

Space Weather Operational System Development in Chinese Academy of Sciences

Center for Space Science and Applied Research, CAS
National Space Science Center

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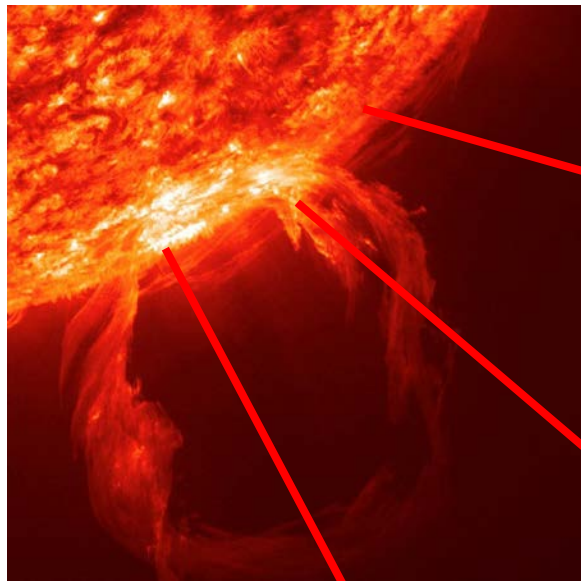
Outline

Swx background

History of Swx Tech. Support System at SEPC

Capability of SWx Operational System at SEPC

Background-Space Weather & solar storm



~93 million miles from the Sun to the Earth

Electromagnetic Radiation

8 minutes

Gamma rays
X-rays
Ultraviolet
Visible
Infrared
Microwave
Radio

High Energy Particles

10-30 minutes

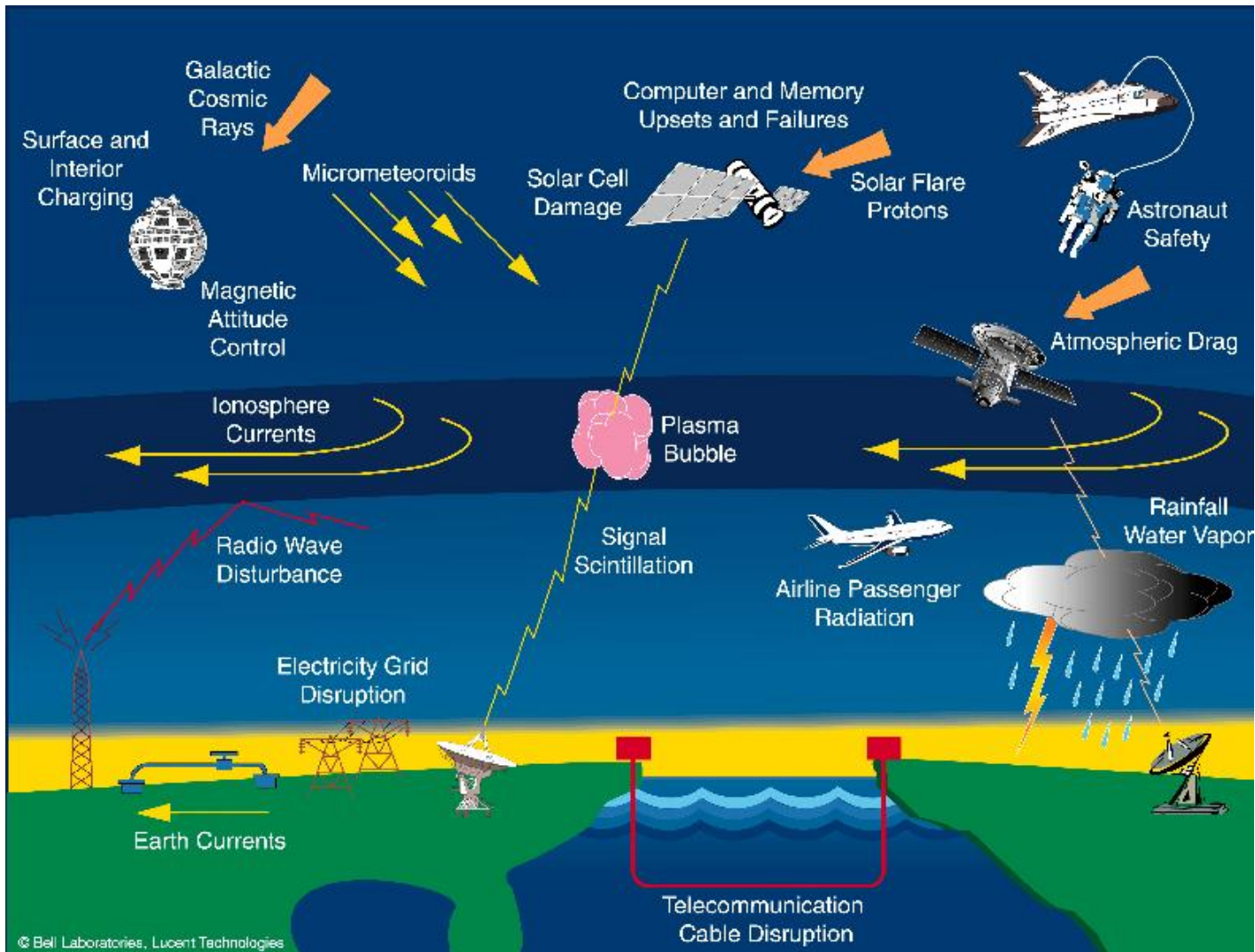
Heavy Ions
Alpha Particles
Protons
Neutrons
Electrons

Magnetized Plasma

18-96 hours



Background-Space Weather effects



Background- Space Weather effects

Global Threat – Global Impact: Oct 2003

18 of 34 NASA Earth and Space Science Missions impacted

Flare damages Mars Odyssey probe

Powerdown of Canadian robotic arm on ISS

Solar cell damage on ESA's Smart-1 satellite

Numerous anomalies on FedSat and other Australian satellites

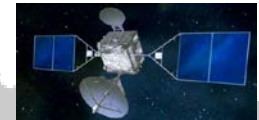
Loss of Japan's ADEOS II satellite



Numerous Polar flights rerouted



Failures of GPS based positioning

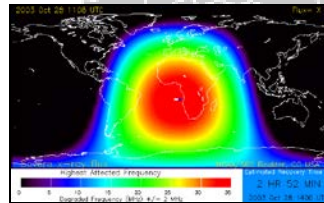


Japan's Data Relay Test Satellite went into safe mode, and took over a week to recover

NOTAM
Route restrictions due to geomagnetic storm impact on communications



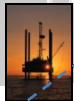
Nuclear power plants reduced power due to geomagnetic storm



Widespread HF outage over African continent



SatComm and HF outages



Oilfield services company reported several cases of survey Instrument Interference around world



C.R. Luigs drill ship, loses GPS, resorts to backup systems



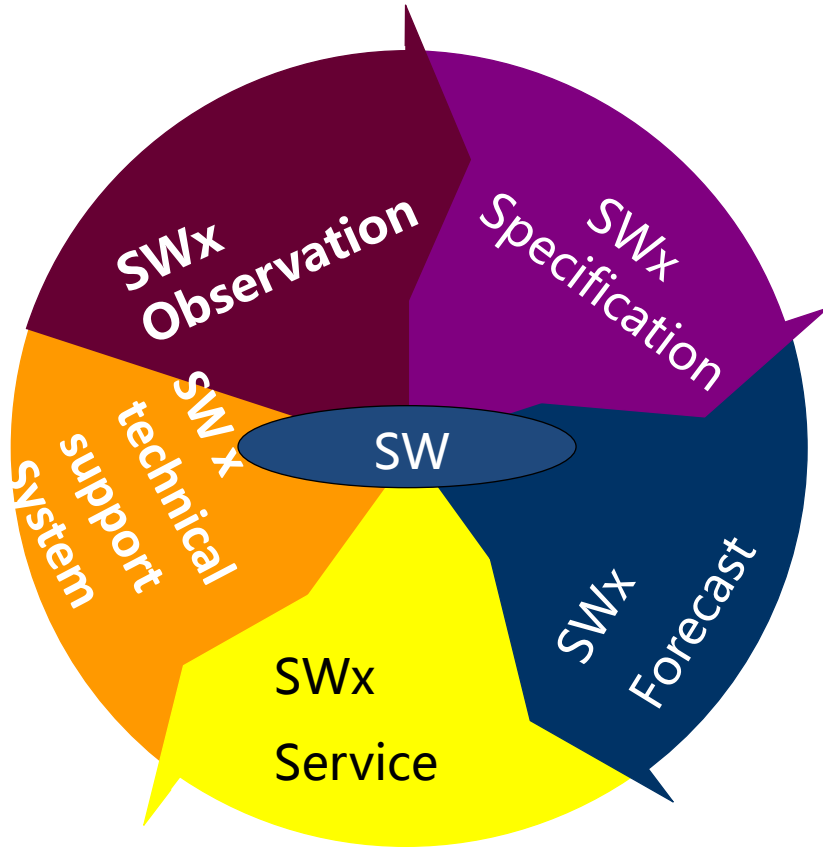
Transformer damage



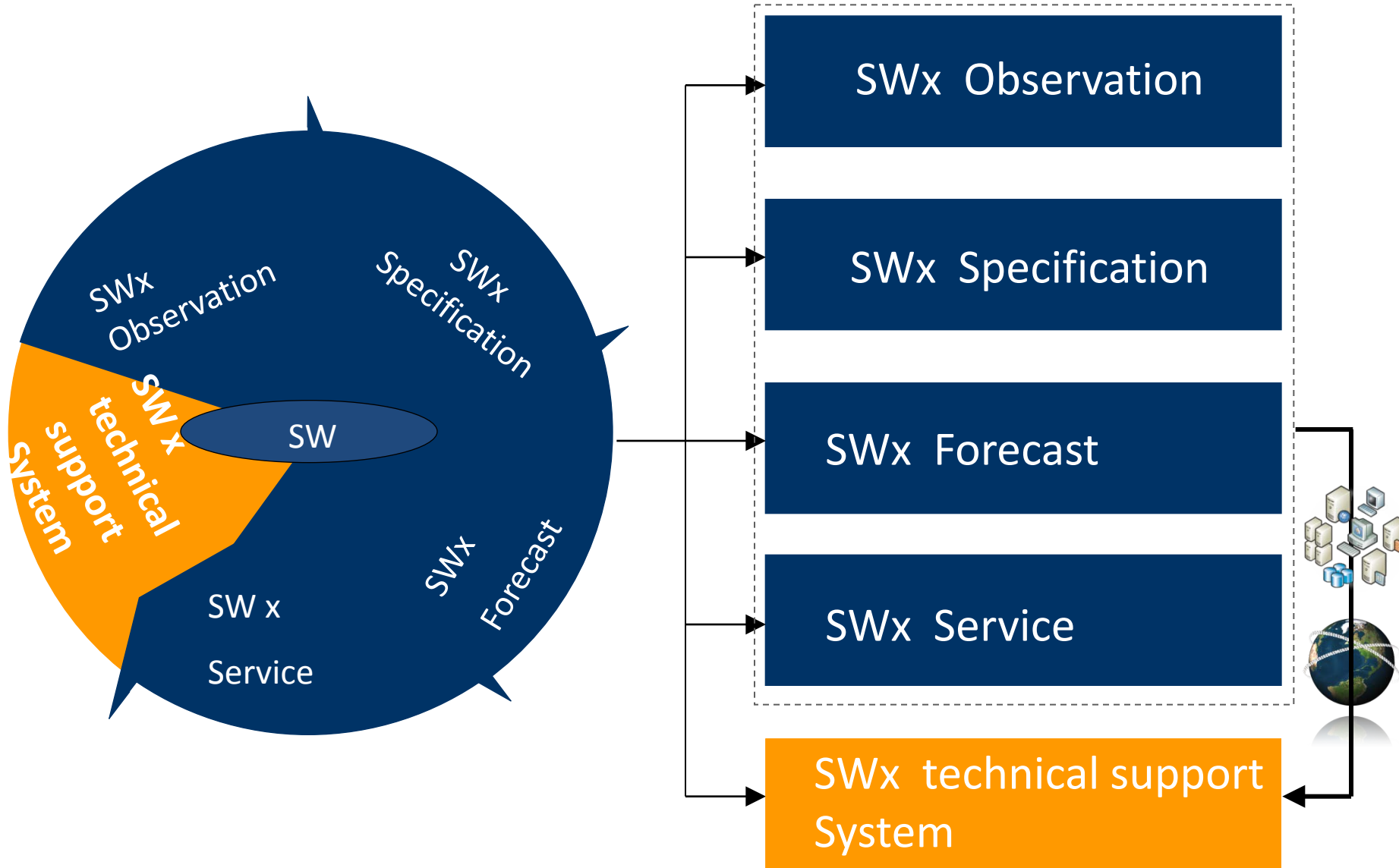
SatComm and HF outages

Over 130 hours of HF communication blackout in Antarctic

Background- Research area of SWx



Background- Research area of SW



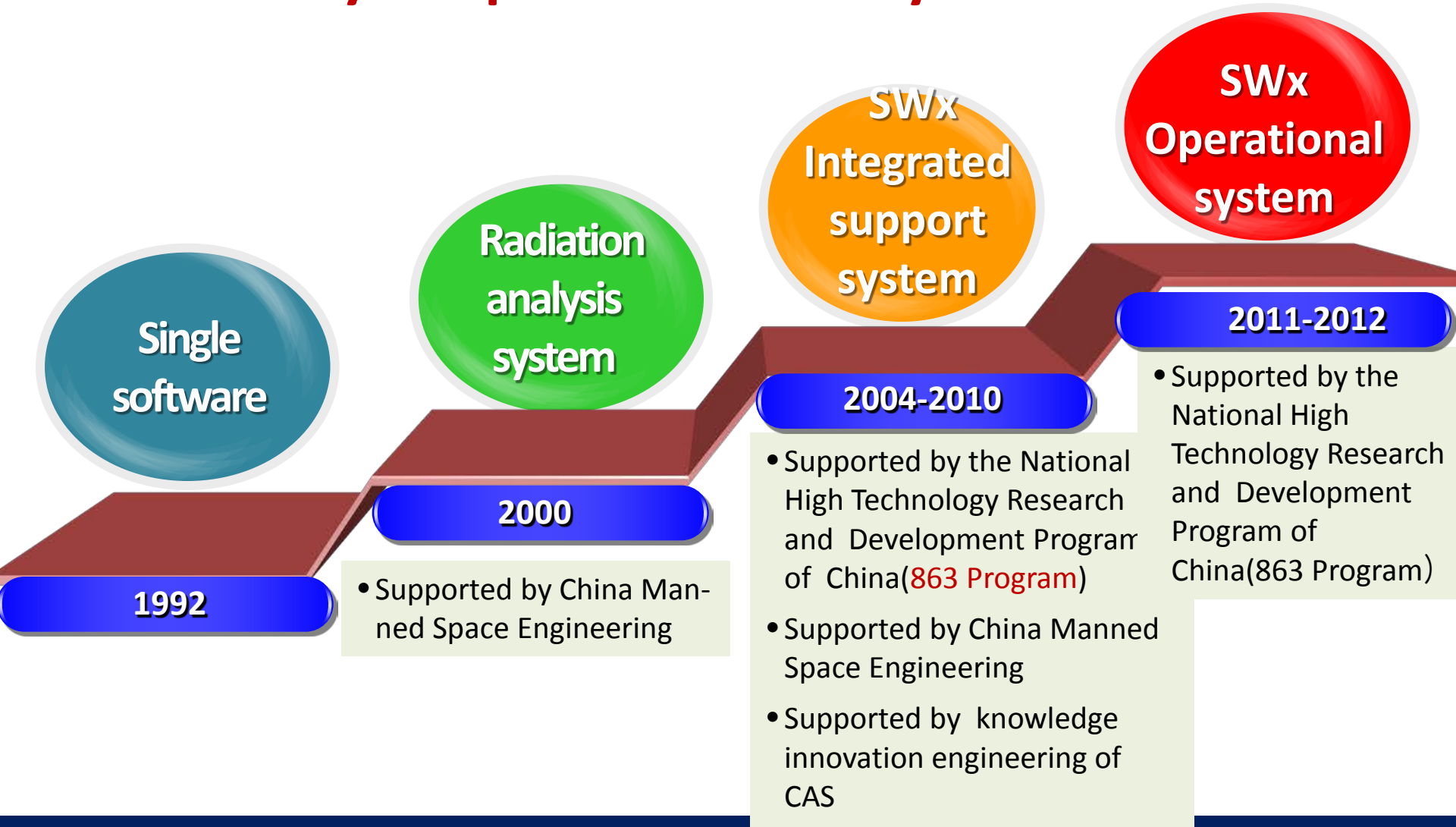
Outline

Swx background

History of Swx Tech. Support System at SEPC

Capability of SWx Operational System at SEPC

History of Space Weather System at SEPC



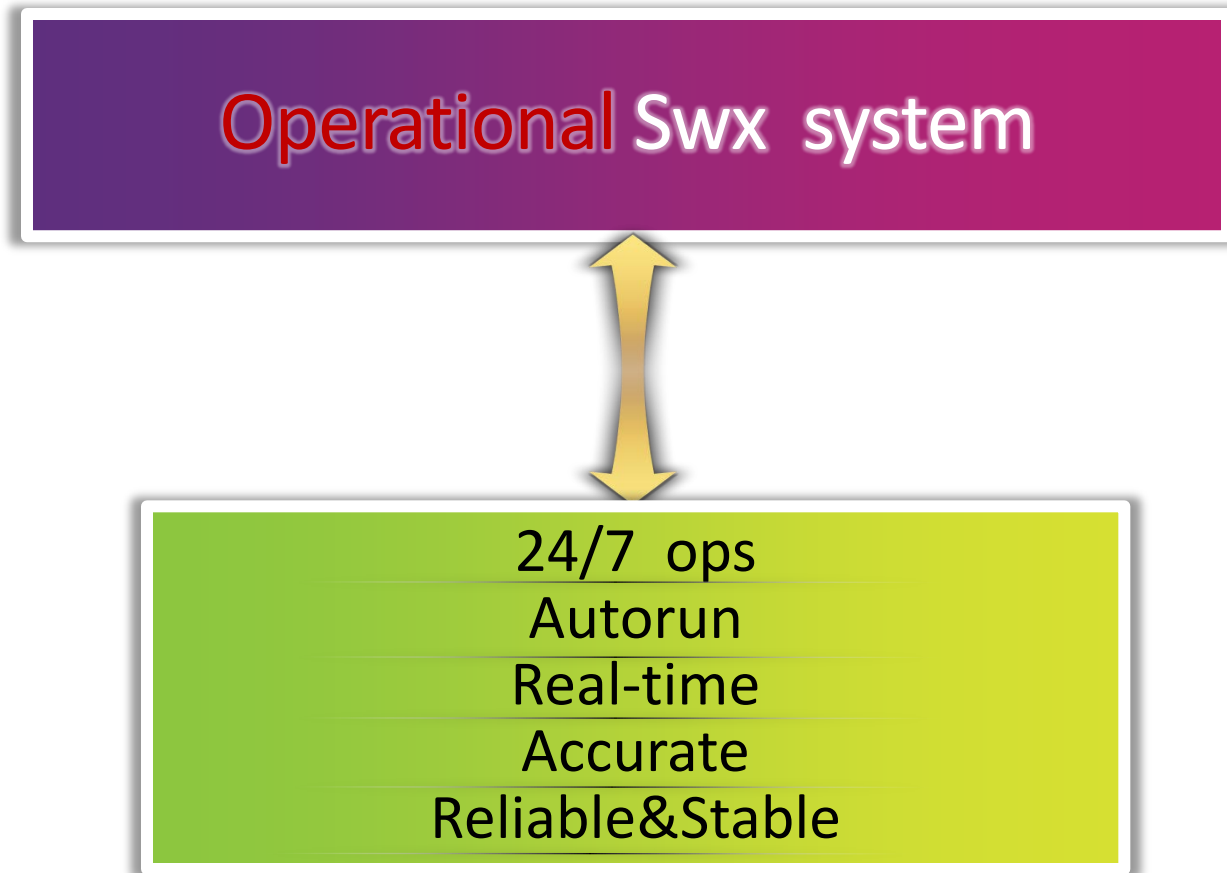
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Swx background

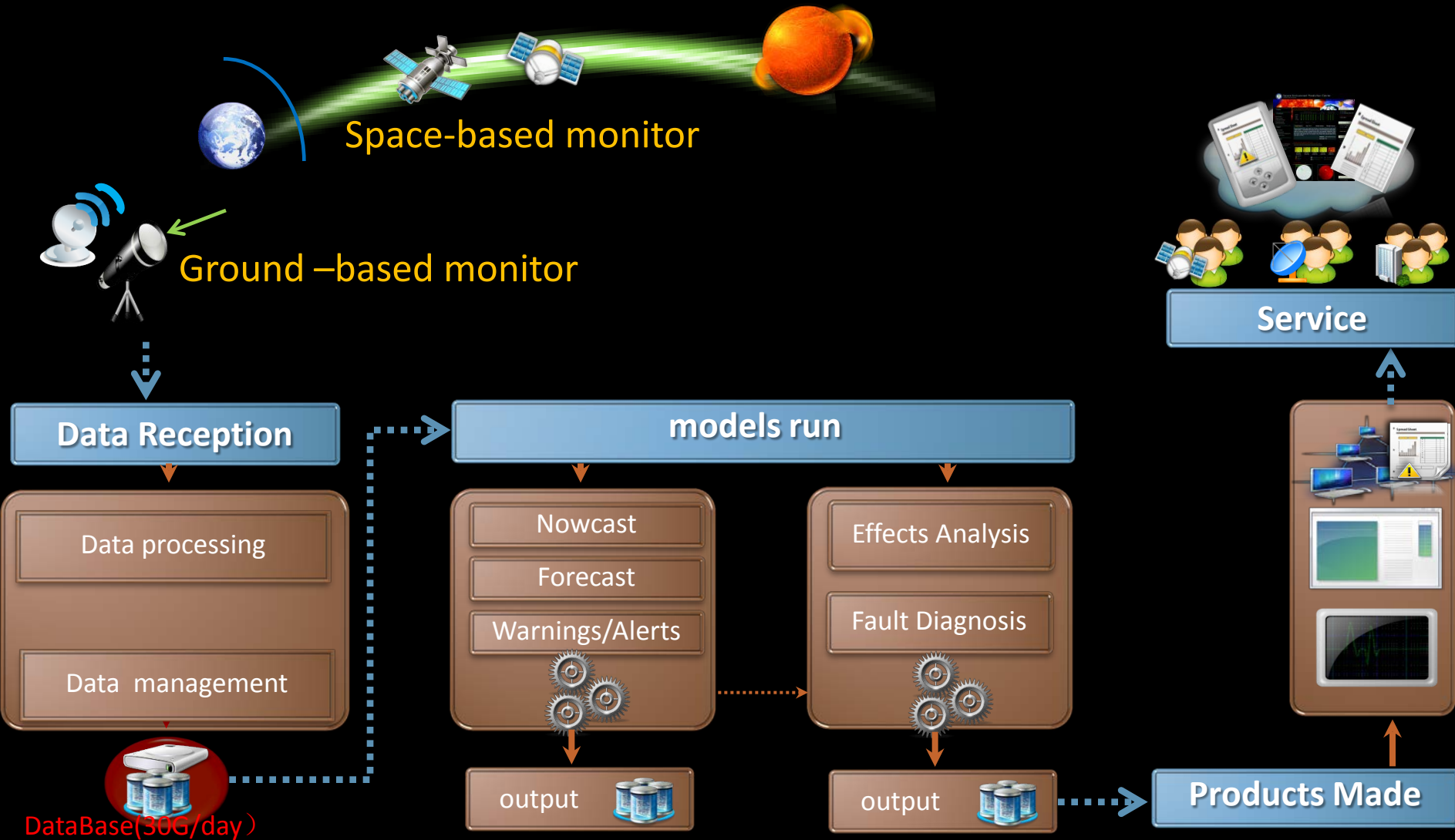
History of Swx Tech. Support System at SEPC

Capability of SWx Operational System at SEPC

Characters of the operational system



Capacity of the SWx Operational system





Ground-based monitor

Data Reception

Data processing

Data management

DataBase(30G/day)

models run

Nowcast

Forecast

Warnings/Alerts

output

International space-based monitor (L1,earth's orbit,GEO,LEO)

STEREO ,ACE, SOHO ,GOES,SDO
NOAA etc.

Space-based monitor

National space-based monitor (GEO,IGSO,LEO)



Products Made



Space-based monitor



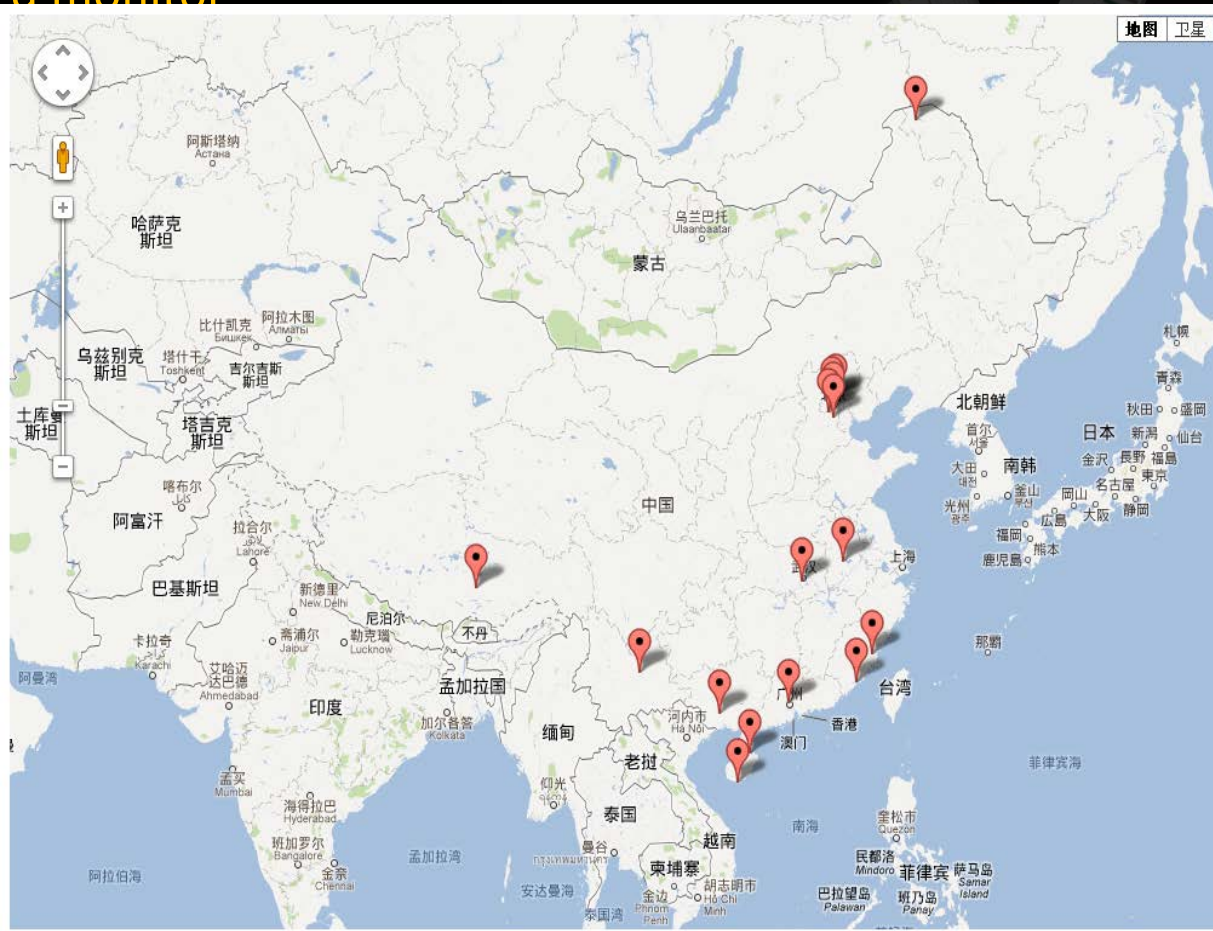
Ground-based monitor

Data Reception

Data processing

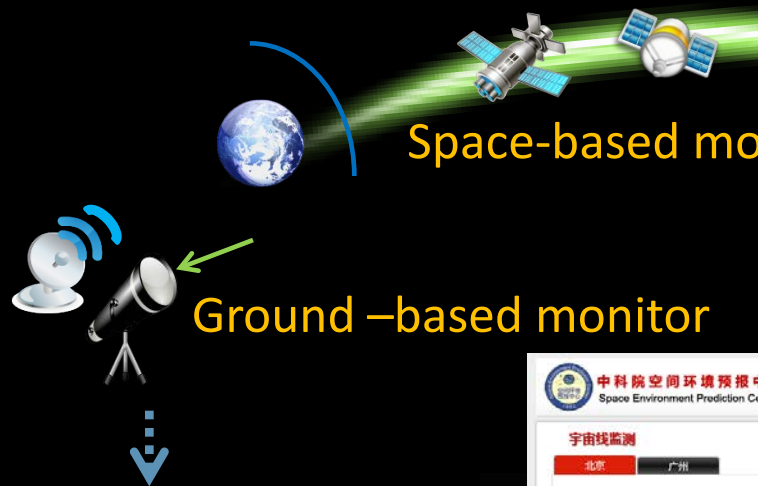
Data management

DataBase(30G/day)



Data Operational Processed

- How to collect the data automatically
- How to carry out data inversion
- How to identify and deal with missing data
- How to identify and deal with “bad” data

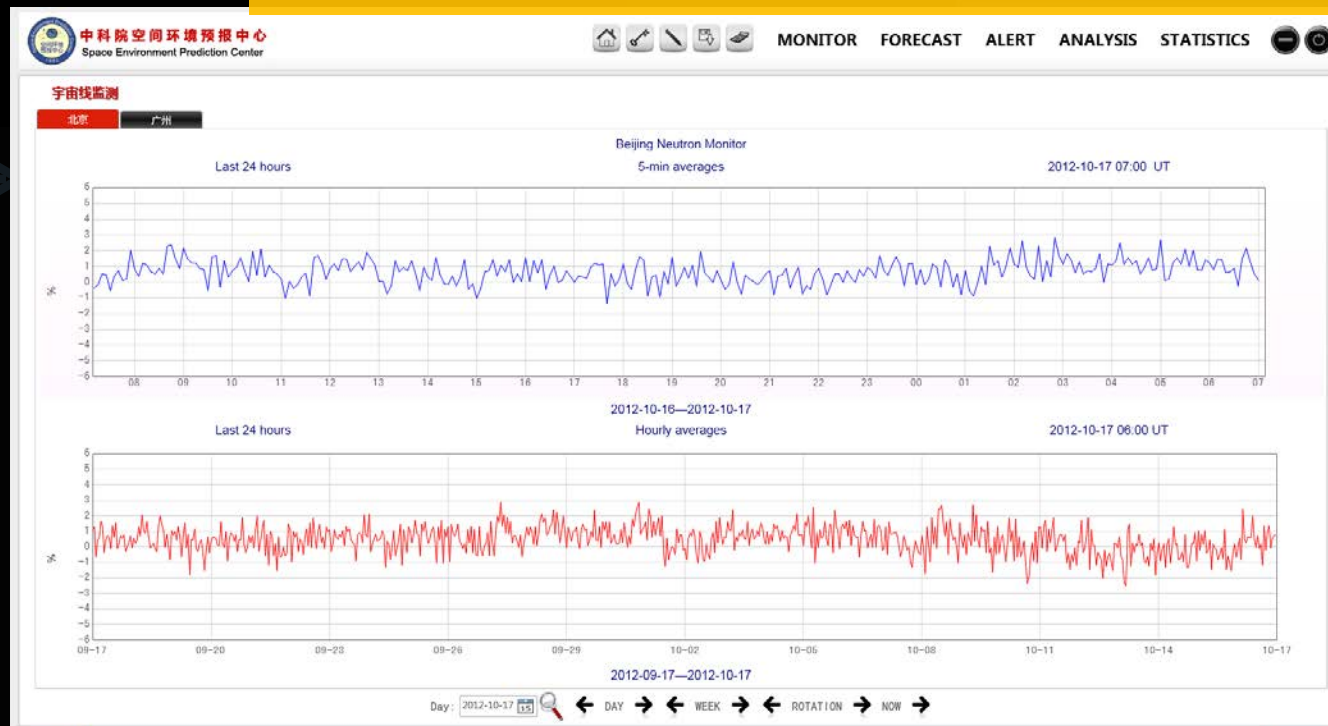


Data Reception

Data processing

Data management

DataBase(30G/day)



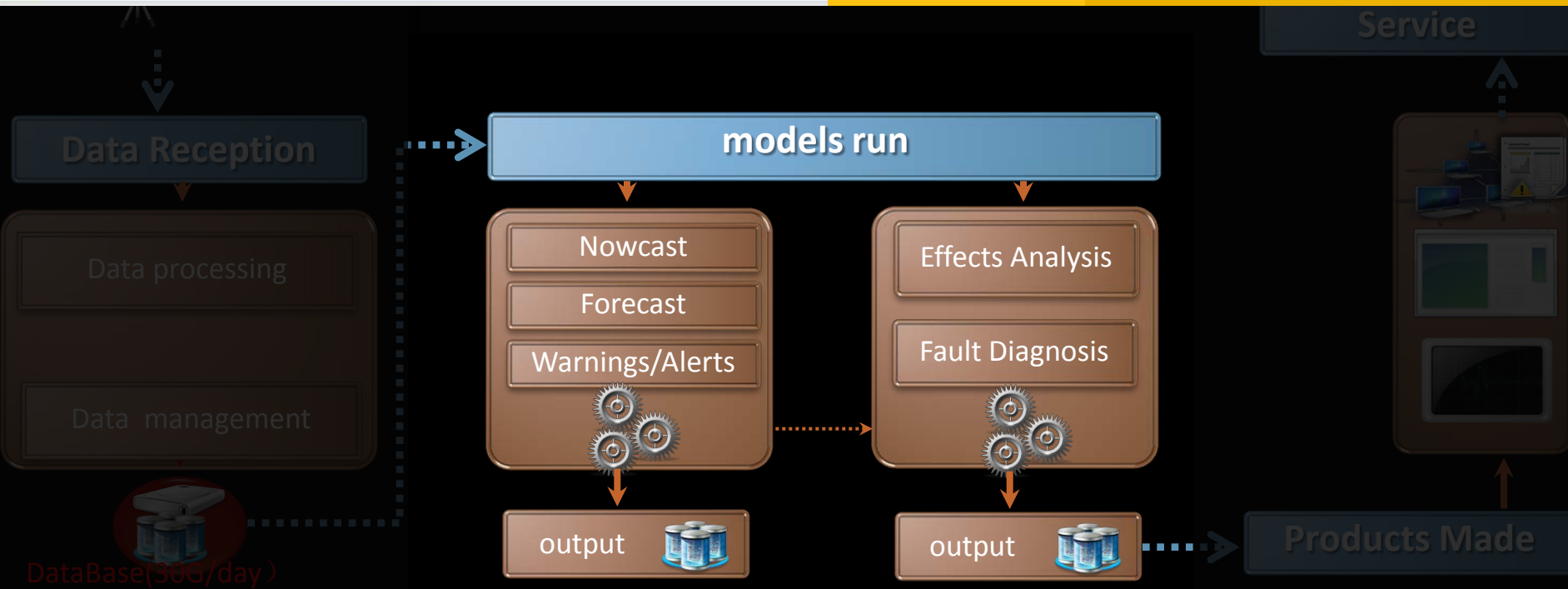
Models run

警报概览



ID	时间	种类
1	2012-10-17 00:00	高能电子
2	2012-10-16 10:35	高能电子
3	2012-10-16 00:00	高能电子
4	2012-10-15 14:20	高能电子
5	2012-10-15 00:00	高能电子
6	2012-10-14 18:25	高能电子
7	2012-10-14 01:00	地磁
8	2012-10-13 19:00	地磁
9	2012-10-13 16:00	地磁
10	2012-10-13 13:00	地磁
11	2012-10-13 10:00	地磁
12	2012-10-13 07:00	地磁
13	2012-10-13 00:00	高能电子
14	2012-10-12 06:15	高能电子
15	2012-10-12 00:00	高能电子
16	2012-10-11 10:40	高能电子
17	2012-10-11 00:00	高能电子
18	2012-10-10 20:20	高能电子
19	2012-10-10 00:00	高能电子
20	2012-10-09 22:00	地磁
21	2012-10-09 18:30	高能电子
22	2012-10-09 07:00	地磁
23	2012-10-09 04:00	地磁
24	2012-10-09 03:00	地磁

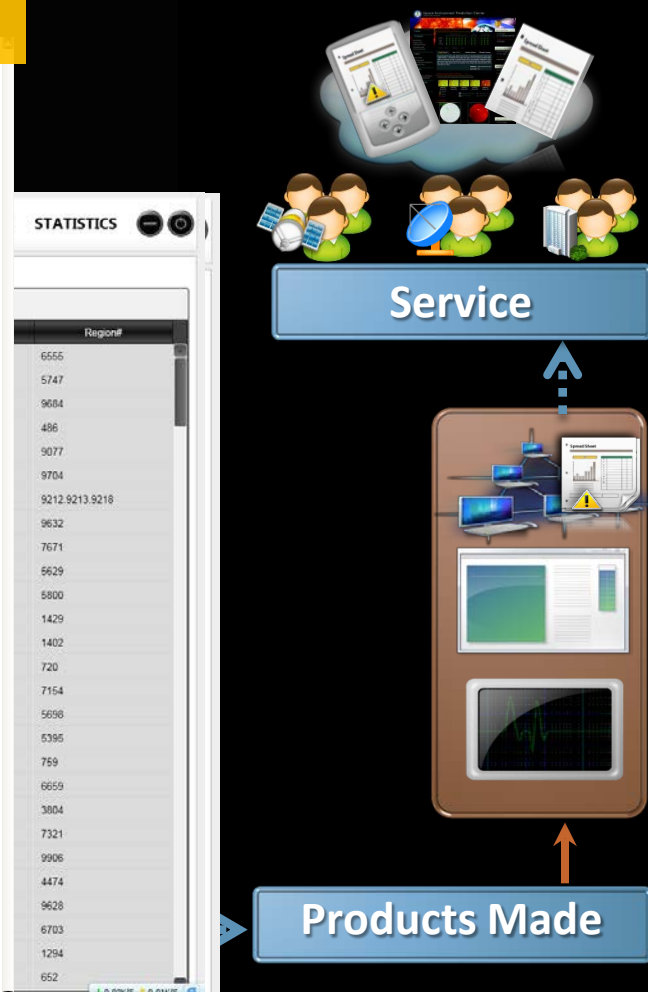
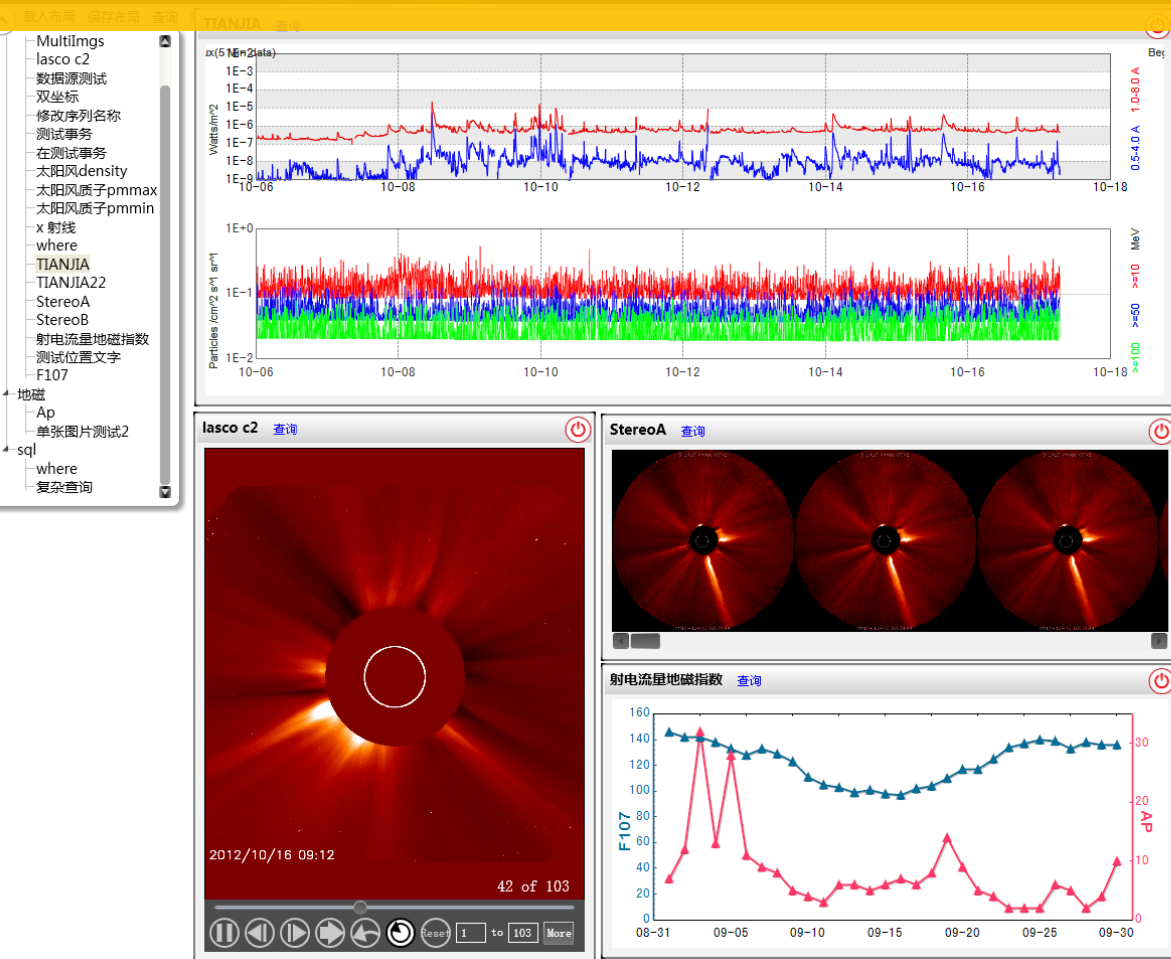
- Transiting research model to operational model
- Ensuring input data stream
- Models running driven by real-time data

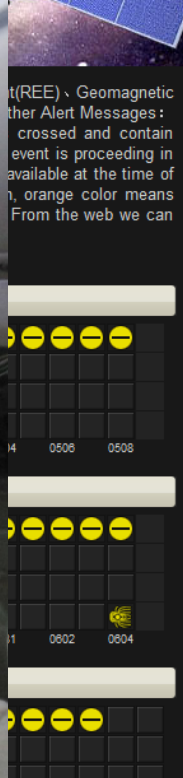


Products Made

Information(data&model output) analysis tool for forecaster

Products Assessment





> Processed Data

- Coronal Hole Index
- Solar Active Regions
- F10.7 Index

> Archive

> Data Sources

> About US

台站数据

招聘

太阳爆发对地球的三粒攻击：太阳爆发活动释放出巨大的物质和能量，它们穿越星际空间，到达地球附近，引起近地空间环境的剧烈扰动。...

活动区磁图根据北京怀柔太阳观测站的全日面纵向磁数据绘制生成。

太阳全日面Ho图像由位于北观测站的20cm全日面Ho望远镜

Service

- Website for the public
- SMS of SWx alert for tailored users
- Real-time phone App for public
- Mobile vehicle for tailored space mission
- Other

Products Made

Capacity of the SWx Operational system



Space weather conditions monitoring room



Space weather forecast room



Supercomputing room

Thank you for attention