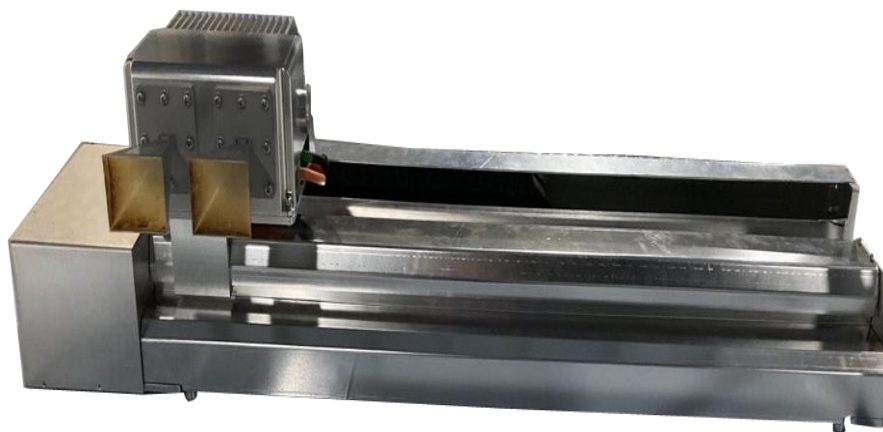


Starwin Hybrid Monitoring and Warning SAR System

1. Product Introduction

Synthetic Aperture Radar (SAR) is an advanced remote monitoring system based on microwave interferometry technology, which has high-resolution imaging radar and can obtain high-quality two-dimensional images; Both range measurement and imaging provide intuitive observation results. The measurement target is displayed through radar image, and micro-deformation measurement is the key function of the system. Interferometry technology is used to obtain the micro variables of pixel points in the test target through real-time or quasi real-time algorithms. Micro-deformation is evaluated in combination with other measurement methods, and finally comprehensive evaluation results are obtained.



2. Product Features

- Continuous ground monitoring.
- 24/7.

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- Non contact and wide range of use.
- High monitoring accuracy, long distance, large area, high efficiency, and strong timeliness.
- Fully automatic real-time monitoring, 24-hour unmanned continuous monitoring Remote data transmission and control.
- Visualization software, easy and convenient to operate.
- Automatic disaster warning.
- The device is lightweight, highly mobile, easy to install, and highly flexible.

3. Technical Advantages

- FM Continuous Wave Technology.
- IF Signal Processing Technology.
- Baseband Processing and Transmission Technology.
- SAR Imaging Technology.
- Interferometric Measurement Technology.
- Atmospheric Correction Technology.

4. Application

- Mines pit monitoring
- Slope monitoring
- Bridge monitoring
- Dam monitoring
- Building monitoring

5. Performance Indicators

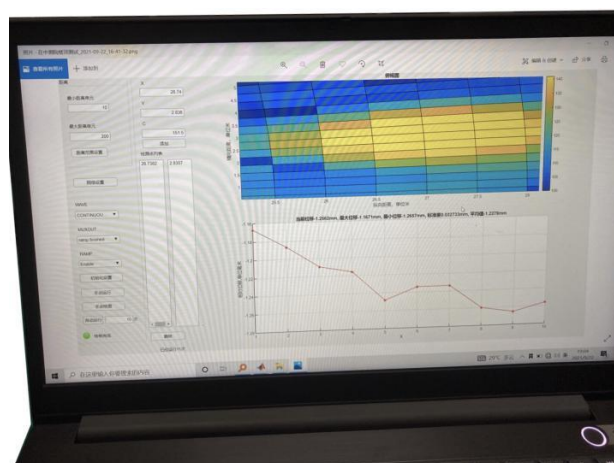
Technical Parameter	Condition Index (1m track)	
Mode	SAR	RAR

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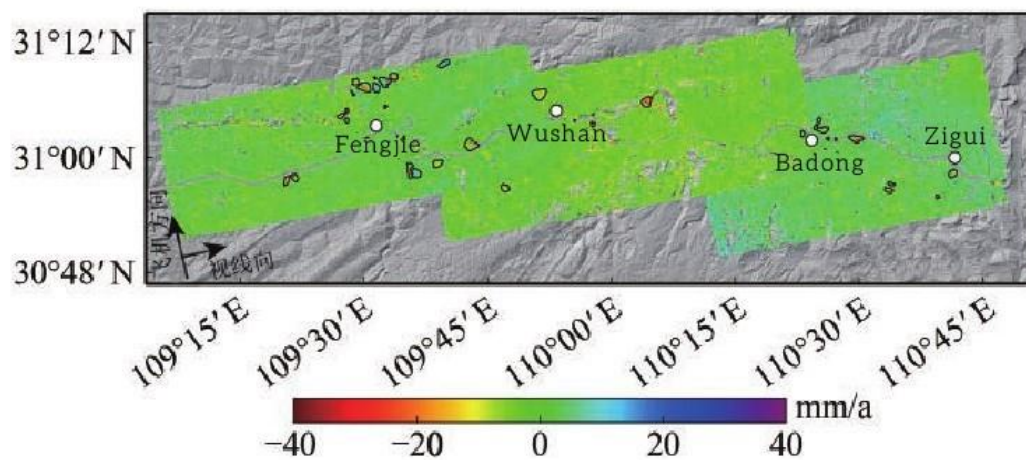
Carrier	K band	
Bandwidth	150MHz	
Range Resolution	1m	
Maximum Operating Distance	3km	
EIRP	55dBm	
IP Grade	IP65	
Operation Temperature	- 40°C ~ +55°C	
Accuracy	±0.1 mm	±0.01 mm
Azimuth Resolution	9.6mrad	-
Imaging Time	≥ 15s	-
Power Consumption	≤ 60W	30W
Overall Weight	≤ 25kg	-
Effective Length of Track	950mm	-
Total Length of Track	1300mm	-



6. Application Case

● Case 1_ Identification of Landslide Hazards in the Three Gorges Reservoir Area

Landslides (including mountain collapses) account for 80% of the total geological disasters in the Three Gorges Reservoir area of China, bringing great risks to navigation along the Yangtze River and people's lives and property. The multi-track InSAR data set is used to detect large-scale landslide deformation, which is of great significance for the prevention and control of geological disasters in the Three Gorges Reservoir area. Three adjacent track data sets are used to map the slope stability of the Zigui-Fengjie section in the Three Gorges Reservoir Area. After data processing, the deformation rate graph of each orbit is obtained, which is then spliced through the deviation of the overlapping area of adjacent orbits.

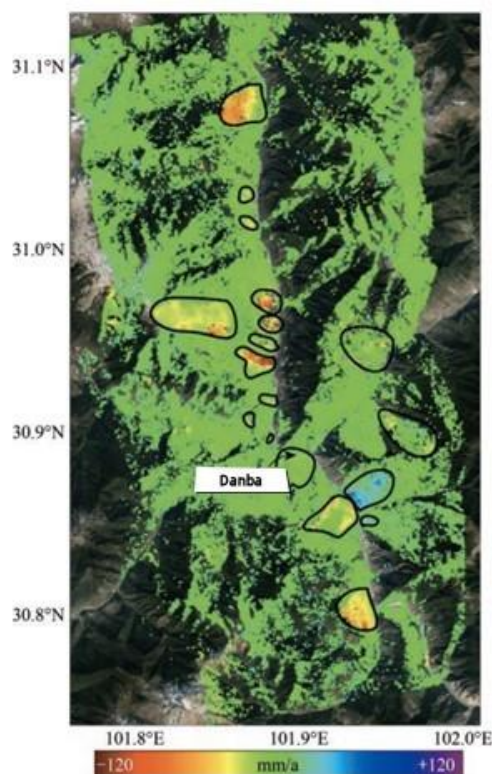


The above figure shows the average line of sight deformation rate of the Fengjie to Zigui section of the Three Gorges project. A total of 17775238 point targets were extracted from three track datasets, covering a range of approximately 4800 km² (改为²). The deformation rate distribution of the 96% point target is within the range of -10 mm/a to 10 mm/a, indicating good overall stability. Based on the

magnitude of deformation rate values, 30 active landslides were discovered, covering an area of approximately 48 km², providing effective reference for the prevention and control of geological disasters in the Three Gorges Reservoir area.

- **Case 2_ Identification of landslide hazards in Danba County, Sichuan Province**

Danba County, Sichuan Province of China is located in the upper reaches of the Dadu River Basin in the eastern Hengduan Mountains of the Qinghai Tibet Plateau. The terrain in the area is steep, with significant elevation differences, and the geological environment is fragile. Geological disasters such as collapses, landslides, and mudslides occur frequently. With the strengthening of human engineering activities, the development of geological disasters in the area is intensifying, and multiple landslides have revived and deformed, posing a huge threat to the lives and property of local residents.



PALSAR average deformation rate map of Danba County, Sichuan, China

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The coherent scatterer InSAR analysis method was used to extract the deformation rate of radar line of sight direction, as shown in Figure 2. Among them, approximately 80% of the measured point shape change rate absolute values are less than 8 mm/a, indicating that most areas are relatively stable. Based on the deformation rate values, a total of 17 unstable landslides were identified.

- **Case 3_ Monitoring of Landslides in Hanyuan County, Ya'an City, Sichuan Province, China**



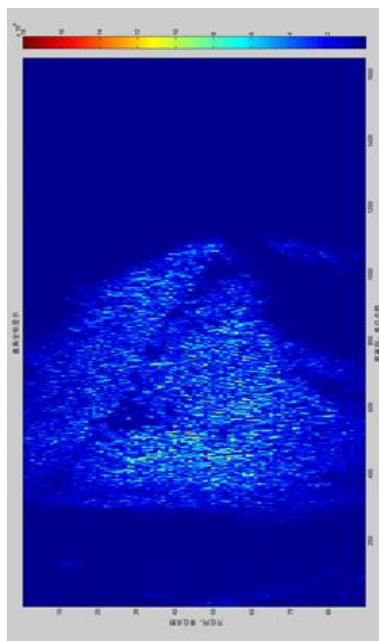
24 - hour continuous monitoring of all meteorological conditions

The experimental site is Hanyuan County, Ya'an City, Sichuan Province, China. adjacent to the quicksand River. The surface vegetation is mostly short and small shrubs, and the weather is mainly sunny and cloudy. Short term heavy rainfall often occurs, and temperature and humidity vary greatly day and night. During monitoring, the equipment is continuously running with a sampling interval of 30 seconds, with a target mountain distance of 600 to 1000 meters and an elevation of approximately 1000 meters. The equipment is installed on the roof of a residential building.

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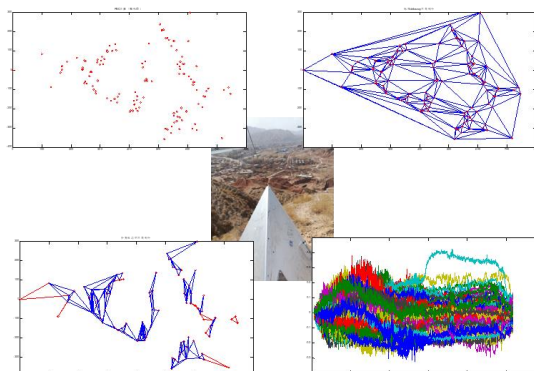
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Compared with the optical image, it can be seen that the radar image can accurately reflect the outline, distance and other information of the mountain, and accurately reflect the details of the mountain gully and ladder structure.

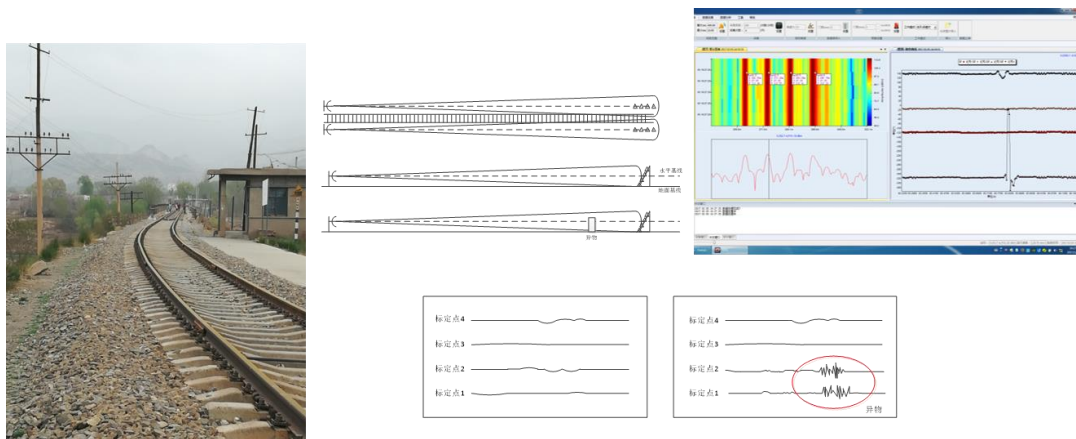
- **Case 4_ Monitoring in Yongjing County, Gansu Province, China**



Multiple testing sites were selected in Yanguoxia Town, Yongjing County, Gansu Province, China for long-term monitoring. Mainly verifying the stability

and environmental adaptability of the equipment, imaging distance and quality, using multiple algorithms to analyze data and enhance phase stability.

● Case 5_ Railway Foreign Object Monitoring



Use the real aperture mode of radar to monitor-deformation in the phase of calibrated distance points. When the scene is stable, the phase remains unchanged and follows a straight line. When pedestrians pass by, the electromagnetic wave propagation path is affected and the phase changes. In simulation experiments, a stone can produce a significant brief phase change as it flies past the calibration point.

Two points on the railway bridge are used as reference points to track its phase, which is very stable when no one passes ahead. When someone passes in the middle, the phase appears a continuous unstable jitter, indicating that there is a "foreign body" invasion.