



High Precision Applications with BeiDou

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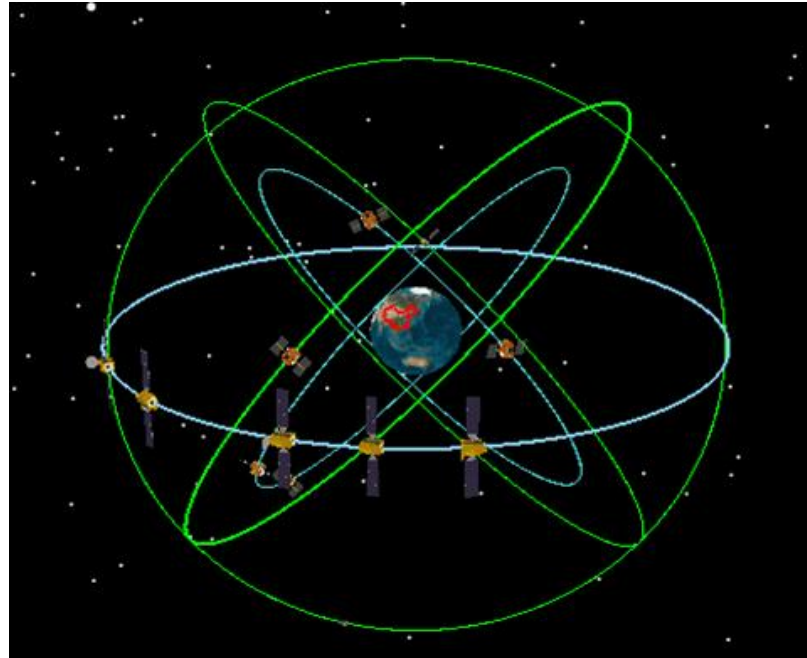
2 Overview of BeiDou high precision products

3 Applications of BeiDou high precision products

4 Summary

Background

- BeiDou: Full Operational Capability for China and surrounding area since Dec 27, 2012.



Background

- BeiDou System Contributions
 - Support tri-frequency applications
 - New services on communications
 - Short Message Service (RDSS function)
 - More satellites and better frequency diversity
 - 14 more satellites
 - more signal components and more modulations
 - GEO satellites can improve availability and TTFF

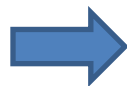
Overview of BeiDou high precision products

用心 领跑北斗产业化

Surveying
CORS
...



BDS B1/B2/B3
GPS L1/L2/L5
GLONASS L1/L2
GALILEO E1/E5a/E5b

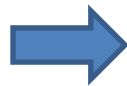


RTK
Heading
DGNSS
...

GIS
...



BDS B1
GPS L1
GLONASS L1
GALILEO E1



DGNSS
...

Overview of BeiDou high precision products

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RTK Rx



CORS Rx



BDS B1/B2/B3
GPS L1/L2
GLONASS L1/L2



GIS Products

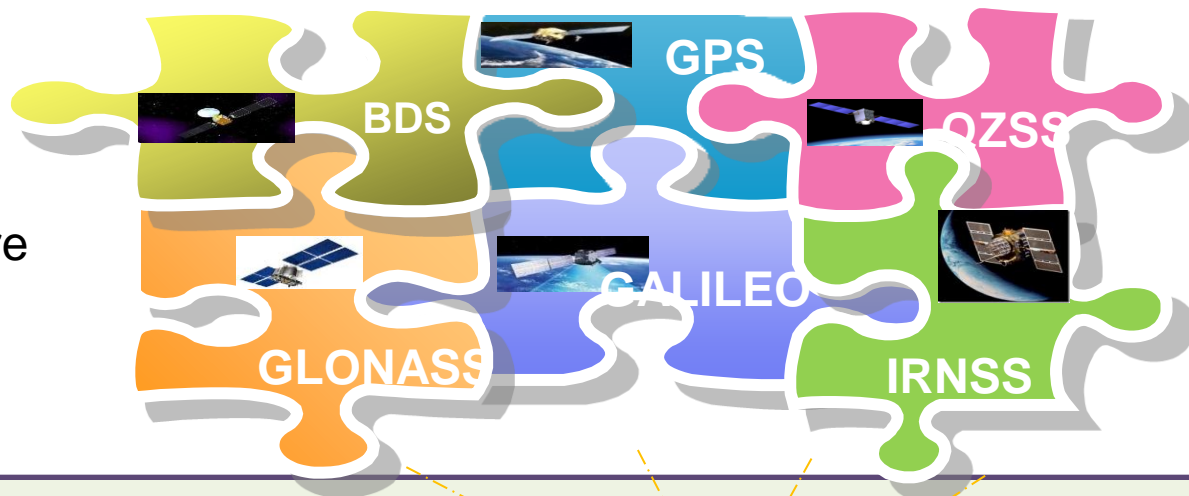
BDS RNSS / RDSS
GPS L1
DGNSS



Overview of BeiDou high precision products

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Unicore
Rx Architecture



Signal Receiving

Any 4 (or more) GNSS satellites

Baseband

- Unified and configurable baseband architecture
- Code generation unit to support all types of PRN codes
- Support BPSK, QPSK, BoC, mBoC, AltBoC, etc.

PVT

- Unified GNSS coordinate and time system
- PVT with Embedded RAIM for security and integrity

Applications of BeiDou high precision products

用心 领跑北斗产业化

- Surveying, Mapping & GIS
- Continuously Operating Reference Stations
- Meteorological Applications
- Heading & Positioning
- Deformation monitoring
-

Applications of BeiDou high precision products

- Surveying, Mapping & GIS
 - Giving full play to the multi-constellation combined positioning accuracy advantage and BDS tri-frequency application advantages, it can provide more accurate, more reliable performance.



Applications of BeiDou high precision products



- CORS: BeiDou Ground Base Enhancement System
 - Consisting of 30 ground base stations
 - GNSS Receiver: Unicore UR370 (BDS B1B2B3, GPS L1L2, GLONASS L1L2)
 - CORS software: WHU PowerNetwork
 - Positioning accuracy: Horizontal < 2cm; Vertical < 5cm (RMS)



Applications of BeiDou high precision products

用心领跑北斗产业化

- CORS: BeiDou Ground Base Enhancement System

PowerNetwork 工程: ur370

武汉大学卫星导航定位技术研究中心研制的PowerNetwork软件

The screenshot displays the PowerNetwork software interface for a CORS system. It features a central map showing the layout of ground stations (G05, G25, G04, G17, G10, G02, G23, G12, G13, R17, R02, R01, R24, R23, C08, C01, C03, C06, C04, C09, C05, C02) around a central point. The map includes a compass rose and distance markers. To the right, there are configuration panels for station name (u370), coordinates (X: -2166800.4766, Y: 4383845.7260, Z: 4081170.8005), receiver type (UR370), and communication settings (TCP/IP, Client mode, IP: 124.127.118.169, Port: 45008). Below the map, there are fields for station offsets (North: 0.000, East: 0.000, Vertical: 0.000) and epoch time (1719.357376.0). A bar chart shows signal strength for various stations, and a table below it provides detailed data for each station.

	G05	G25	G04	G17	G10	G02	G23	G12	G13	R17	R02	R01	R24	R23	C08	C01	C03	C06	C04	C09	C05	C02
sn1	47	40	51	50	51	50	48	48	48	42	44	50	50	50	46	44	46	50	42	47	40	41
sn2	43	38	50	49	50	48	40	47	41	36	39	45	48	49	49	47	48	50	42	48	40	45
sn3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	43	46	48	42	45	38	41
Azim	221.2	321.3	36.8	134.2	190.5	292.6	53.5	291.1	87.0	317.0	0.0	183.1	348.2	107.2	164.4	146.5	189.0	258.0	124.2	237.5	246.9	227.5
Elev	20.8	11.7	67.5	43.4	77.3	49.1	20.2	32.7	29.4	12.6	0.0	71.7	62.9	50.5	58.1	36.0	42.2	79.0	25.4	50.9	14.9	29.5

接收机观测值信息 接收机观测值信息

输出

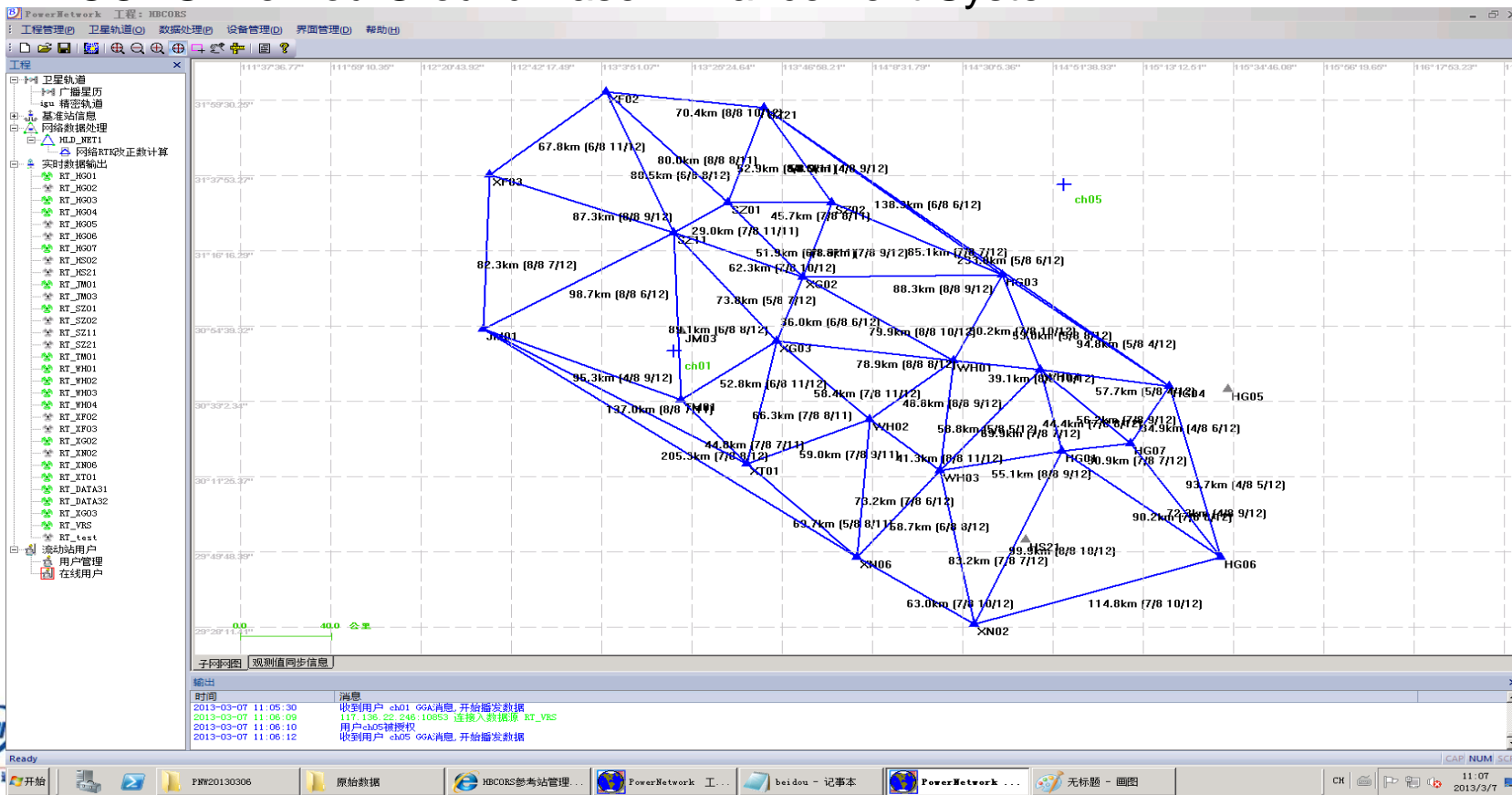
时间 消息

2015.12.30 11:16:11

Applications of BeiDou high precision products

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CORS: BeiDou Ground Base Enhancement System



Applications of BeiDou high precision products

用心 领跑北斗产业化

- Meteorological Applications: water vapor monitoring & measurement system

– User:



– Requirements

- BDS B1/B2/B3 & GPS L1/L2 & GLONASS L1/L2
- Range noise < 10cm RMS
- Carrier noise < 1mm RMS
- > 16GB flash for data storage
- Remote control and upgrade over TCP/IP

– Quantity

- 12 sets so far
- >200 sets in the coming years



Unicore UR370

Applications of BeiDou high precision products

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- Meteorological Applications: water vapor monitoring & measurement system



Applications of BeiDou high precision products

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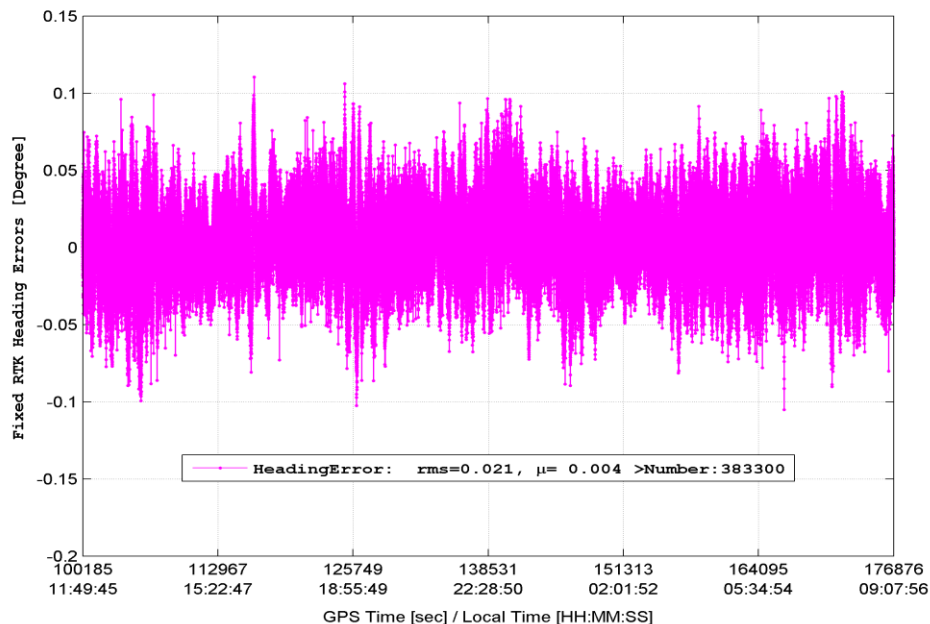
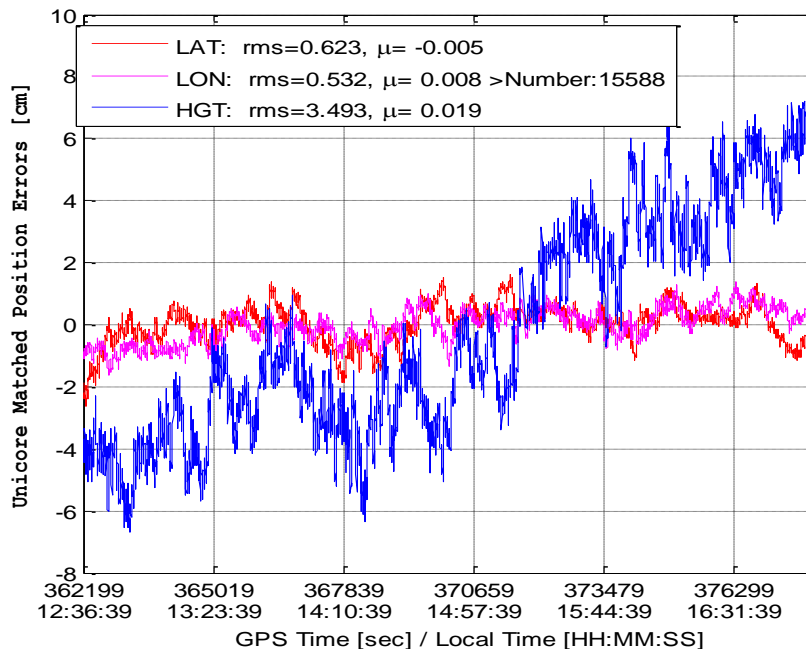
- Heading & Positioning: Driving test

- The market vehicle positioning and heading market in China has great potential, especially in the field of driving test, due to the government requirements of layout specifications for driving test fields and facilities.
- With the use of dual-frequency or tri-frequency RTK and heading technology, BeiDou high precision receiver can achieve a position accuracy of 2cm , heading accuracy of 0.2° , and a velocity accuracy of 0.03m/s, fully meet the requirement of driving test applications.



Applications of BeiDou high precision products

- Heading & Positioning: Driving test



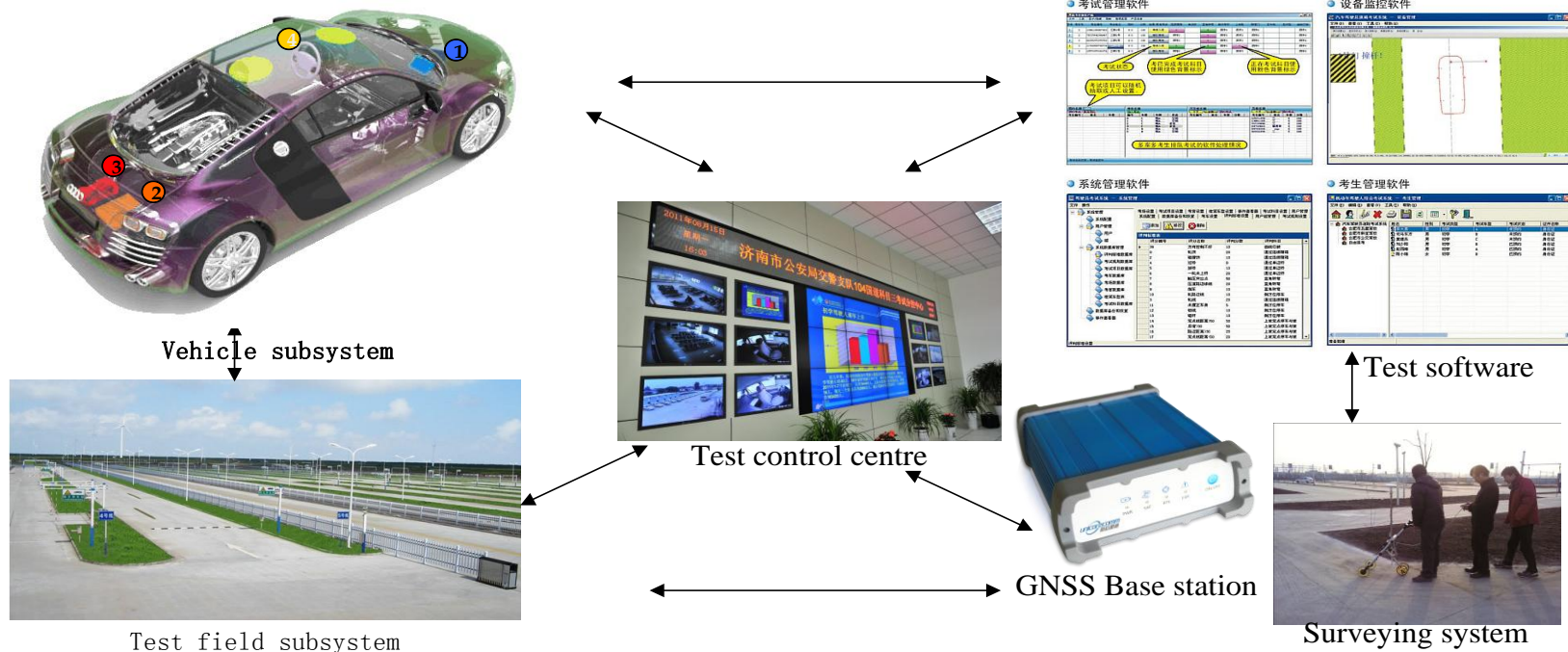
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Applications of BeiDou high precision products

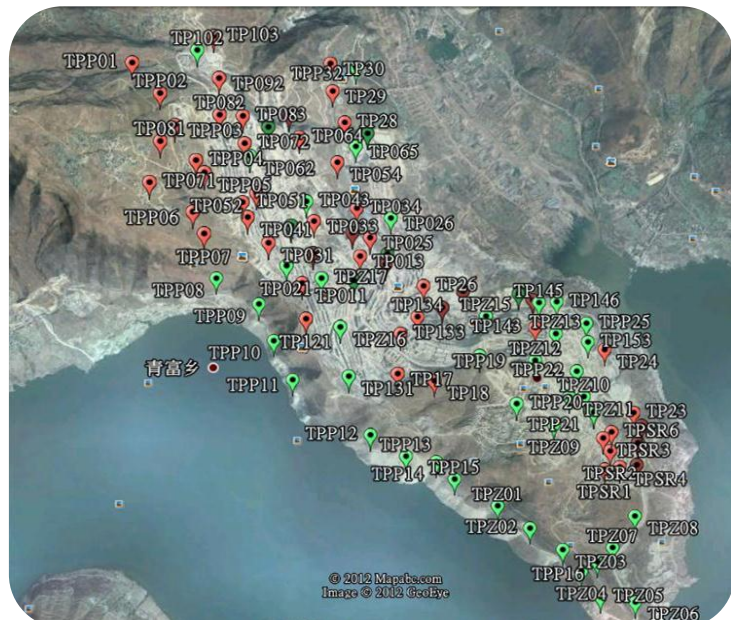
用心领跑北斗产业化



Applications of BeiDou high precision products

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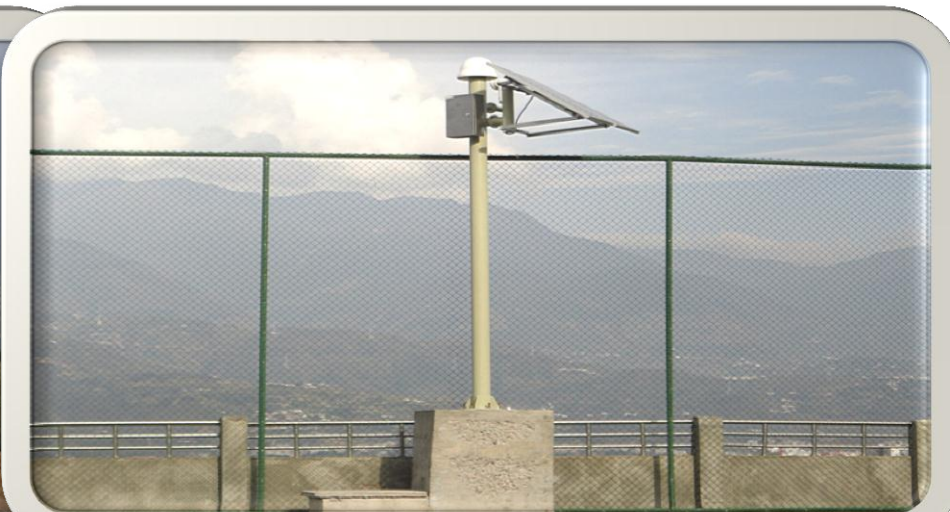
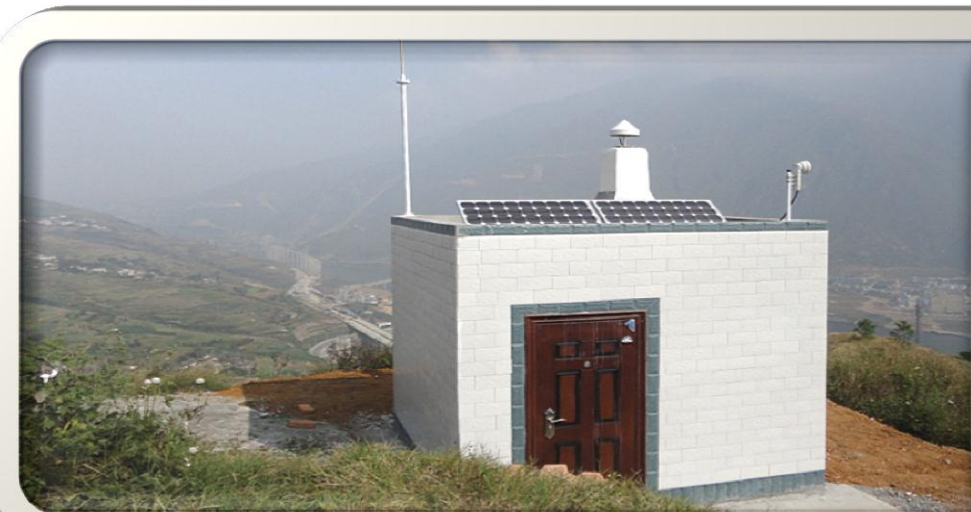
- Deformation monitoring: Hanyuan, Sichuan



Applications of BeiDou high precision products

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- Deformation monitoring: Hanyuan, Sichuan



Applications of BeiDou high precision products

- Deformation monitoring: Bazhong, Sichuan



Applications of BeiDou high precision products

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- Before and after the earthquake



A 7.0-magnitude earthquake hit Lushan county of Ya'an city in southwest China's Sichuan Province, April 20, 2013

Summary

- BeiDou navigation system provides significant enhancements to GNSS.
- The BeiDou receivers has been already developed and also comprehensively used in high precision applications, such as surveying & GIS, CORS network, driving test system and deformation monitoring system, etc.
- Taking the advantages of BeiDou system and GNSS interoperability, wider applications will be explored not only in China and also worldwide.



北斗星通旗下企业

Thank you!

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