SUPERMAP COMMUNICATIONS

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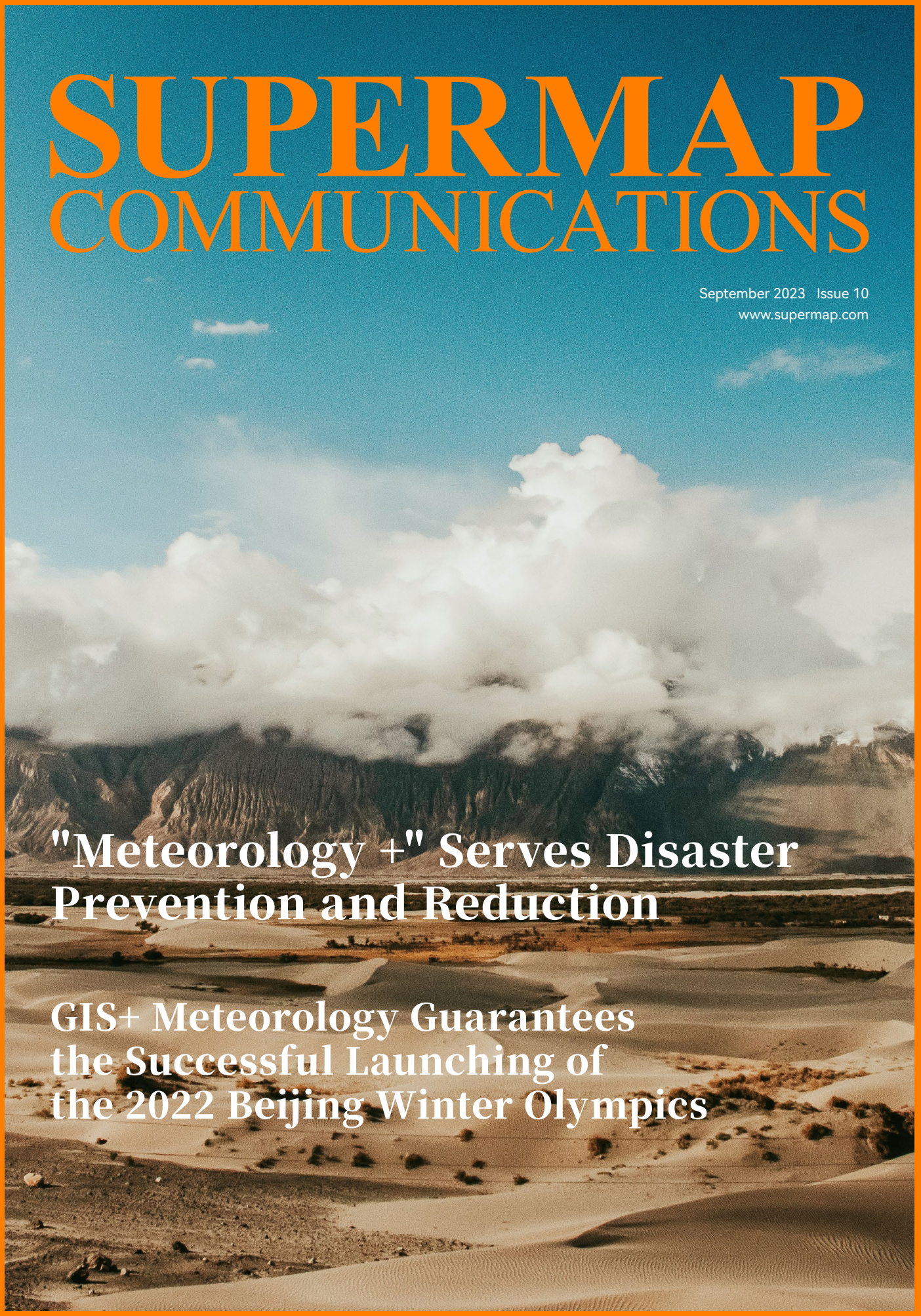


"Meteorology +" Serves Disaster Prevention and Reduction

GIS+ Meteorology Guarantees the Successful Launching of the 2022 Beijing Winter Olympics

Who is SuperMap?

SuperMap was founded in 1997, is a platform software and application software manufacturer focusing on Geographic Information Software (generalized GIS) and Geospatial Intelligence (GI), and a key player in Information Technology Application Innovation Industry, Spatio-Temporal Big Data, Artificial Intelligence, and Virtual Reality. It consists of SuperMap Software (parent company, stock code: 300036), wholly-owned subsidiaries, and holding subsidiaries, as well as domestic branch offices and agencies. In 2022, the total staff number of SuperMap is more than 4,300 and the annual revenue reached 232 million USD (1.6 billion RMB).

1997
Founded

How has SuperMap performed so far?

Together with more than 3,000 Independent Software Vendor (ISV) partners and hundreds of thousands of developers, SuperMap empowers the informatization of governments and enterprises in nearly 100 industries. It has developed distributors and partners in over 50 countries and SuperMap GIS end users in over 100 countries. Now, SuperMap ranks 1st in the GIS software market in Asia and 2nd globally.

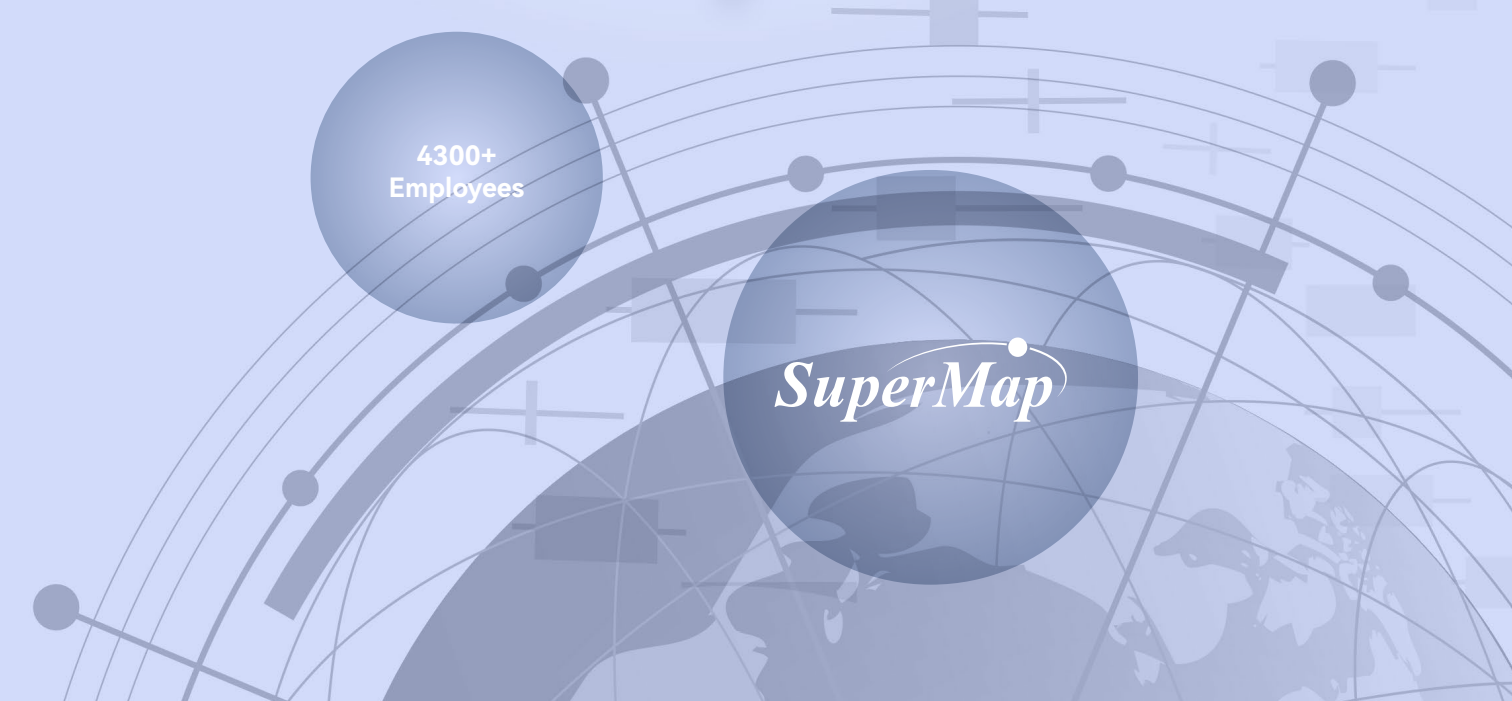
100+
Countries'
Users

What will SuperMap be?

With “Innovate Geospatial Intelligence, Elevate IT Value” as the mission and “Light up Every Corner of the World with Geospatial Intelligence” as the vision, SuperMap will keep providing advanced GIS technologies and products to more global users.

1000+
Partners

4300+
Employees



SUPERMAP COMMUNICATIONS

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FOCUS

CASE STUDY

"Meteorology +" Serves Disaster Prevention and Reduction

SuperMap has built an integrated meteorological platform based on the SuperMap GIS technology system, and built a "meteorological +" industry application service model for transportation, electric power, agriculture, ecology, emergency and other fields, providing meteorological support for disaster prevention and reduction for all walks of life.

Meteorological conditions are important factors that affect economic and social production and people's life. With the development of modern agriculture, transportation, energy, marine economy and other industries, the effectiveness of meteorological information services has become increasingly prominent. With the application of new generation information technologies such as big data, artificial intelligence, and the Internet of Things in the meteorological field, meteorological services can provide the public and industries with more refined, more professional, and more diversified services, playing a greater role in rural revitalization and production development, and facilitating high-quality economic and social development.

Based on the SuperMap GIS technology system, SuperMap has built an integrated meteorological platform, and a "meteorological +" industry application service model for transportation, electric power, agriculture, ecology, emergency and other fields. By establishing meteorological disasters monitoring, forecasting and early warning system according to disaster types and key industries, SuperMap has built a new meteorological service format that deeply integrates meteorological services and related industries, improving the infrastructure defense capability and disaster-bearing capacity of key areas. This will help to realize the real-time interaction of the whole industry and online services of the whole industry chain, and provide all walks of life with meteorological support for disaster prevention and reduction.

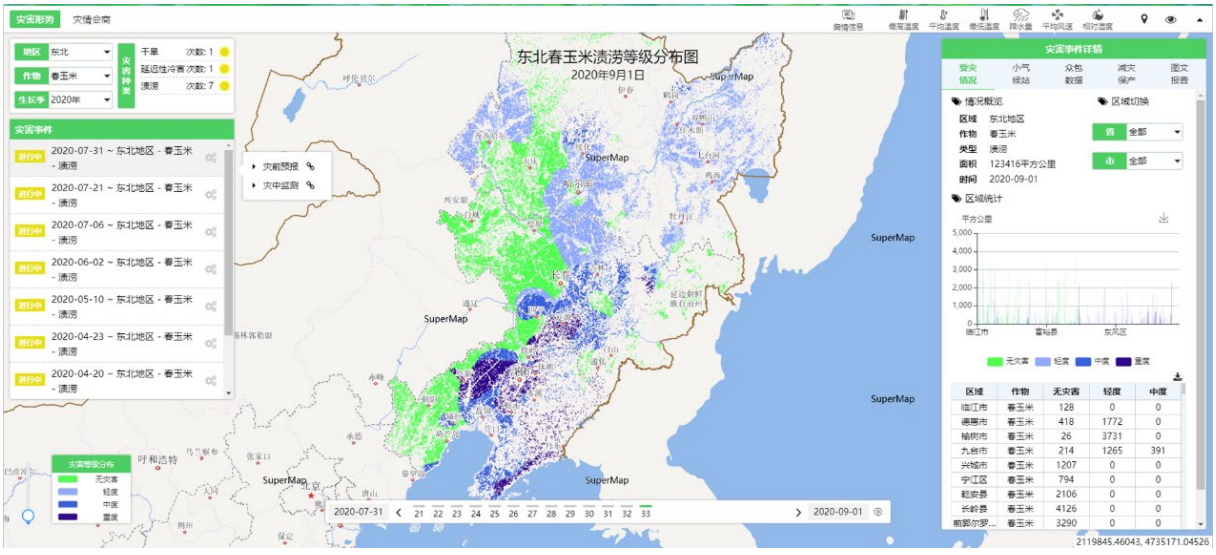
"Meteorology + Agriculture ": Serving the modernization of agriculture and rural areas

The agricultural meteorology system is based on actual weather conditions, forecasts and historical climate data. It consists of forecasting, process monitoring and post-event evaluation according to different meteorological conditions on which different crop growth processes depend in specific areas and time periods. It also provides targeted agricultural meteorological services facing different service demands.

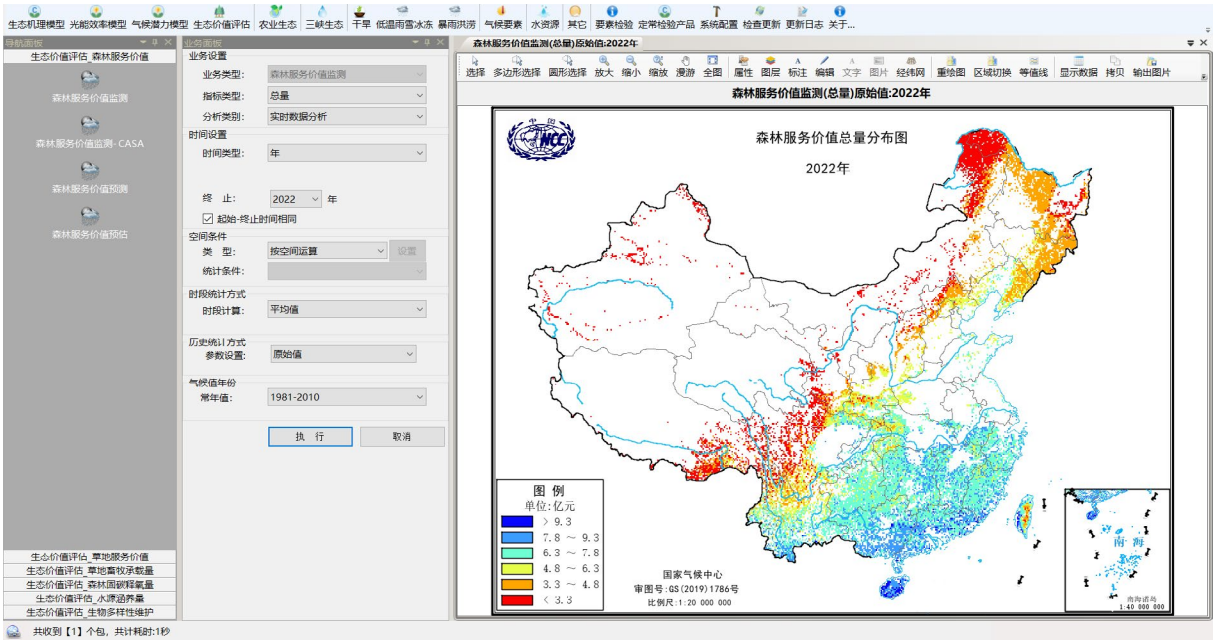
The smart agricultural meteorological service platform mainly consists of four parts: the agricultural meteorological spatio-temporal big data center, the agricultural meteorological “one picture” platform, the agricultural meteorological comprehensive business platform, and the agricultural meteorological “Internet + service” platform. The platform has realized the automation of the data collection process with intelligent business support, and society-oriented service. The platform is based on the visual modeling tools and models and to continuously integrate framework system, achieving fast and efficient access to new data, new models, and new algorithms, and provides business operation guarantee for model-supported functions such as disaster warning, monitoring, evaluation, and production; based on the resource management and services of the one picture model, the platform has formed an "air-sky-ground" 3D monitoring system for agricultural meteorological disasters, enabling refined comprehensive research and judgment supported by big data to assist leaders in decision-making; based on the concept of “Internet + Service” concept, it provides meteorological information and agricultural information such as agricultural climate, weather conditions, disaster forecasts and early warnings, giving full play to the role of meteorological services in the development of modern agricultural construction, and improving the application efficiency of meteorological services for agriculture.

"Meteorology + Ecology": Empowering ecological prediction and ecological climate impact assessment

The platform establishes an eco-meteorological spatio-temporal big data center, which can seamlessly connect to the meteorological big data cloud platform, and gather data on meteorological observation and prediction, eco-meteorological



Meteorology + Agriculture



Meteorology + Ecology

disaster forecast and warning, eco-meteorological disaster risk, ecological resource assessment and other data to provide unified support for all business links of ecological meteorological services such as ecological and meteorological disaster forecast and warning, eco-meteorological disaster risk forecast and ecological resource assessment.

The platform integrates the ecosystem productivity model and ecosystem service value model. Based on the comprehensive research and analysis on climate change, ecological disaster risks, ecological resources and other businesses through the ecological meteorological comprehensive analysis and product making platform, the platform can provide ecological factors and ecosystem service value assessment products. This will further help realize the analysis and evaluation of forest service value, grassland service value, grassland livestock carrying capacity, forest carbon fixation and oxygen release, water source conservation, and biodiversity.

It provides an interactive production platform for eco-meteorological service business products for business personnel to meet the production needs in various business scenarios. Through one eco-meteorological map, the integrated display and shared services of eco-meteorological service products are realized, which will provide authoritative eco-meteorological information and scientific decision-making basis for carrying out eco-meteorological service and ensuring the sustainable development of social economy.

"Meteorology + Transportation": Monitoring and early warning of disastrous weather along the traffic routes

The "weather + traffic" service is based on the sharing of real-time weather monitoring information

along the traffic routes. It automatically collects relevant traffic weather information from observation stations along the traffic line, background visibility observation stations, radar, satellite cloud images, typhoon observation data, etc., and realizes the interconnection and resource sharing of traffic weather data.

Through the traffic meteorological service system, we can efficiently and accurately monitor and analyze the weather conditions and road conditions along the traffic routes in real time, and analyze disaster-causing conditions and disaster-causing processes of high-impact weather including dense fog (fog), road icing, heavy precipitation, snowfall, strong winds, thunder and lightning, etc. We can also carry out highway traffic meteorological risk early warning services based on the traffic meteorological impact model. Through the integrated analysis of meteorological and railway data, the platform can provide meteorological support services for railway construction and operation covering the entire chain of railway engineering construction, operation dispatching, and driving safety, and develop accurate and sophisticated meteorological warning products for route sections to realize highway, railway, and waterway transportation real-time monitoring, forecasting and early warning. Service information can also be released to relevant departments and service users through a variety of methods to ensure meteorological service for highway and railway transportation.

"Meteorology + Electricity": Ensuring the safe production and stable operation of the energy system

The electric and meteorological monitoring, early warning and risk assessment system integrates functions such as power grid spatial information, multi-source meteorological data display, meteorological disaster monitoring and early warning, power grid load forecasting, disaster risk assessment, service product production and release, etc. It can meet the common needs of meteorological departments and electric power departments for services in the electric power meteorological industry. It provides professional power grid spatial information services, conducts scientific meteorological disaster impact assessments, and can quickly initiate power grid meteorological disaster emergency response. Through power grid meteorological forecast and warning services and disastrous weather impact assessments, it gives play to the role of meteorological information in the power grid's response to extreme weather, improving the power grid's meteorological emergency warning capabilities, promoting "meteorology +" to empower the new energy power industry, and assisting the meteorological services for safe operation of the power grid and refined power dispatching.

Meteorology+Electricity

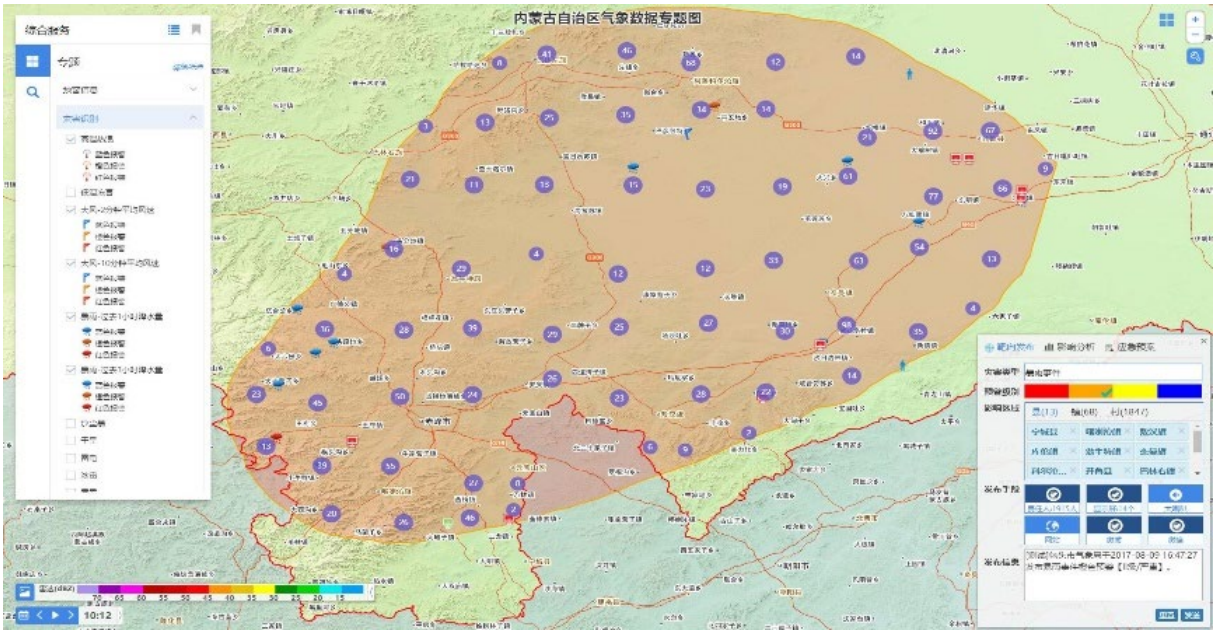
"Meteorology + Tourism": Empowering meteorological disaster risk early warning in tourist attractions

Relying on the meteorological monitoring network of key tourist attractions, we build a comprehensive meteorological service platform for tourist attractions that integrates data collection, monitoring, early warning, forecasting, production, distribution and sharing. We develop tourism meteorological service products, and assist in carrying out meteorological disaster risk investigation and meteorological risk early warning in tourist attractions, which enables the production of tourism meteorological service products that provide professional, refined and quantitative services.

Through the tourism meteorological service information sharing platform, we provide convenient, accurate, timely, and rich scenic spot meteorological disaster forecast and warning information, tourism information, and professional tourism meteorological service products to meteorological departments, tourism departments, scenic area management departments, and the public, which help to ensure tourism safety, reduce disaster losses, improve tourism management and emergency response levels, and comprehensively improve tourism meteorological service capabilities and levels. Through "Weather +", ice and snow tourism, eco-tourism, and rural tourism meteorological services are empowered to facilitate the development of the tourism industry.

"Meteorology + Emergency ": Natural disaster forecasting, early warning and emergency support services

The meteorological ensurance sevice system for emergency sources information such as socio-



Meteorology + Emergency

economic data, emergency supplies, rescue forces, refuge sites, land, water conservancy, transportation, meteorology, etc., and integrates the comprehensive risk census results of natural disasters to provide one map of emergency support through meteorological early warning to realize emergency management data query and display.

To meet the service needs of emergency support for natural disasters, we provide medium and long-term early warnings for major meteorological disasters and short-term early warnings for sudden extreme weather, and develop emergency-oriented meteorological disaster early warning service products. Based on professional and objective model forecasts, combined with emergency auxiliary support of the plan, a unified view of emergency auxiliary support has been constructed to analyze the impact scope of disaster events, obtain early warning auxiliary emergency response commands through collaborative deduction and command, comprehensive research and judgment, achieving auxiliary decision support and accurate directional early warning issuance.

The system provides special meteorological monitoring, forecasting and early warning services for different business needs such as production safety, forest fire prevention, flood control and drought relief, improves the ability to respond to emergencies and the ability to accurately and timely release public information, and improves the timeliness of early warning information for personnel in charge of emergency, the coverage rate of public information reception, and ultimately achieve the purpose of reducing casualties and property losses in emergency response.

Conclusion

Based on the meteorological disaster integrated platform, SuperMap provides "meteorological +" service application models in agriculture, ecology, transportation, electric power, tourism, emergency and other industries, provides meteorological support services for all walks of life, serving the high-quality development of the meteorological industry.

Full-Process Management of Meteorological Disasters Based on the "Integrated Platform" Model

China is one of the countries with the most serious natural disasters in the world. There are many types of disasters distributed over a wide area in China with high frequency and causing heavy losses. The government has proposed to improve meteorological disaster prevention and reduction capabilities, establish risk assessment models for different disaster-bearing bodies and digital analysis application of national meteorological disaster risks, and improve support capabilities of meteorological disaster risk management.

Relying on multi-source data fusion and big data technology, superMap's integrated platform of meteorological disaster gathers multi-source disaster data, industry data, Internet data and other multi-channel meteorological disaster data, meteorological observations, predictions, disaster processes, inundation data and other disaster factors, hidden danger points, early warning points, population, GDP and other carrier information to form a meteorological disaster risk big data center and implement more than 100 professional model algorithms. It has built a unified structure and highly intensive meteorological disaster risk management platform, enabling disaster risk online analysis, production and application services throughout the whole business processes for multiple disasters such as heavy rains, floods, droughts, typhoons, high temperatures, low temperature freezes and other disasters.

The platform adopts the "one map" technical framework to integrate multi-element, multi-time and multi-regional disaster data. It integrates disaster risk information based on space, time, disaster, business and product dimensions, and integrates various dynamic meteorological disaster risks by correlating different disaster weather via spatial elements to evaluate business-related information. The platform can serve as a data platform, business platform and research platform to support meteorological disaster risk management and natural disaster prevention, providing decision-making support for disaster monitoring and identification, impact assessment, risk estimation and risk zoning.

Meteorological disaster risk spatio-temporal big data center

The platform enables multi-source disaster data collection, quality control, data management, data monitoring and data services. The services include the system that can automatically collect and process

Multi-source disaster data

data in the background based on visual modeling technology, and manual data collection, reporting, and management based on the Web, achieving automatic collection, processing, and calculation of meteorological observation and prediction, disaster processes, disaster risks, and other data. The system can capture multi-source heterogeneous data through data acquisition and conversion, and perform format fusion and conversion of system data based on the data format of the big data center, so that the data conforms to the storage strategy of the big data center and can be shared and applied based on a unified service interface.

The data resource management function realizes metadata-driven data storage and management through the disaster risk big data resource directory. Data monitoring supports real-time monitoring of the total amount, increment, quality, and collection and production of data.

Multi-element, full-process meteorological disaster risk management in one map

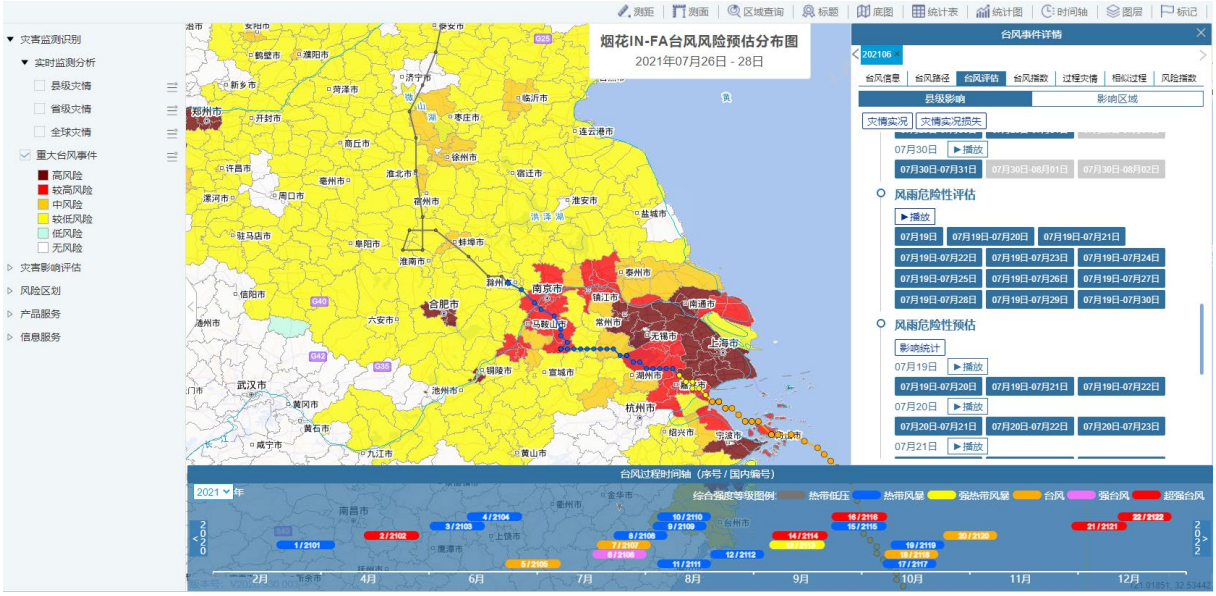
The platform adopts the "one map" technical framework to integrate multi-element, multi-time and multi-regional basic geographical data, disaster-producing environment data, disaster-causing factor data, disaster-bearing body data, risk zoning/assessment data, and disaster data. It can assess business-related information through spatial elements to correlate different disaster weather and integrate various dynamically changing meteorological disaster risk. The platform uses a GIS map as the main line to comprehensively integrate meteorological disaster risk management information through the five dimensions of disaster type, business, product, time, and space.

At the horizontal disaster dimension, it can support meteorological disaster risk management such as

heavy rain and flood disasters, drought disasters, typhoons, high temperature disasters, and low temperature disasters; the vertical direction is based on business lines, including disaster monitoring, disaster impact assessment, disaster pre-assessment, and disaster early warning, risk zoning, basic information services supported by the system and other functions; in the temporal dimension, the data, products and functions of the climate business product sequence are effectively integrated through the concept of timeline, such as the business analysis of heavy rain process since 1951, the daily precipitation sequence since 1951 and other information; from the spatial dimension, through GIS spatial visualization technology, different business data, functions, and algorithm results can be organically integrated to achieve more accurate business analysis and generate richer business products; from the business product production dimension, through online business production, the output of any intermediate results of the business analysis in the form of products can be realized to support the business work system.

Automated and interactive meteorological disaster risk business product making

The platform provides an interactive production platform for meteorological disaster risk business products for business personnel and supports the production of refined, quantitative and objective meteorological disaster risk products. The platform supports two service modes: regular product production based on business templates and

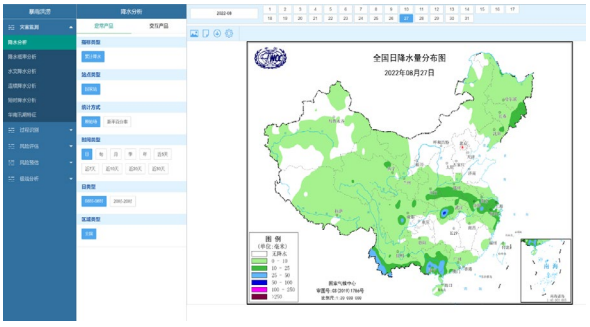


Meteorological disaster risk management

interactive production with flexible parameter configuration. It supports the production of static map products, dynamic thematic map products, statistical chart products, graphic report products and other types of products to meet the production requirements for various business scenarios.

Automated production calls the model in the system, directly connects the results of the disaster risk assessment model, binds the product template, and enters the automated product packaging and output links, thereby realizing the functions of regularly outputting products with fixed format specifications.

The platform provides interactive production of disaster business products for business personnel. Based on the GIS base map, different reference materials can be switched to display, and configurable editing tools are provided for users to conduct interactive mapping. The graphics can be loaded into product templates to generate graphic products. In addition, the product template can also be called to automatically generate a preliminary text product. After interactive editing, the user can save and output it into the final text product.



Output precipitation thematic map

Automated and interactive meteorological disaster risk business product making

Through combining with "Internet +" risk products and services, the platform realizes automated and intelligent early warning services for meteorological disaster risks such as heavy rains, droughts, and typhoons. The platform provides large-scale disaster risk early warning services based on meteorological disaster risk census results. It provides small and medium-scale refined risk warnings for cities, and also refined, objective, diversified and timely forecasting services of disaster impact and risk for specific industries such as transportation and electric power, improving the modernization of the disaster management system and governance capabilities.

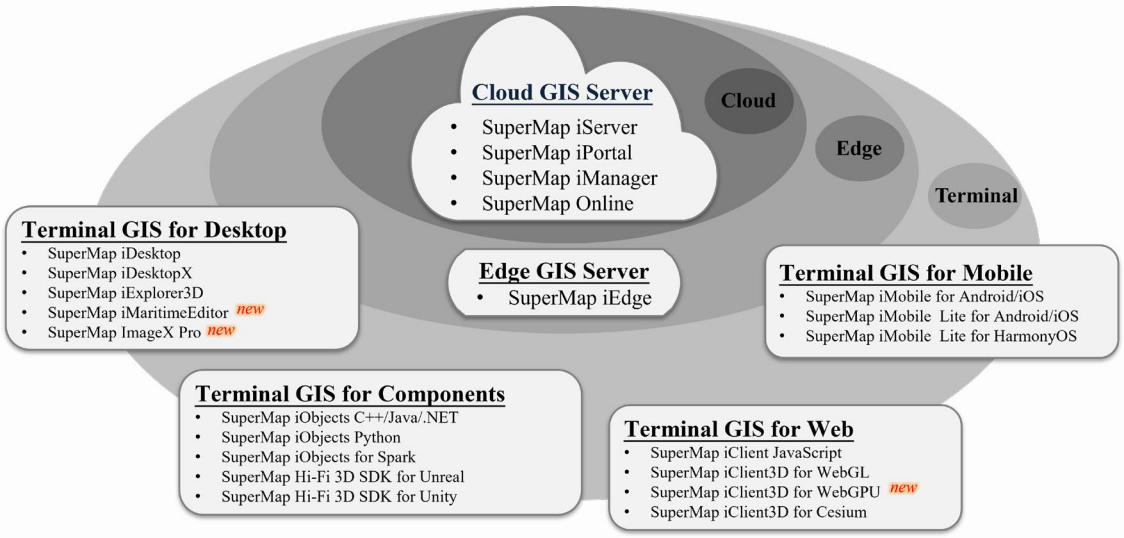
Conclusion

The construction of an integrated meteorological disaster platform provides technical support for meteorological disaster monitoring and identification, impact assessment, risk estimation, and risk zoning. As a data platform, business platform, and research platform for meteorological disaster risk management business, it provides support in decision-making for disaster risk early warning services and natural disaster prevention and mitigation.

Products

What is SuperMap GIS

SuperMap is devoted to developing and providing the most innovative Geographic Information System (GIS) platforms and solutions for global customers. SuperMap product line includes a full range of GIS platforms, including Desktop GIS, Server/Web GIS, Mobile GIS, and Online GIS, which makes SuperMap GIS known as one of the most complete GIS software platforms.



SuperMap GIS 2023 Product Architecture

SuperMap iDesktop: Full-featured Customizable Desktop GIS

SuperMap iDesktopX: Full-featured Customizable Cross Platform Desktop GIS

SuperMap iExplorer3D: 3D Scene Browsing Software

SuperMap iObjects: Full-featured Components GIS SDKs

SuperMap iTablet: Native App for Mobile GIS

SuperMap ARSurvey: AR field surveying tools for Mobile GIS

SuperMap UAV Survey: UAV field survey and annotation software

SuperMap iMobile: Native SDKs for Mobile GIS

SuperMap iServer: Full-featured Application Server for Cloud GIS

SuperMap iPortal: Portal for Cloud GIS

SuperMap iClient: Web GIS APIs for Browsers

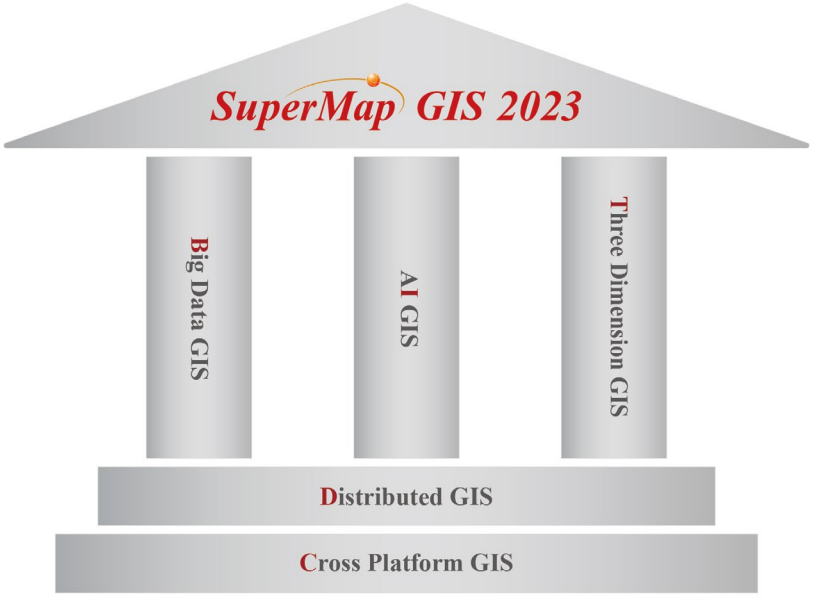
SuperMap iManager: Operation Manager for Cloud GIS

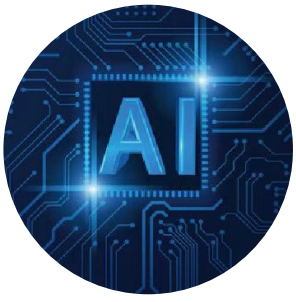
SuperMap iEdge: Server for Edge Computing GIS

Application Cases

Technologies

In SuperMap GIS 2023, SuperMap has further improved the five key technologies system (BitDC) of GIS platform software, they are big data GIS, AI (artificial intelligence) GIS, new 3D GIS, distributed GIS and cross-platform GIS technology, which enriched and innovated GIS theory and technology, and empowered the informatization of various industries.





GIS+ Meteorology Guarantees the Successful Launching of the 2022 Beijing Winter Olympics

Based on SuperMap GIS platform, Beijing Climate Center built the Winter Olympics climate risk assessment system. Through multi-scale, multi-dimensional and multi-perspective analysis of the Winter Olympics competition areas and venues, this system has provided a climate risk assessment covering all event venues for the 2022 Winter Olympics.

The 24th Winter Olympic Games has been jointly held in Beijing and Zhangjiakou from February 4 to February 20, 2022. Compared with the Summer Olympics, Winter Olympics events, especially snow sports events held outdoors, are more vulnerable to meteorological conditions. Wind speed, wind strength, air temperature, and snow temperature can even directly affect the technical performance of athletes. Therefore, intuitive and efficient meteorological services and guarantees are particularly important. Then how the weather was monitored to provide reference for decision making during the competition?

Weather is the starting gun for the Winter Olympics

During the 2014 Sochi Winter Olympics, Sochi, where it's supposed to be cold, had a world record high temperature of 19 degrees Celsius; the downhill race started an hour earlier than originally scheduled, and the slalom skiing was delayed by five hours; the high temperature led to more frequent falling accidents among athletes in snow sports such as skills and U-shaped pool. There is even the famous "three treasures of Sochi" consisting of sunglasses, beaches, and bikinis.

During the 2018 Pyeongchang Winter Olympics, the sensible temperature at the opening ceremony of the Winter Olympics was -8.9 ° C at 22:00, and the wind gusts could reach 8.6m/s. The South Korea Winter Olympics Organizing Committee provided a variety of cold-proof supplies to the audience for free. The display of the Olympic rings at the opening ceremony was recorded in advance due to weather conditions. On the evening of February 23, due to strong winds and snowfall, the dress rehearsal of the closing ceremony "Beijing Eight Minutes" was interrupted and canceled.

When high-impact weather such as heavy snow, heavy fog (visibility <2 kilometers), strong wind (wind speed >10 meters/second), strong warming (snow temperature >0° C) occurs, the competition will often be temporarily suspended, the schedule will be adjusted, and the competition will even be cancelled. During the 2018 PyeongChang Winter Olympics, 10 events in alpine skiing were adjusted due to weather, 3 events in snowboarding were adjusted and 2 events in freestyle skiing.

In the exact words of a former race director, "they say I am the starting gun, but in fact the weather forecast and the actual situation on the field are the real starting gun."

The Beijing Climate Center has compiled and released the "Beijing 2022 Winter Olympics and Winter Paralympic Areas Meteorological Conditions and Gale Risk Analysis Report" for four consecutive years from 2019 to 2022. The content covers the analysis of meteorological conditions and meteorological risk assessment in the Beijing Winter Olympics areas during the same period over the past years. The characteristics of the above-mentioned extreme weather and climate events have been analyzed, and relevant statistical methods have been used to conduct risk assessments with the extreme weather and climate events that occurred in the three major competition areas during the same period in history, and the comprehensive impact of the extreme weather and climate events in the three major competition areas on the competition field have been analyzed in details.

To ensure the smooth progress of Beijing Winter Olympics, the Beijing Climate Center built the Winter Olympics climate risk assessment system based on SuperMap GIS platform. This system combines the characteristics of the Winter Olympics meteorological services and provides climate risk assessment products covering all event venues for the Winter Olympics through multi-scale, multi-dimensional and multi-perspective integrated analysis of the Winter Olympics competition areas and venues. The system is based on the climate risk assessment gained from the comparative analysis of historical long-sequence data and real-time monitoring data from automatic stations. It comprehensively uses various statistical and analytical technologies to produce venue maintenance and game-time risk assessment products based on the needs for safe operation of the Winter Olympics, providing meteorological services for the decision-making of the Winter Olympics organizing committee and improving the meteorological informatization and support service capabilities of the Beijing Winter Olympics.

Designed specifically for events with full range of diagnosis and evaluation

Through the data from 155 national basic weather stations and 358 regional automatic stations in Beijing and Hebei and Winter Olympics stations, the system has provided climate characteristic assessments for the three competition areas of Beijing, Yanqing and Zhangjiakou; for the five competition venues in the Beijing competition area, two competition venues in Yanqing Division and five venues in Zhangjiakou Division, it has provided outdoor and indoor venue meteorological condition assessments according to competition types; it has also provided meteorological risk assessment on precipitation, strong wind, low temperature, fog/haze and other events for a total of 15 major events and 102 minor events. Through the above services, it has provided strong support for venue location selection, event schedule, and other event work.

BJ-RUC mode application provides precise event services

During the preparations and competitions for the Winter Olympics and Winter Paralympics, athletes and the public have higher demands for the accuracy of weather forecasts. Weather forecasts also need to meet higher standards in terms of time and space, and this requires support from high-precision numerical weather prediction models. The system uses the numerical model products of the Beijing Meteorological Bureau's Rapidly Updated Circulation Numerical Forecasting System (BJ -RUC) to provide hourly forecast products for the next 10 days for each venue of the Winter Olympics. It has provided strong meteorological support for national team athletes preparing and training in various venues.

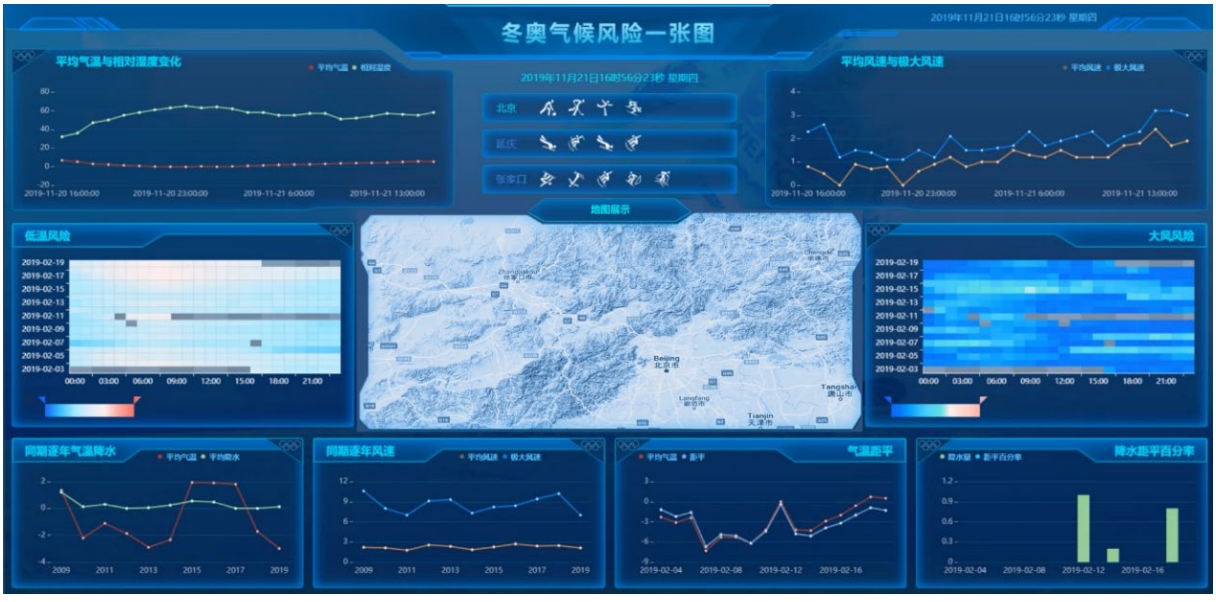
GIS empowerment with multi-dimensional visual data analysis

The system conducts data fusion analysis from different dimensions such as time, space, and meteorological risks. From the spatial dimension, with the help of GIS spatial visualization technology and graphical means, meteorological risk assessment and analysis based on the location of each competition venue in Beijing, Yanqing, and Zhangjiakou competition areas are realized; from the dimension of time, real-time meteorological data analysis is realized hour by hour and day by day, and the analysis of historical contemporaneous data of the Winter Olympic Games and the Winter Paralympic Games, as well as analysis of historical extreme meteorological conditions; in terms of meteorological risk, for factors such as temperature, strong winds, and precipitation that are closely related to the Winter Olympics events, the analysis of low temperature, strong winds, precipitation, sand dust and sandstorms and haze, etc. is conducted.

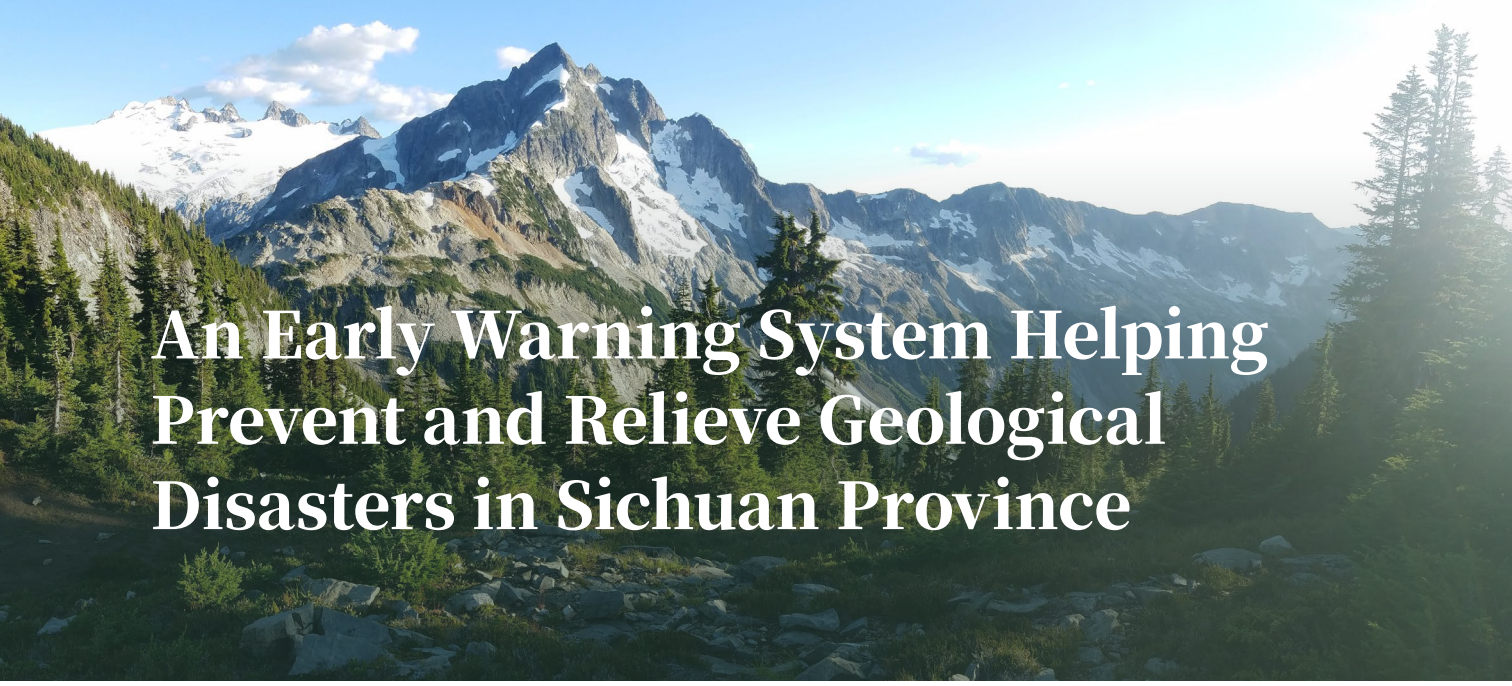
Based on GIS one map technology, the system clearly and effectively displays the distribution, climate characteristics and meteorological risks of each event venue in the three competition areas, having comprehensively improved the Winter Olympics meteorological decision-making service capabilities and informatization level, and provided information for the Winter Olympics Organizing Committee's decision-making work on various events.

Summary

Since its establishment, the system has provided data support and decision-making basis for the preparation of the "Beijing 2022 Winter Olympics and Winter Paralympic Competition Area Meteorological Conditions and Strong Wind Risk Analysis Report" for many years. Meanwhile, it has also provided decision-makers with accurate decision-making basis for the construction and maintenance of the venue and played a significant role before and after the game. As a precious scientific and technological heritage of the Winter Olympics, the system has been put into daily climate business assessment work to provide refined and sustainable climate services for subsequent major events.



GIS comprehensive visualization display of Winter Olympics climate risk



An Early Warning System Helping Prevent and Relieve Geological Disasters in Sichuan Province

Sichuan spans China's first and second-level landform steps. With mountains and hills widely distributed, frequent seismic activities, complex and changeable climate, it is the province with the largest number of geological disasters in China.

In order to strengthen the monitoring and early warning of natural disasters and protect local people's health, the Sichuan Provincial Institute of Land Space Ecological Restoration and Geological Disaster Prevention and Control adopted technologies of micro-service architecture and distributed storage and analysis and developed the geological disaster and meteorological risk early warning system (hereinafter referred to as "the system").

According to different geological backgrounds and environmental conditions, the system divides the province's early warning range into three major regions and six sub-regions and builds an early warning model for imminent geological disasters and meteorological risks in the province. By combining the data of actual rainfall and forecast rainfall provided by the Provincial Meteorological Bureau, it can also dynamically generate geological disaster and meteorological risk warning and forecast information. By sending the information to the person in charge in a timely and accurate manner through the Geological Disaster Intelligent Prevention APP and early warning text messages, it provides contingency plans for on-site disposal and saves valuable time for transferring the masses.

Refining the early warning area to improve the warning accuracy

At present, due to factors such as errors in equipment monitoring source data, rough division of early warning areas, unreasonable selection of early warning models, and unscientific setting of early warning thresholds, the accuracy of early warning of land disasters is generally low. In order to improve the accuracy, the system verified the rainfall data of meteorological stations in Sichuan Province, and eliminated the rainfall data of obviously abnormal stations; the early warning area was refined to the level of administrative villages, and administrative villages with the same geological environment are divided into the same warning area, which reduced the influence of different geological environments in the same early warning area on the early warning results.

In addition, according to the historical rainfall distribution in the early warning area, the user can select the data of real rainfall and forecast rainfall of the meteorological station in different periods and input it into models for calculation. Based on the early warning thresholds in the three major regions and six sub-regions, the thresholds are set considering the actual local rainfall conditions to further improve the accuracy of early warning and forecasting of land disasters.

Improving the model computing to ensure timely warning

In the battle of geological disaster prevention and control, the early warning of geological disasters plays the role of a radar sentinel. It is not only necessary to identify accurately but also to warn quickly. In order to improve the calculation efficiency of the early warning model, the calculation data of the system is stored in the MongoDB database, the data is processed through Python, and distributed computing is performed. Combining multi-thread computing and multi-cluster deployment, the calculation time of the early warning model of the system is reduced from the initial 30 minutes to about 7 minutes, which ensures that the warning results can be sent promptly and buys more time for persons in charge to implement disaster prevention plans.

Classified early warning for dual control of geological disasters

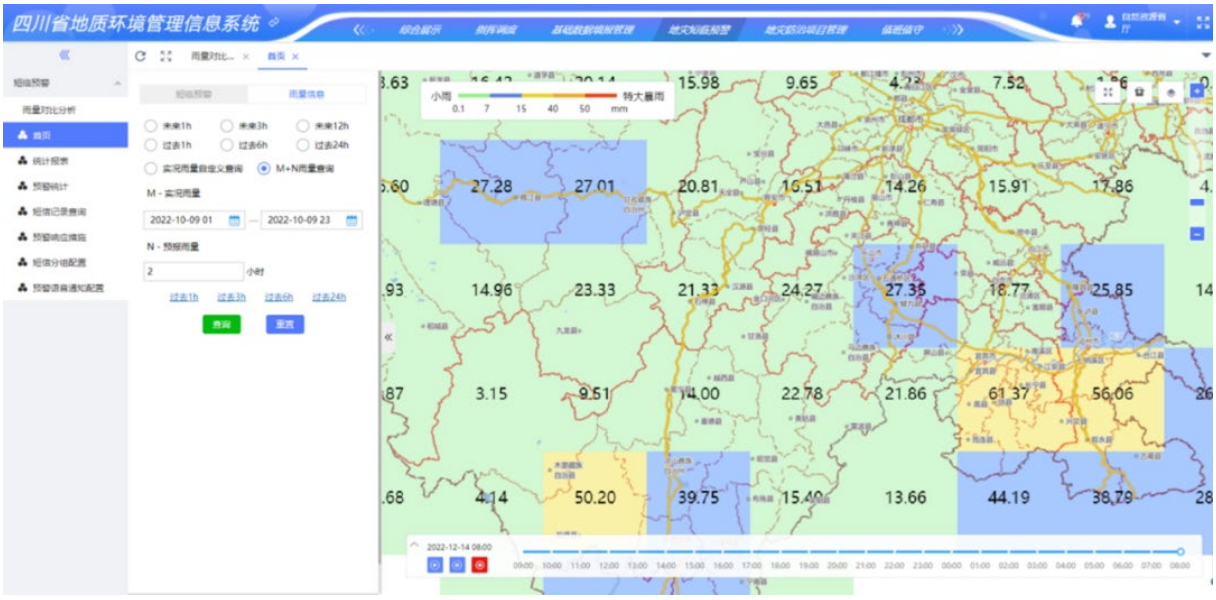
In view of the fact that heavy rains in Sichuan Province can easily lead to geological disasters such as landslides and mudslides, the whole range of the province is divided into extremely high, high, medium, and low four-level risk areas based on the susceptibility and danger of the area, and the extremely high and high-risk areas are also included in the monitoring, early warning and protection system to achieve dual control of geological disasters.

In the prevention and control of geological disasters, it is necessary not only to consider the consistency of regions of different risk levels but also to customize the early warning and protection measures of geological disasters based on the actual situation of the region. The system is divided according to the scope and responsibilities of users of four levels: province, city, county, and grassroots. Users at a certain level can set and send imminent warning SMS content to persons in charge at this level and lower levels, playing the role of prompting and supervising.

Coordination between PC and mobile Apps to form a closed-loop management

The system can generate imminent warning results and send them to the PC and mobile APPs. Through user rights management, users of different levels can only view the warning information within the scope of their responsibility. When the early warning is triggered, the system will compare the warning area and level with that of last time, and send early warning text messages every 6 hours, informing the corresponding person in charge of the early warning information and pre-planned measures.

In the system, users at the city and county level in Sichuan Province are mainly responsible for the overall management, supervision, and command and dispatch of disaster protection. Grassroots full-time monitors will strengthen inspection after receiving early warning text messages, and adopt corresponding emergency plans according to the early warning level. When the early warning message is sent, if the grassroots full-time monitors have not read the early warning message within 10 minutes, the system will automatically voice dial and play the full content of the early warning message to ensure a response from frontline personnel, which will form a closed-loop management mechanism from early warning information generation, transmission, reception to early warning response.



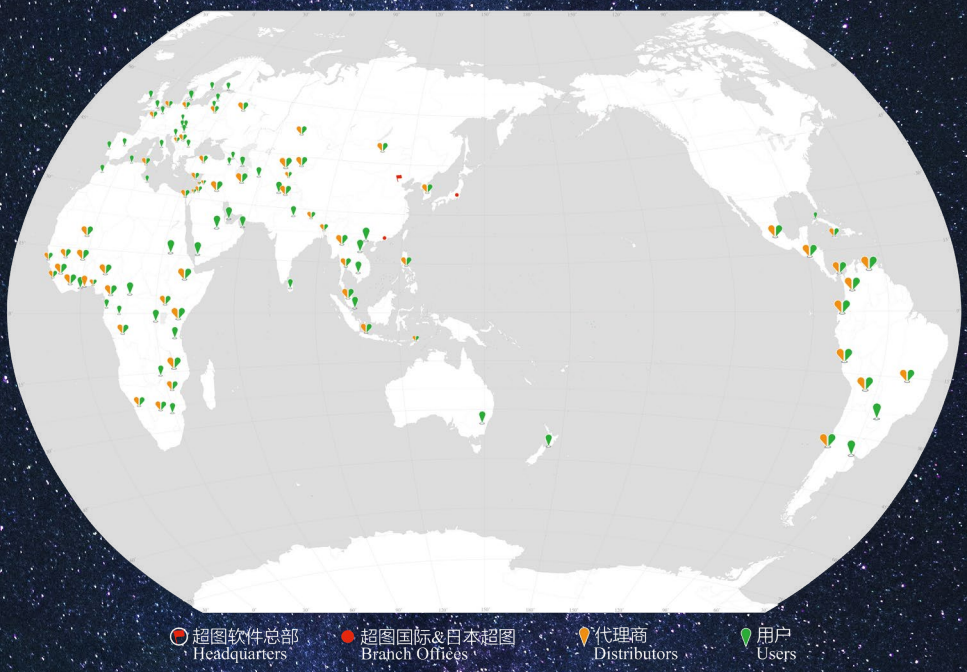
Results displayed in GIFs

Based on the geological environment and meteorological station rainfall data, the system dynamically calculates and generates rainfall and early warning information at the back end. Through SuperMap GIS platform, data such as basic data, rainfall distribution, early warning areas, hidden danger points, and risk areas in the early warning areas are loaded onto the map for visualization rendering, which will realize functions such as layer management and map-attribute linkage. Through the visual map, users can quickly learn about the distribution of rainfall, the distribution area and level of the early warning area, the distribution of hidden danger points and risk areas in the early warning area, and quickly locate and query the basic attribute information of relevant hidden danger points and risk areas.

The system also answers to the query about the actual rainfall of meteorological stations in Sichuan Province and the query about the 24-hour real-time rainfall trend of the station. Through the dynamic display of the 24-hour real-time rainfall distribution data of the whole province, users can quickly grasp the changes in rainfall distribution and heavy rainfall in the whole province in the past 24 hours and the change trajectory of heavy rainfall. This will provide comparative analysis data for the verification of the threshold value of the early warning model, gradually improving the threshold value of the model, and continuously improving the accuracy of early warning.

During the 2022 flood season, the system has sent a total of more than 330,000 early warning text messages across the province, issuing timely warnings to heavy rainfall areas across the province. Among them, more than 60 successful early warnings bought valuable time for surrounding residents to relocate, having avoided the risk of people's lives and property loss. Next, the Sichuan Provincial Institute of Land Space Ecological Restoration and Geological Disaster Prevention and Control will conduct a comparative analysis of rainfall and early warning data during the flood season to provide data reference for subsequent optimization of early warning models.

Global Distributors and Users



SuperMap has developed distributors and partners in more than 50 countries and SuperMap GIS end users in over 100 countries. We are looking for more partners from all over the world to build a global partner eco-system.