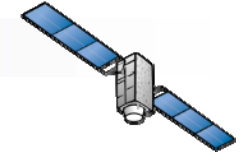


# Quasi-Zenith Satellite System



Office of National Space Policy,  
Cabinet Office, Government of Japan

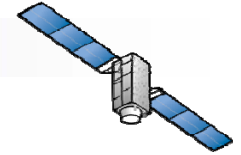
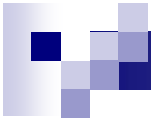
## QZSS Overview



# Quasi-Zenith Satellite System

- **Functional Capability:**
  - GNSS Complementary
  - GNSS Augmentation
  - Messaging Service
- **Coverage:** Asia and Pacific region
- **Signals:**
  - L1C/A, L1C, L2C and L5
  - L1S (L1-SAIF) on 1575.42 MHz
  - L6 (LEX) on 1278.75MHz
- **First QZSS satellite “MICHIBIKI”**
- **Four satellites constellation shall be established and the service will start in 2018.**



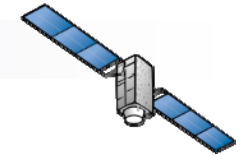


# *Timeline of QZSS (planned)*

FY	2012	2013	-----	2016	2017	2018	2019	-----	-----	2031	2032	
		<b>Development (~6 years)</b>										
						<b>Operation (15 years)</b>						

## QZSS Functional Capability 1

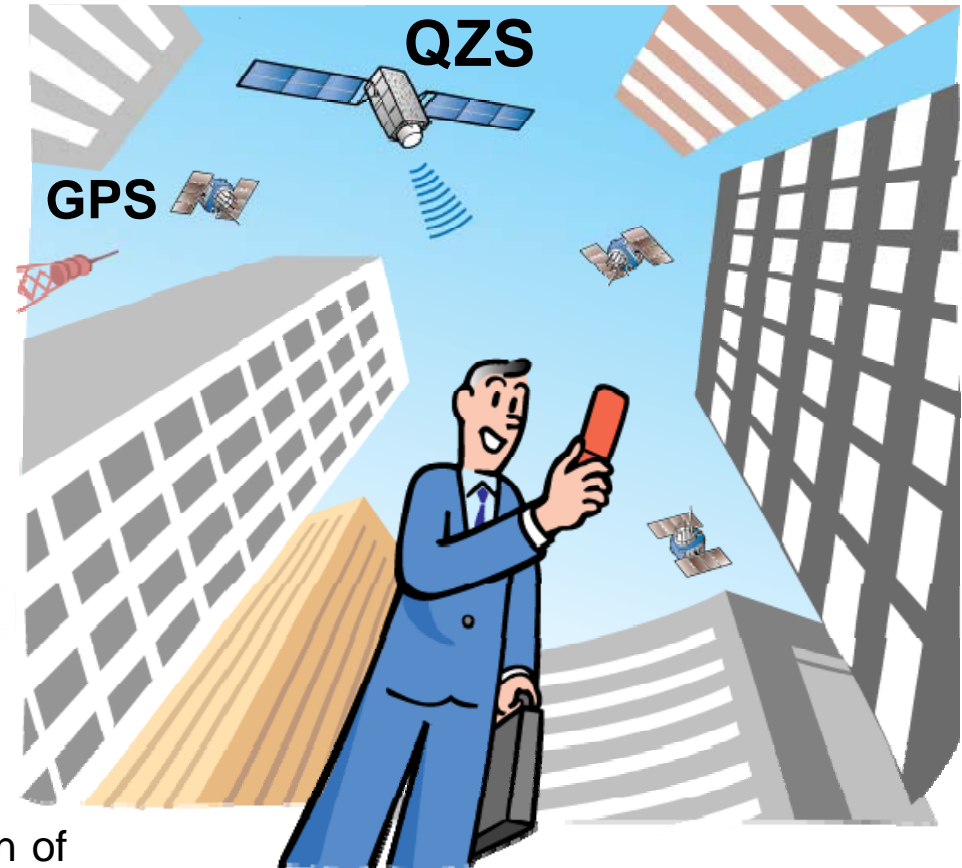
# GPS Complementary



**QZSS improves positioning  
availability time**

Navigation signals L1-C/A, L1C, L2C, and L5 sent from high elevation will improve the time percentage of positioning availability from 90 % (GPS only) to 99.8 % \* (GPS + QZSS.)

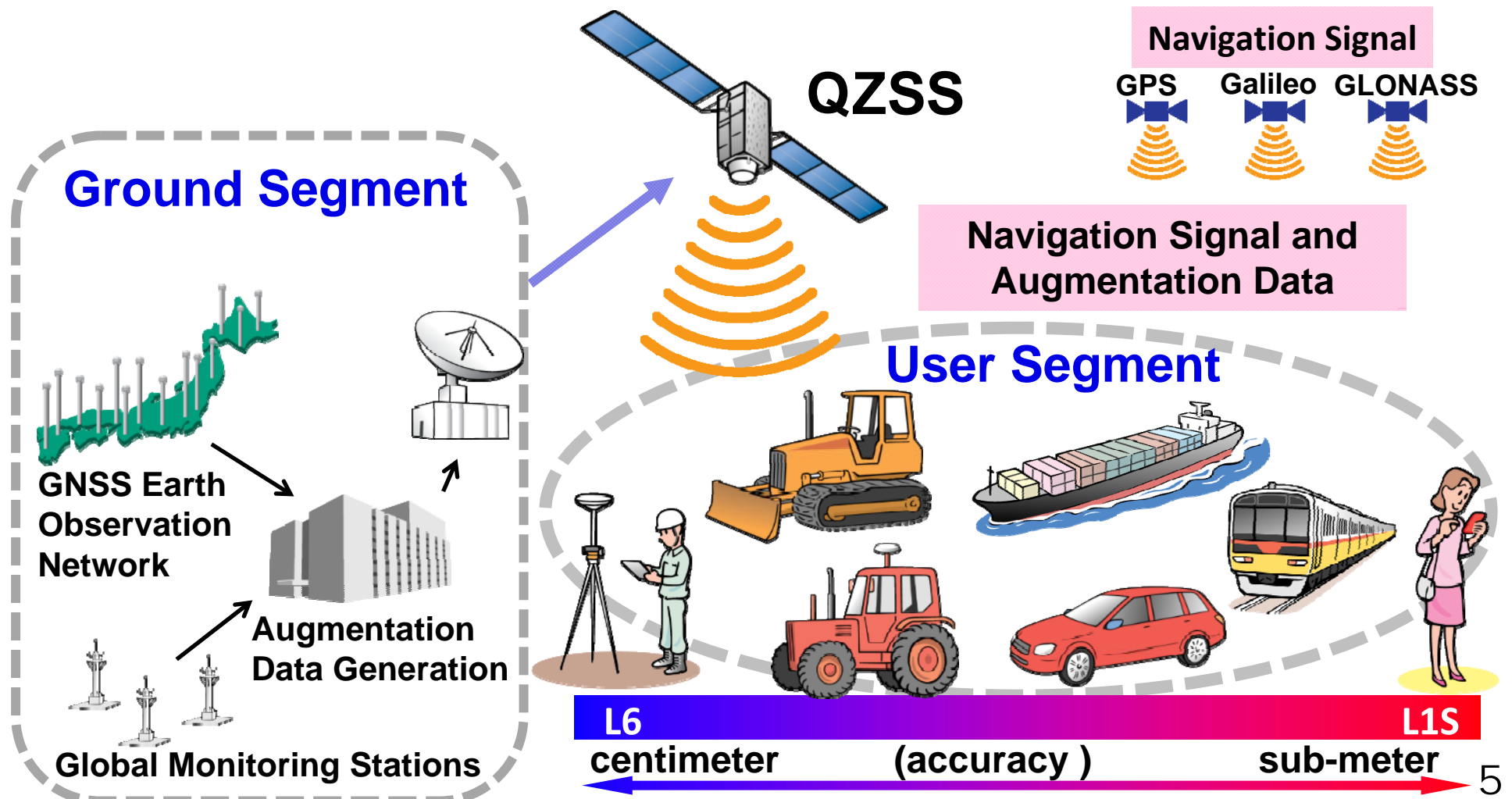
\* The time percentage that the position dilution of precision (PDOP) is less than 6 when a satellite whose elevation angle is 20 degrees or over is used for positioning calculation.



## QZSS Functional Capability 2

# GPS Augmentation

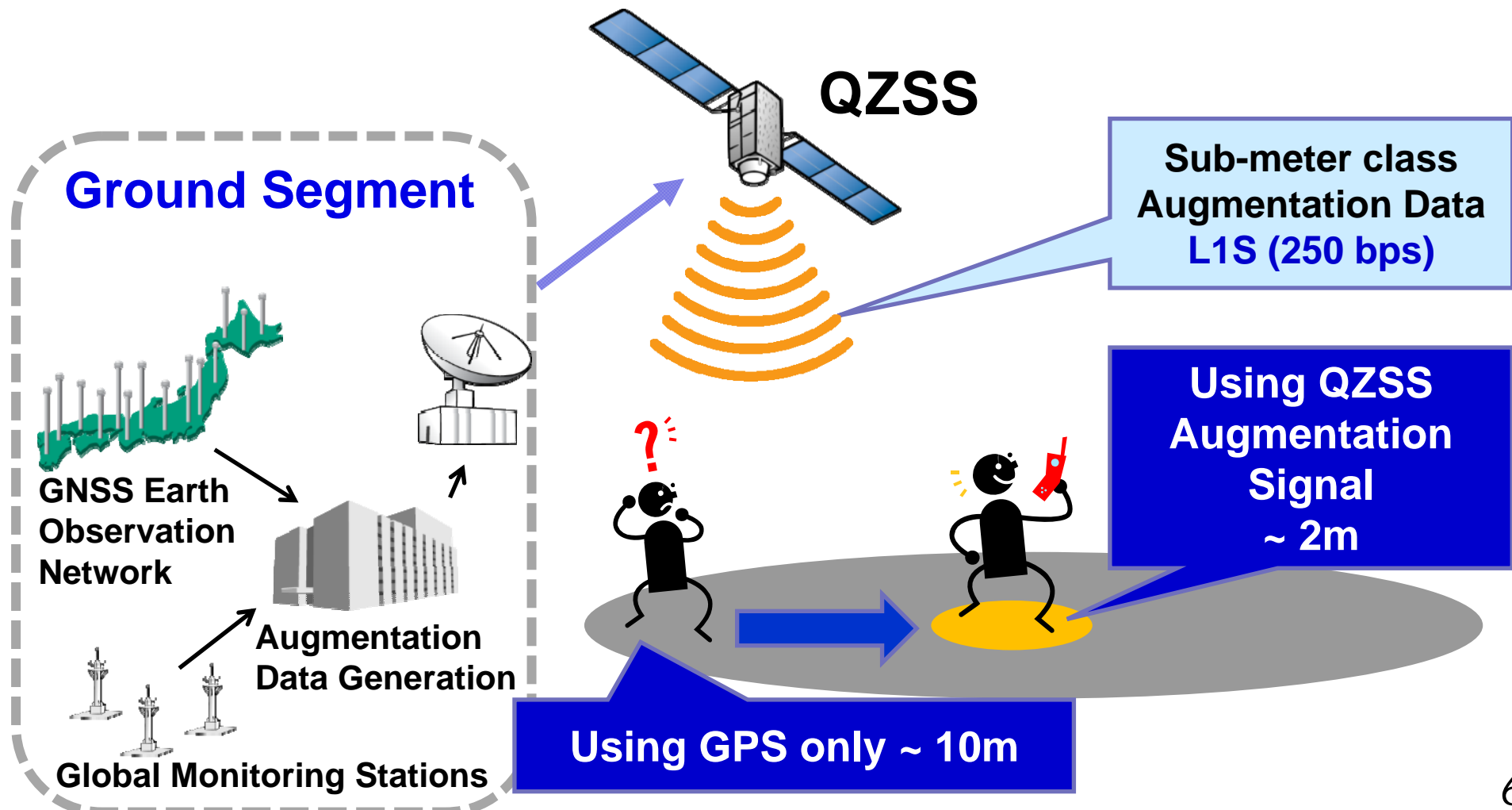
QZSS improves **positioning accuracy and reliability**



## QZSS Functional Capability 2

# GPS Augmentation

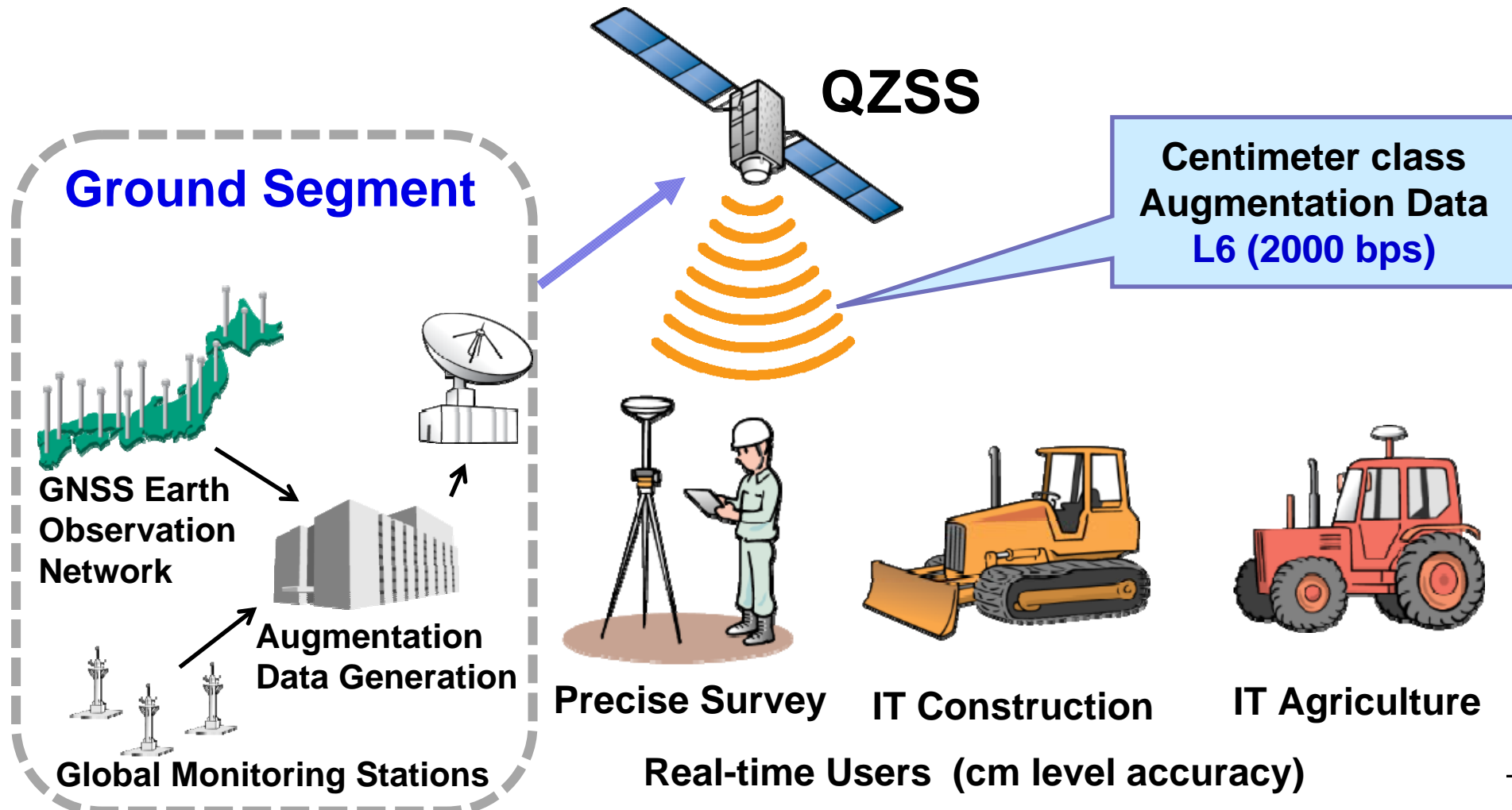
## Sub-meter Class Augmentation



## QZSS Functional Capability 2

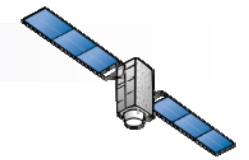
# GPS Augmentation

## Centimeter Class Augmentation



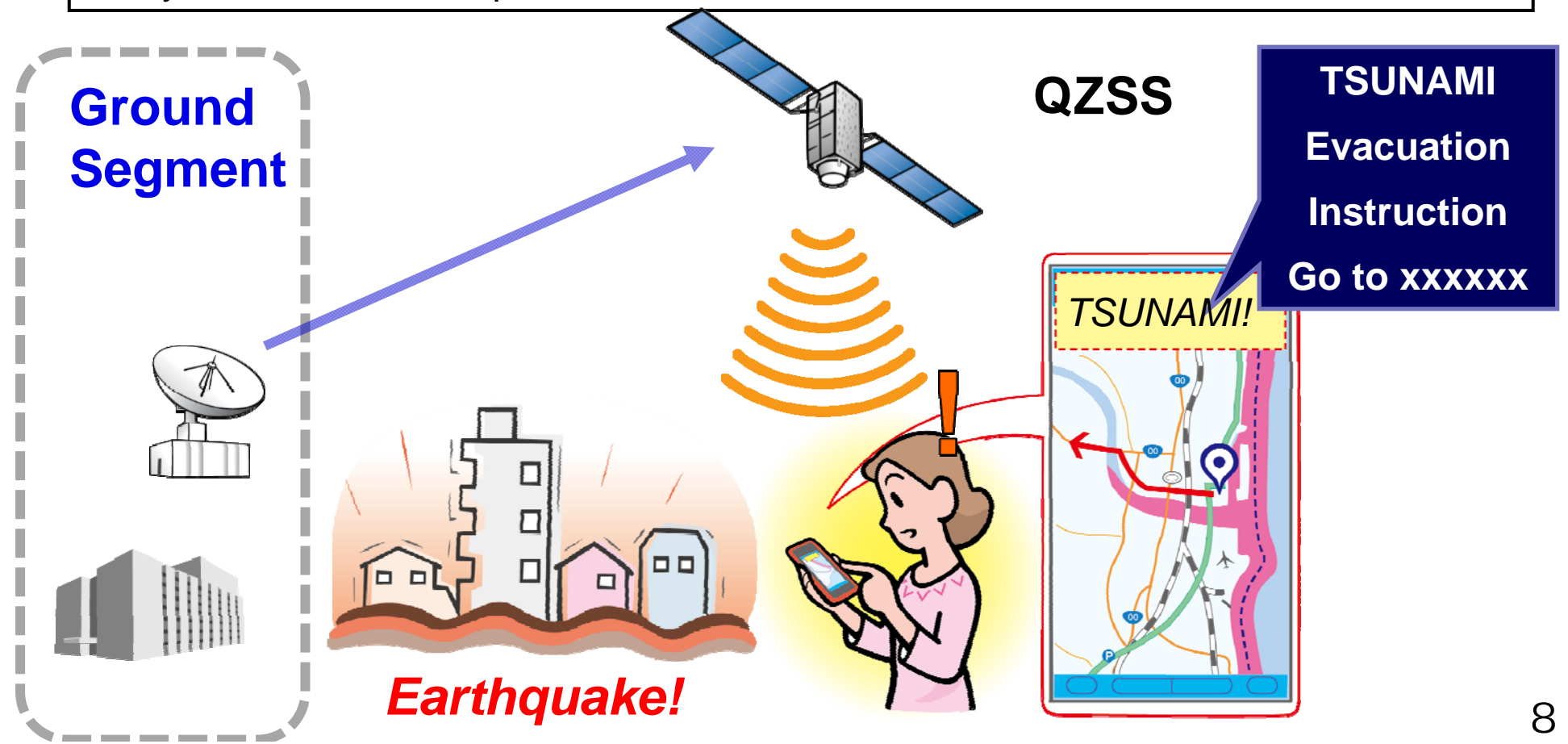
# QZSS Functional Capability 3

## Messaging Service



### QZSS can send short messages

- QZSS can send short messages such as emergency warnings simultaneously to everyone with a mobile phone.





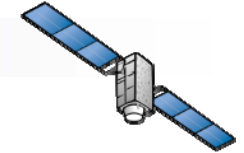


# QZSS Update

- ***Basic policy on the implementation of the operational QZSS project*** (*Cabinet Decision on September 30, 2011*)
  - The Government of Japan has decided to accelerate the deployment of the operational QZSS as expeditiously as possible.
- ***Verification of QZS-1 MICHIBIKI***
  - Technical Verification by JAXA
  - Application Verification by private companies

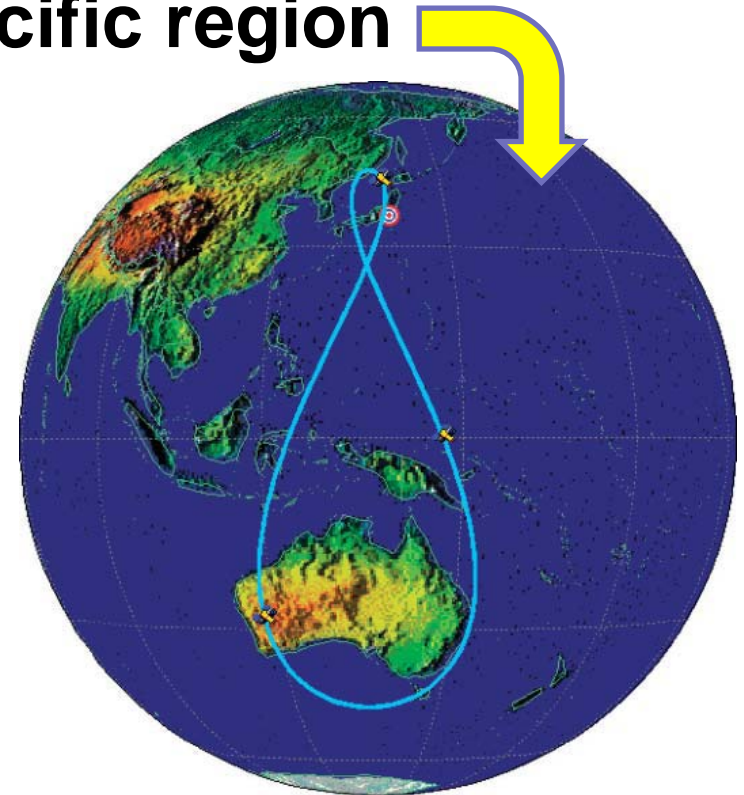
# ***Basic policy on the implementation of the operational QZSS project (1)***

*Cabinet Decision on September 30, 2011*

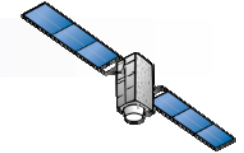


## **The QZSS will contribute to**

- **Welfare of the Asia and Pacific region**
- **Broad range of security**  
including the improvement  
the capacity to respond to  
natural disasters



**QZSS Satellite Ground Track**

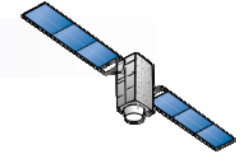


## ***Basic policy on the implementation of the operational QZSS project (2)***

*Cabinet Decision on September 30, 2011*

- **GOJ has decided to accelerate the deployment of the operational QZSS as expeditiously as possible.**
- **Four satellites constellation shall be established by the late 2010s.**
- **In the future, seven satellites constellation shall be completed to enable sustainable positioning.**
- **The Cabinet Office shall develop, deploy and operate the operational QZSS, based on the achievement of the first QZSS satellite MICHIBIKI, and shall submit a budget request to cover relevant cost.**
- **Legal amendments shall be made in order for the Cabinet Office to fulfill such a role in time for budget implementation.**

# QZSS Technical Verification of QZS-1 MICHIBIKI

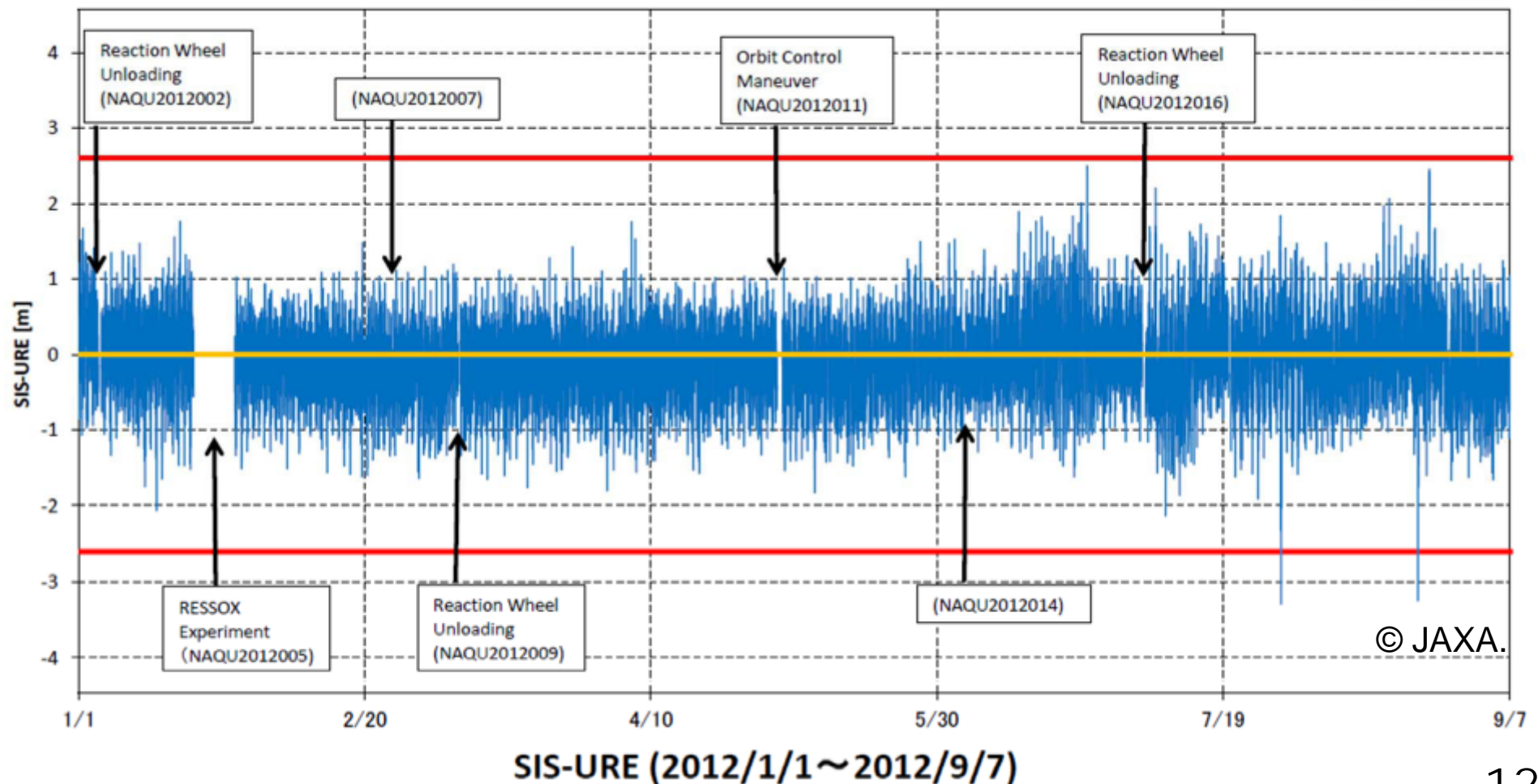


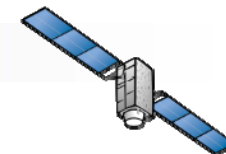
## Accuracy : Signal-in-space User Range Error (SIS-URE)

MICHIBIKI SIS-URE meets its specification, within +/- 2.6m (95%).

Its SIS-URE(RMS) is about 40cm & less than that of GPS's target, about 90cm\*.

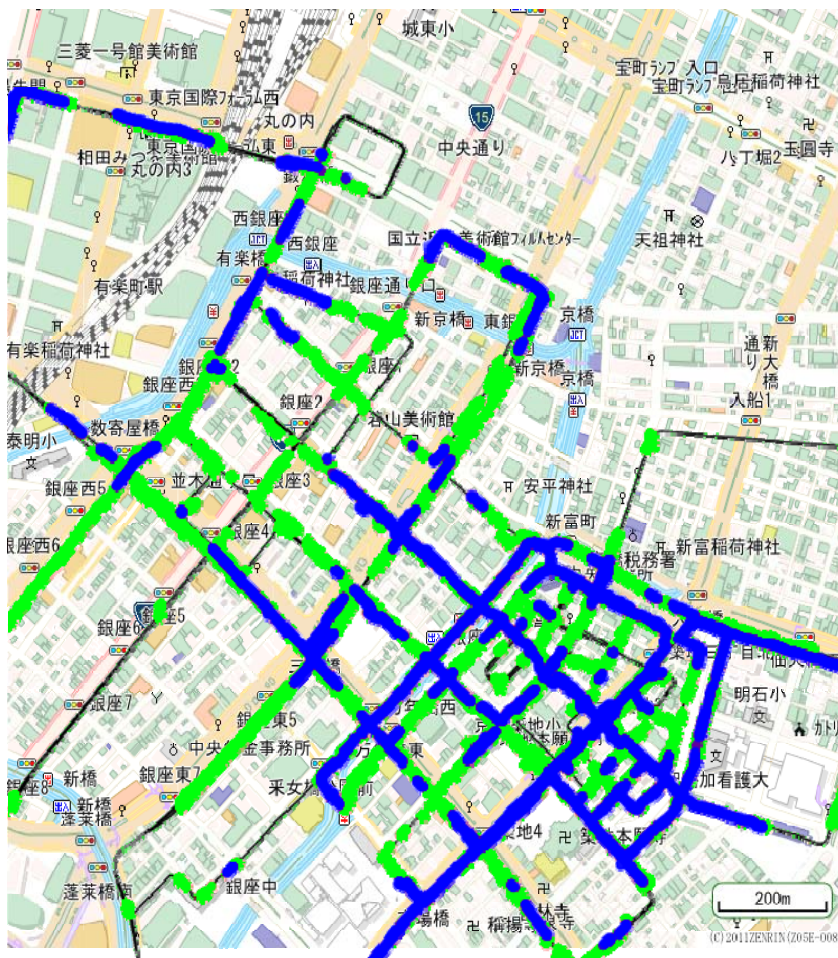
(\*refer to GPS Program Update to CGSIC 2011)





# QZSS Technical Verification of QZS-1 MICHIBIKI

## Availability Improvement in Ginza, Tokyo (Feb. 19, 2011)



© 2011ZENRIN (Z05E-008)

- Reference route
- Positioning result of GPS stand-alone use
- Positioning result of GPS+QZSS combination use

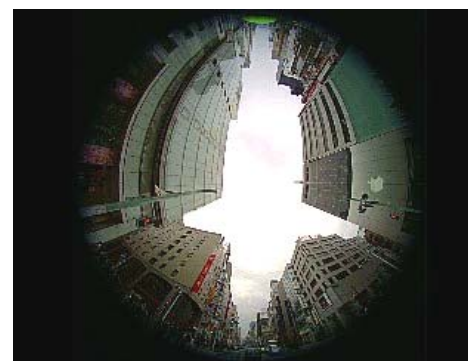
Date of Observation: 2011/2/19  
250 minutes driving observation data  
during 6:00-12:30 obtained under JAXA-  
Melco joint research experiment

Single Frequency DGPS positioning  
Availability

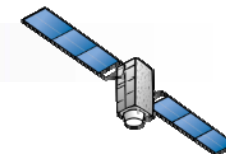
**GPS: 39.5%**



**GPS+QZSS: 69.1%**

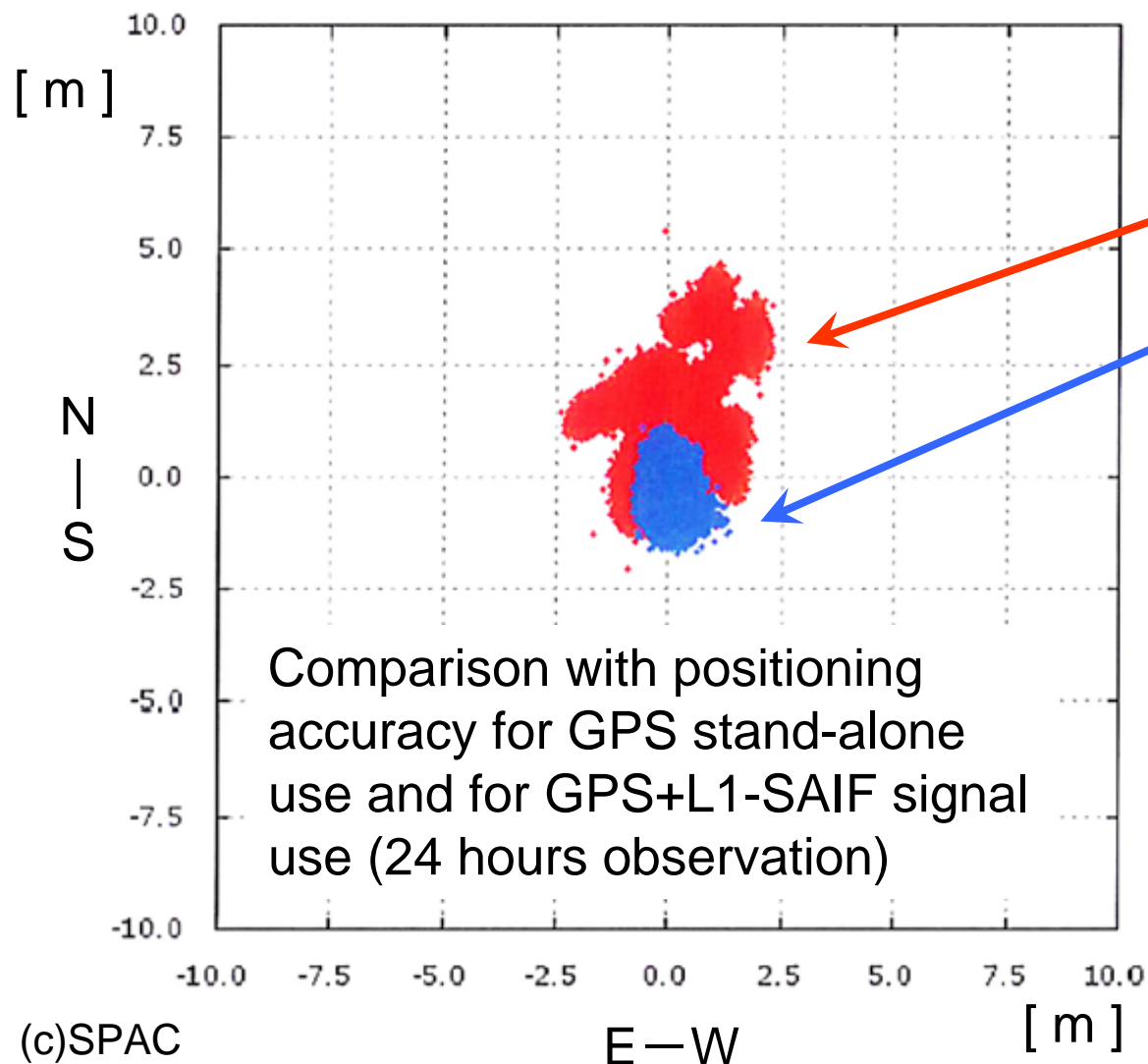


© JAXA.



## QZSS Technical Verification of QZS-1 MICHIBIKI

### Accuracy Improvement using augmentation signal L1-SAIF from MICHIBIKI



Positioning Error(RMS)

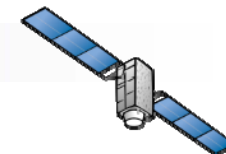
Horizontal	
GPS Only	1.56m
GPS+L1-SAIF	0.46m

Vertical	
GPS Only	3.85m
GPS+L1-SAIF	0.57m

\* Observation Point  
GPS-based control station  
in Kawagoe, Japan, 5/3/2011

\* SAIF : Submeter-class Augmentation with Integrity Function, conformable to SBAS signal



## *Master Plan of QZSS*

- **The Cabinet Office shall develop, deploy and operate QZSS.**
- **Four satellites constellation shall be established and the service will start in 2018.**
- **The four satellites constellation will consist of three QZSs (IGSOs) and one GEO satellite.**
- **In the future, seven satellites constellation shall be completed to enable sustainable positioning.**