... not found )

### Future Plans:

- 100G optical transmission system will be mounted on the "KAIKO Mk-IV" to underwater video test for the "Super Hi-Vision 8K camera system" in February 2018.
- In the near future,  
We are planning to dive by "KAIKO" at Challenger Deep of Mariana Trench again.

Thank you very much for your kind attention.

