

"POLAR SCANNER": POLAR ENVIRONMENTAL MONITORING INFORMATION SERVICE PLATFORM

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ABSTRACT

Remote sensing is increasingly being used in polar environment monitoring. Multi-source remote sensing data were utilized for providing support to ship ice navigation and investigation on sea ice. Applications of remote sensing data saved time for scientific investigation and logistics services, ensured the safety of people, ship and equipment. "Polar Scanner" is a remote sensing application system for polar environmental monitoring.

INTRODUCTION

With the aid of the platform and remote sensing production, the Chinese Antarctic Expedition planned ship route reasonably, explored land-fast sea ice and laid down a plan of discharge; and the Chinese Arctic Expedition crossed the Trans-Polar Passage successfully, chose appropriate sea ice stations.

OBJECTIVE

Technology: GIS, remote sensing, GNSS, big data, IoT etc.
Demand: scientific expedition vessel navigation, route planning, real-time weather information and risk analysis, navigational information, video surveillance, research data management.
Service: data aggregation, information inquiry, data statistics, intelligent analysis, information push.

ARCHITECTURE

"Polar Scanner" Platform (<http://www.polarscanner.org/>)

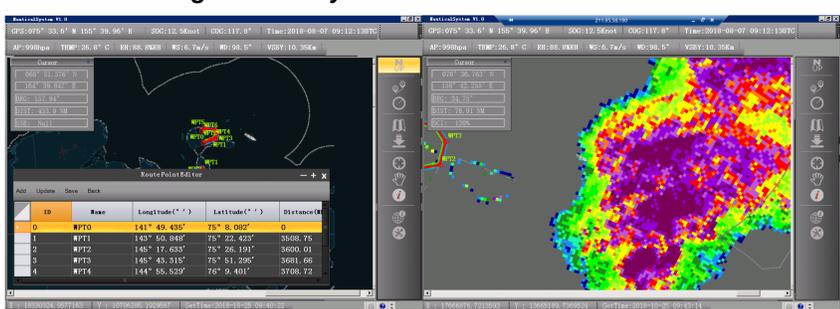
- Nautical information subsystem
- Ice zone navigation subsystem
- Polar sea ice environmental monitoring subsystem
- Polar meteorology subsystem
- Video supervisory subsystem
- Arctic unmanned ice station monitoring subsystem

FUNCTION

1. Nautical information subsystem

Base maps: nautical chart, satellite image, vector map
Information: GPS, depth sounder, underway CTD, SBE21, automatic meteorological station, compass.
Data transmission: from Xuelong vessel to PRIC, satellite link
Overlay: remote sensing sea ice products (ice concentration, Ice drift, satellite images); meteorological products (wind field, cyclone).
Query: water depth data, EEZ information.
In support of route and scientific investigation planning.

2. Ice zone navigation subsystem



"Nautical information subsystem"+ route design function
Users: captain, deck officer, chief engineer.
C/S, enhance system response efficiency.
Deployed in "Xuelong" and "Xuelong 2".

3. Polar sea ice environmental monitoring subsystem

Multi-format sea ice data: NC、HDF、CSV、Geotiff.
Based on big data platform, distributed clusters Hadoop and NoSQL database Hbase. Hundred billion of data records, mass data management and query.



Sea ice concentration information release (1979 -): graduation statistics, historical curve at location, dynamic map.
Sea ice extent information release (1981 -): value and image per day, curve per year, extremum values.
inter-annual change, seasonal variation, correlation analysis (with SST, Air temperature), coupling analysis, hysteresis analysis.
Historical contemporaneous ice concentration curve at station, current ice concentration value and navigation advice.

4. Polar meteorology subsystem

Meteorological data of polar research stations, automatic meteorological station data on Xuelong vessel.
Real-time weather information. Real-time temperature, humidity, pressure curve and wind-rose diagram generation.
Online report. Data sharing service.

5. Video supervisory subsystem

Video surveillance devices on polar research stations and Xuelong vessel
Latest video screenshot, video playback based on single frame image.

6. Arctic unmanned ice station monitoring subsystem

Under construction
Real-time observation data of arctic unmanned ice station, data transfer through Iridium Satellite.

APPLICATION

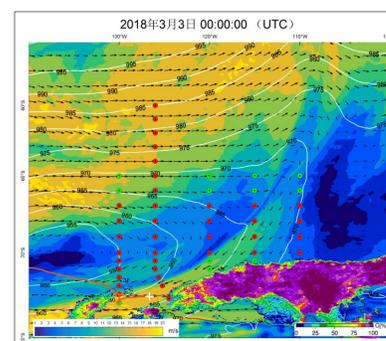
1. Polar navigation safeguarding



During the 34th Chinese Antarctic Expedition and the 8th, 9th Chinese Arctic Expedition, the nautical information subsystem included sea ice concentration product, MODIS images and HY-2A wind field products. The system provided ice navigation guidance service for Xuelong vessel based on "navigation in map".

2. Scientific investigation guidance

Task planning support by remote sensing images, sea ice data, meteorological data, EEZ data etc.



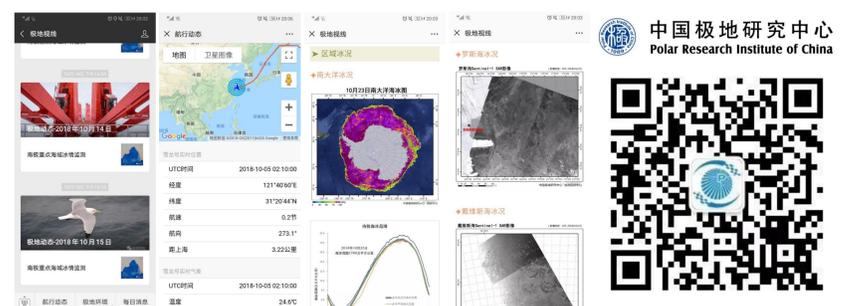
shipborne satellite remote sensing data reception system on Xuelong vessel

3. Polar environmental monitoring service

Real-time meteorological monitoring, near-real-time sea ice information of holantarctic and holarctic region, antarctic key region sea ice monitoring.

4. Science popularization

"Polar Scanner" WeChat Official Account: more than 1,000 followed



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