Current status and future plan of climate services in China

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Beijing Climate Center, CMA

Nov. 8, 2017

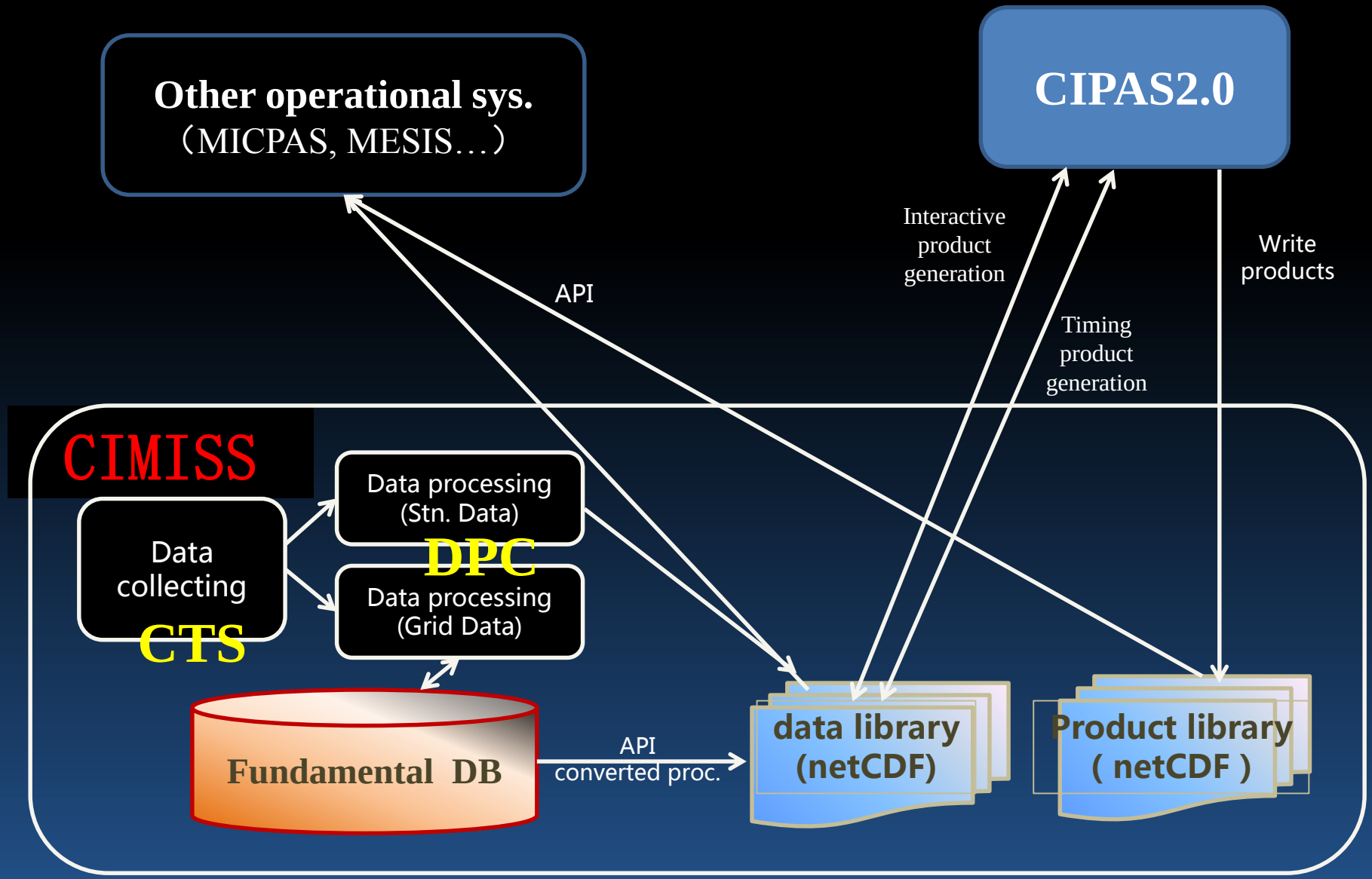
Outline

- Climate Services in China
- Future Development

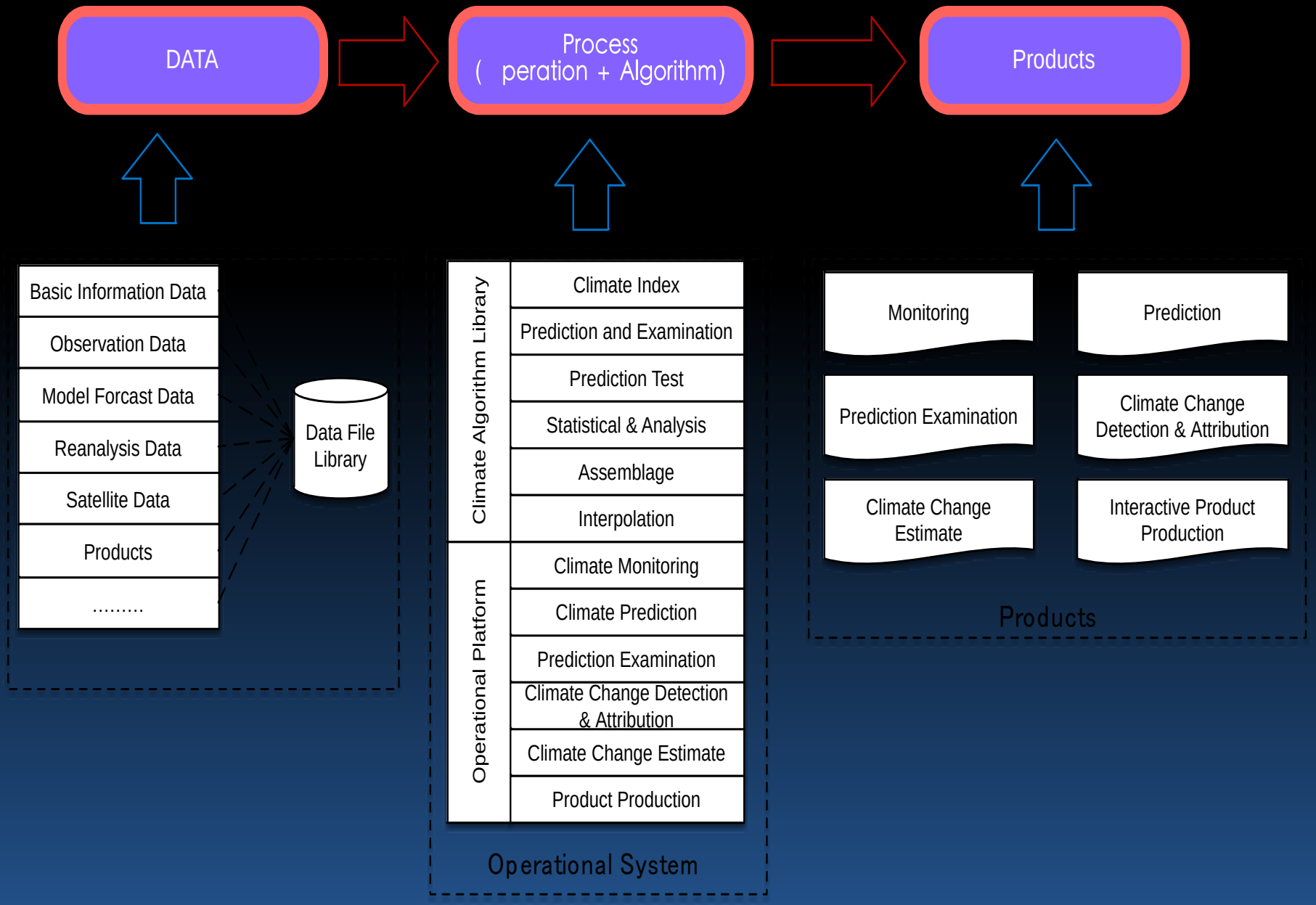
What's the climate information?

- Climate data
- Climate products
- Climate knowledge

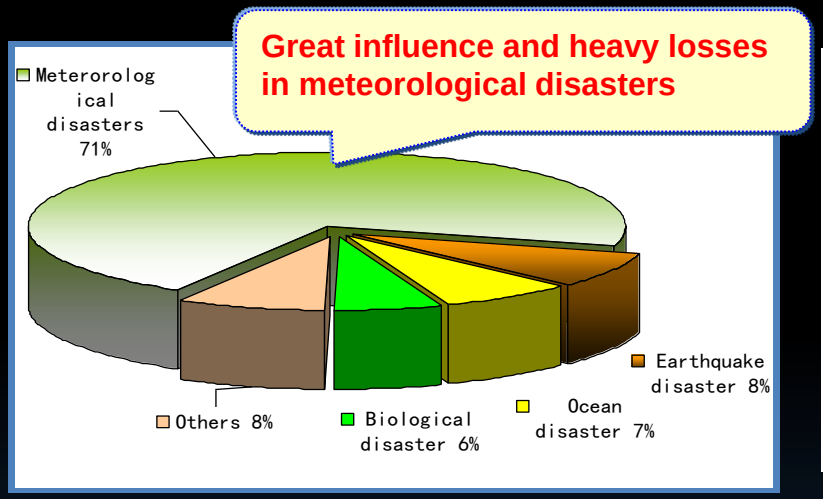
Climate data

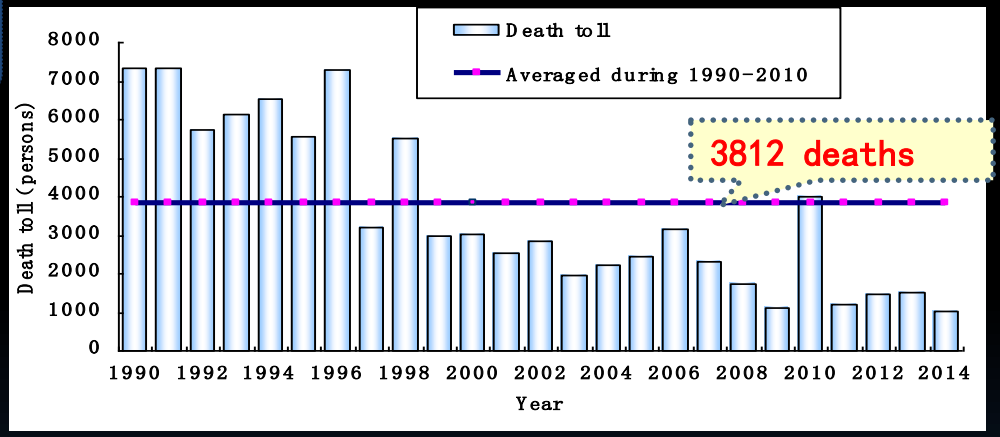


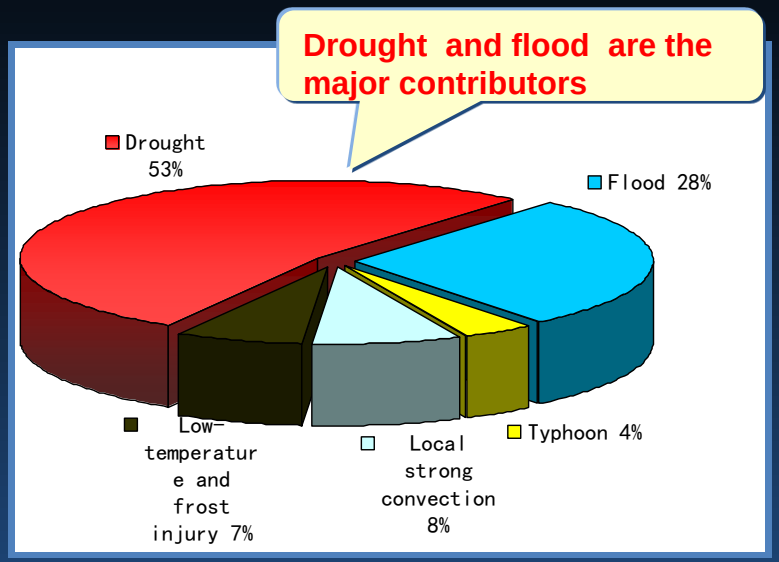
What is CIPAS 2.0

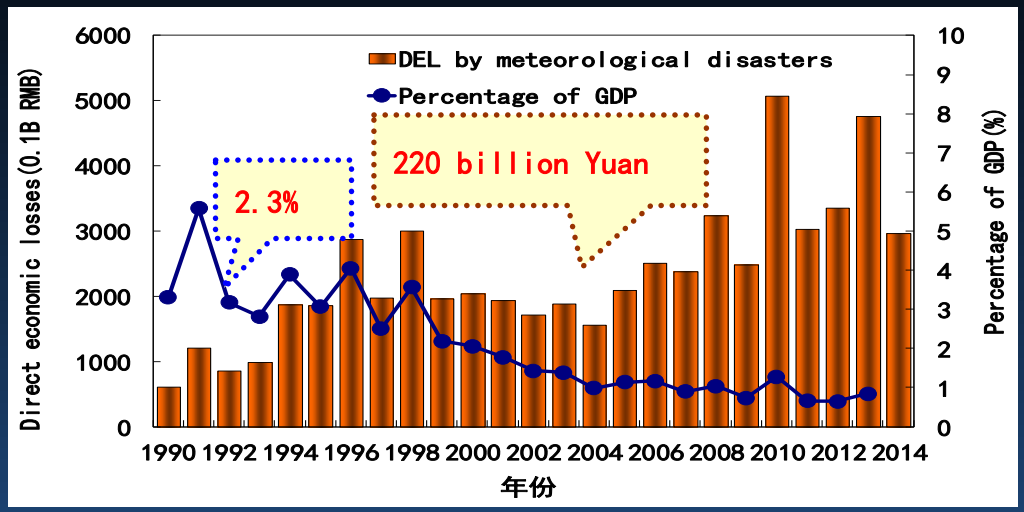


Meteorological disasters occur frequently with great losses in China .







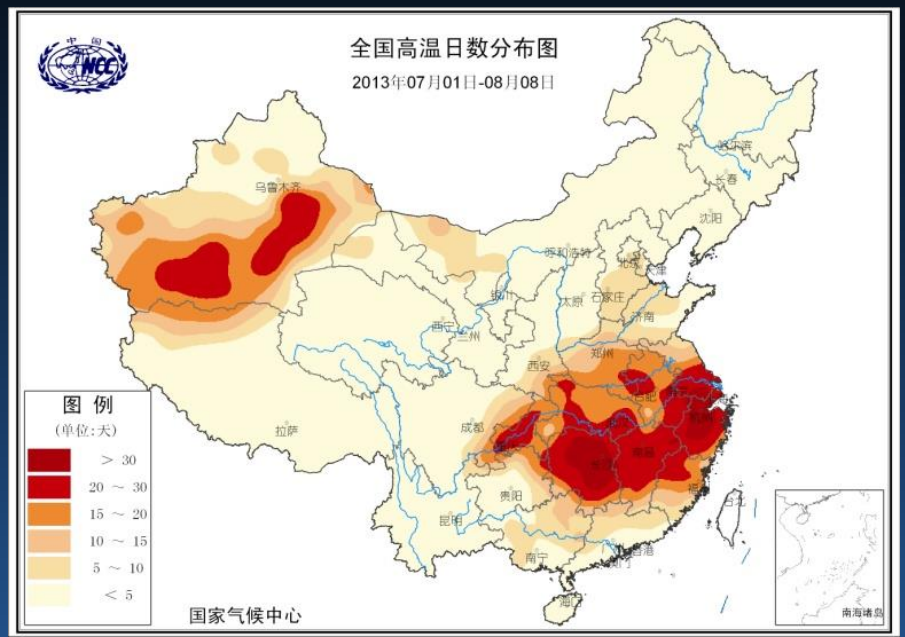


Climate Monitoring

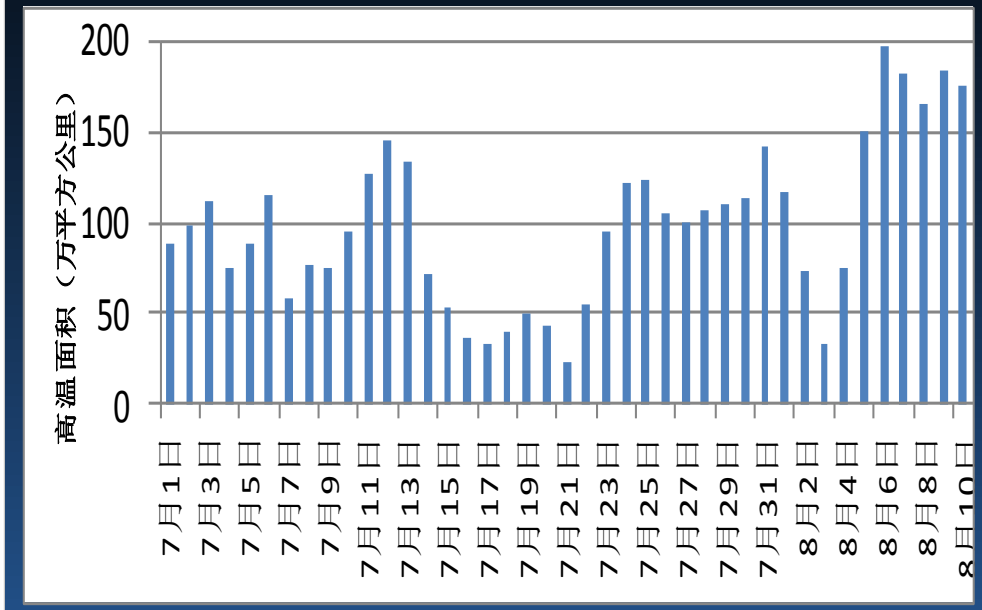
The strongest heat wave in 2013

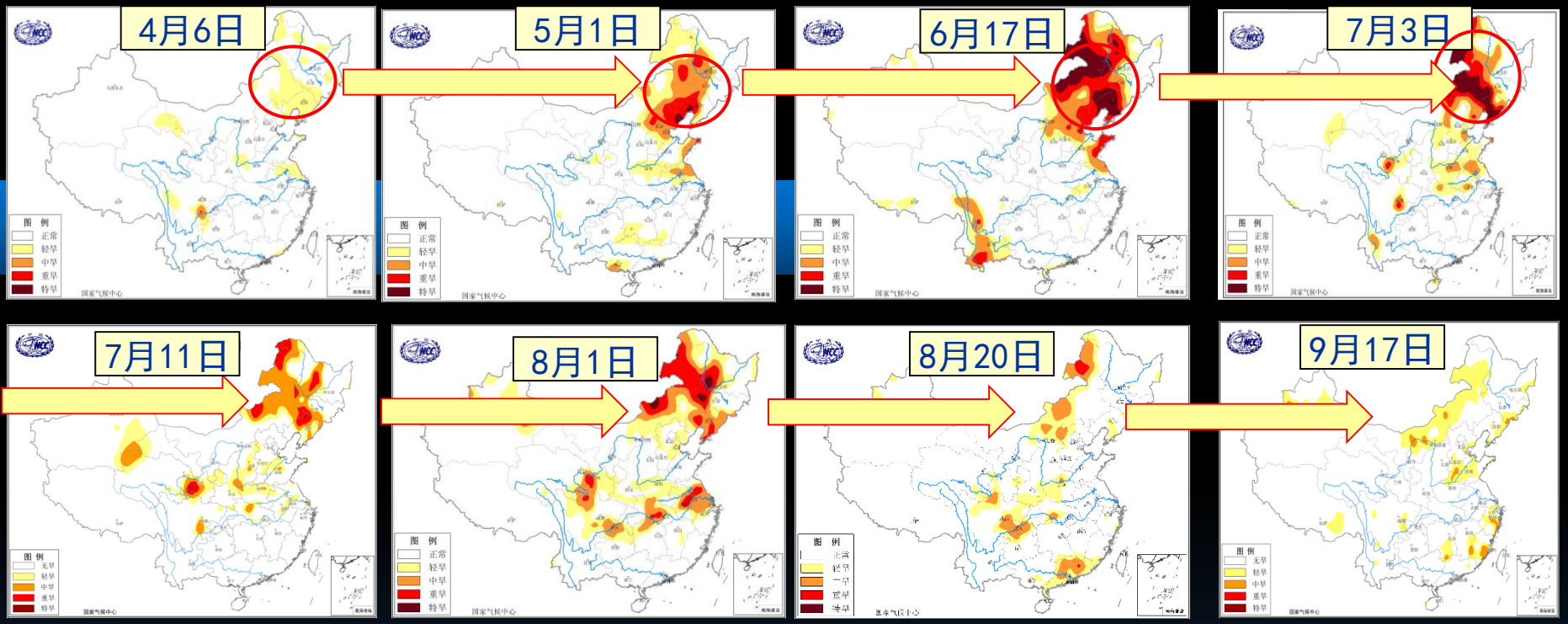
- ✓Mean high temperature(>35℃) days was the most from 1951
- ✓19 provinces hitted heat wave
- ✓98 stations broke the records of max temperature

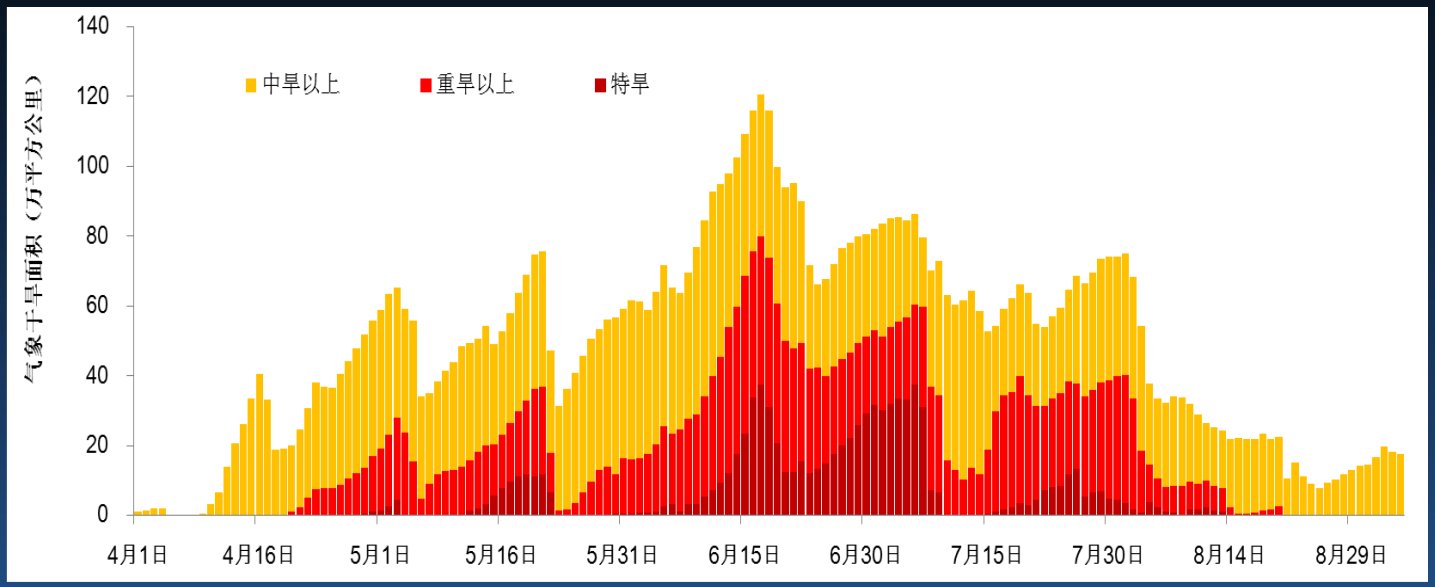
High temperature days in 2013

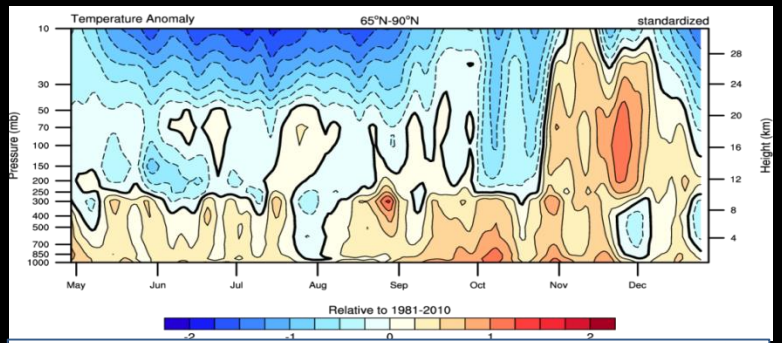


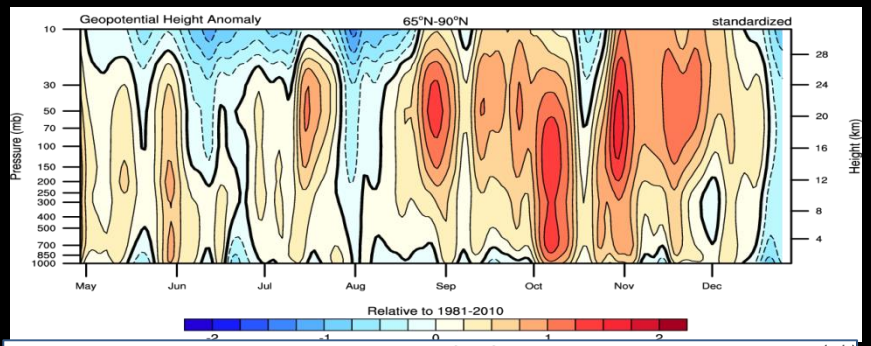
High temperature area in 2013

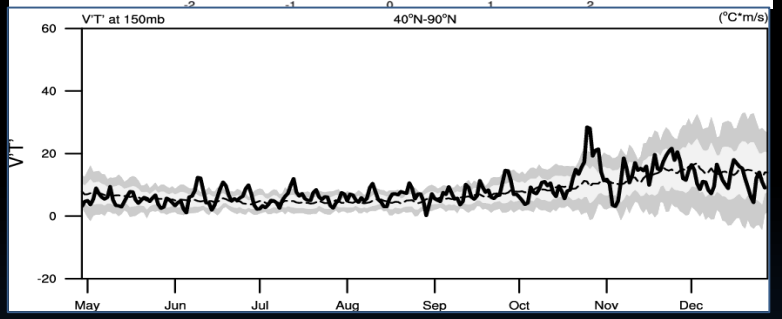


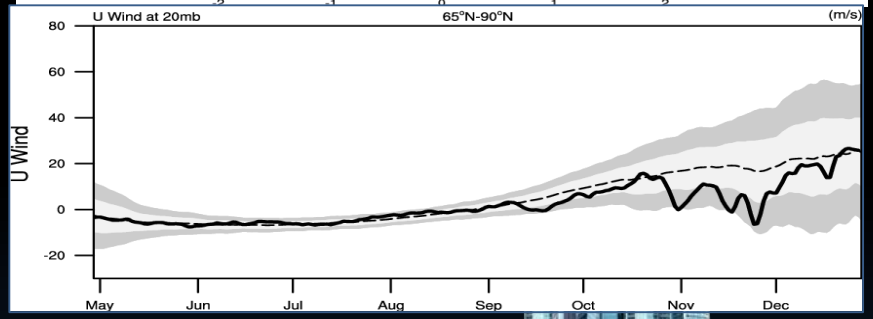

4月6日
5月1日
6月17日
7月3日
7月11日
8月1日
8月20日
9月17日

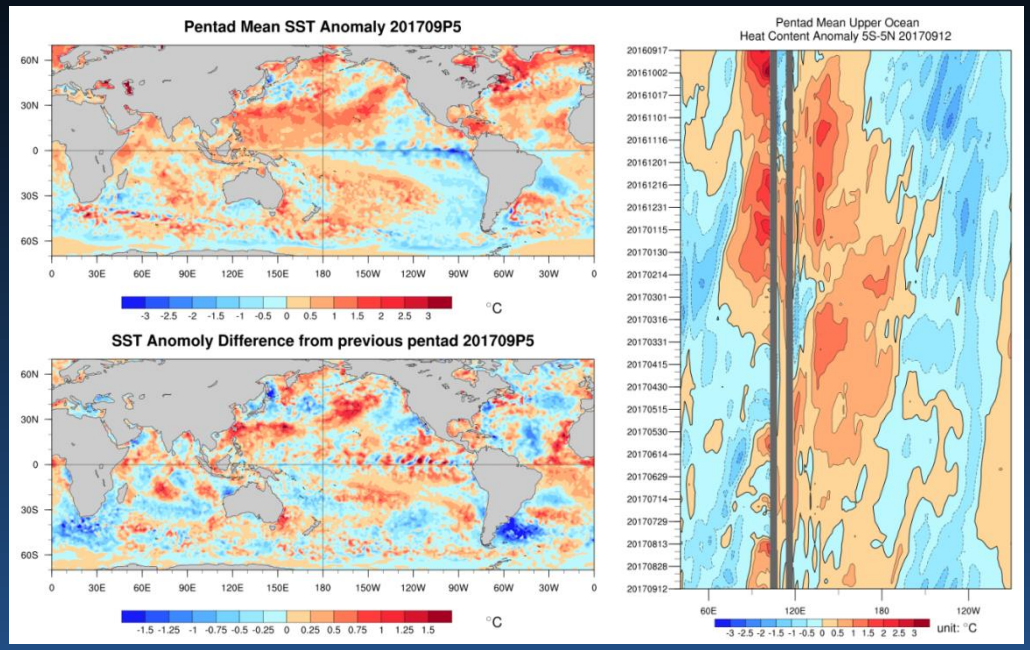

气象干旱面积（万平方公里）
中旱以上
重旱以上
特旱
140
120
100
80
60
40
20
0
4月1日
4月16日
5月1日
5月16日
5月31日
6月15日
6月30日
7月15日
7月30日
8月14日
8月29日


Temperature Anomaly
65°N-90°N
standardized
Pressure (mb)
Height (km)
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Relative to 1981-2010


Geopotential Height Anomaly
65°N-90°N
standardized
Pressure (mb)
Height (km)
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Relative to 1981-2010

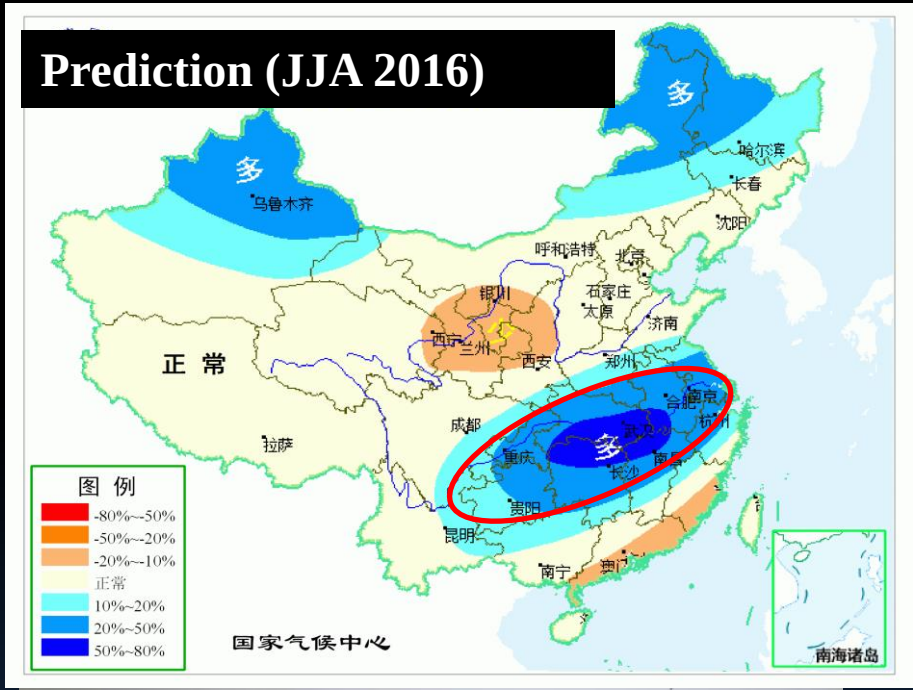

V'T' at 150mb
40°N-90°N
(°C*m/s)
V'T'
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

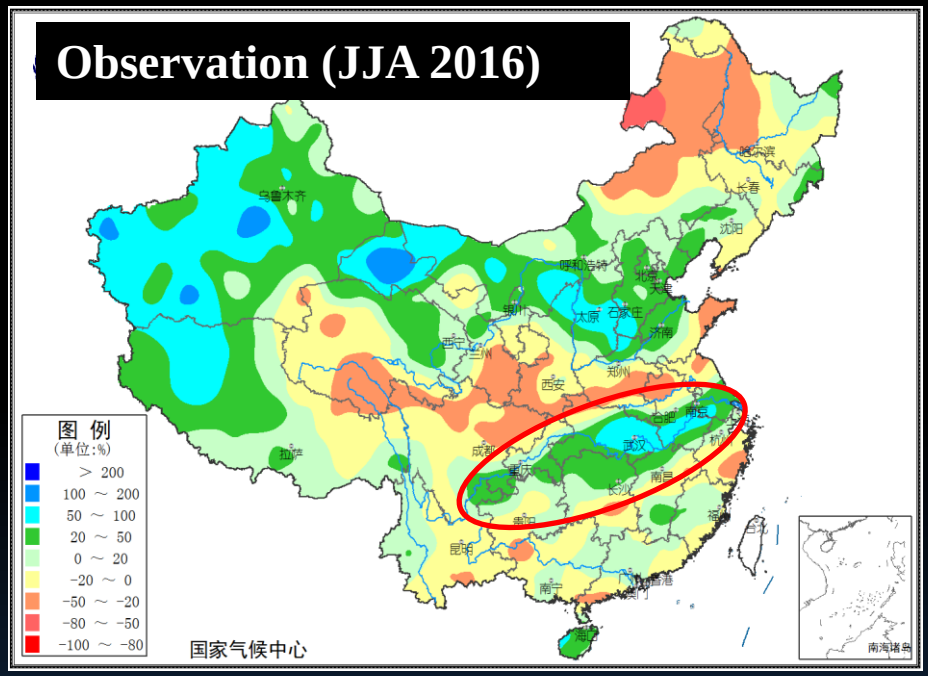

U Wind at 20mb
65°N-90°N
(m/s)
U Wind
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


Pentad Mean SST Anomaly 201709P5
°C
SST Anomoly Difference from previous pentad 201709P5
°C
Pentad Mean Upper Ocean
Heat Content Anomaly 5S-5N 20170912
unit: °C

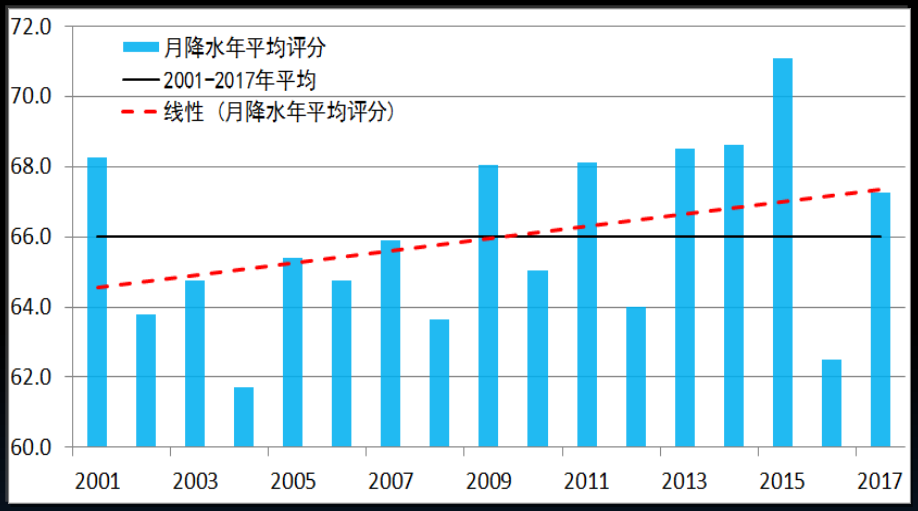
AUSTRALIA
OCEANIA
NEW ZEALAND
VANUATU
TONGA

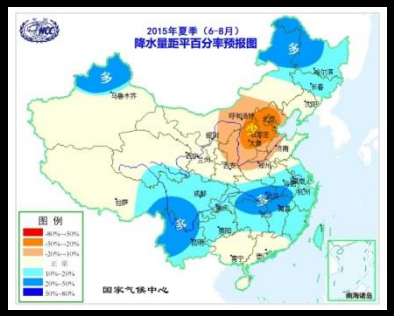
Climate Prediction(seasonal)

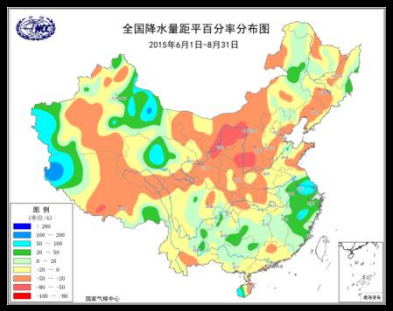


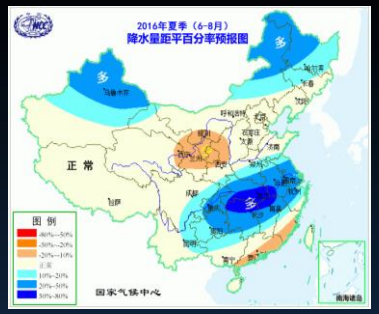


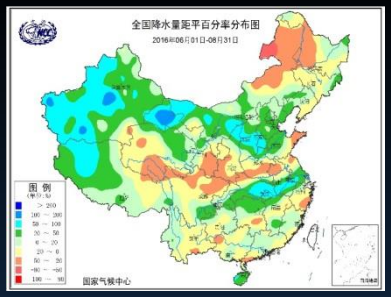
Climate Prediction(monthly)

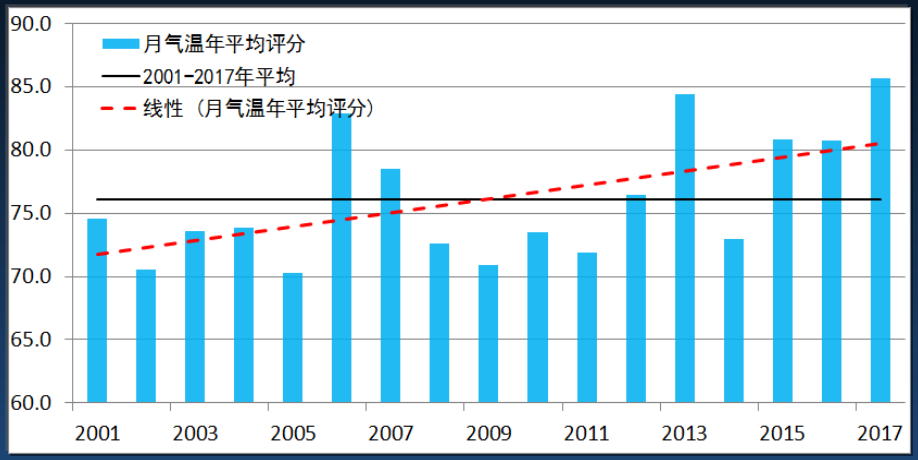


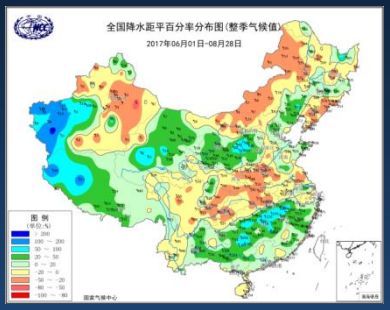






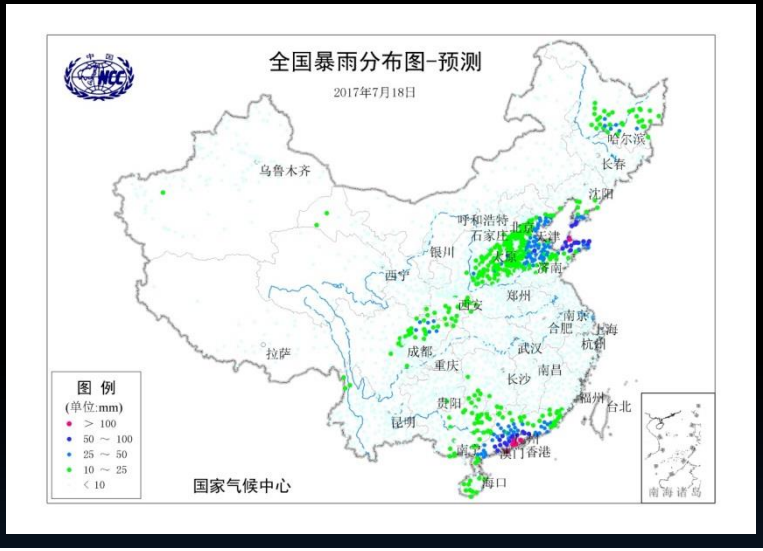




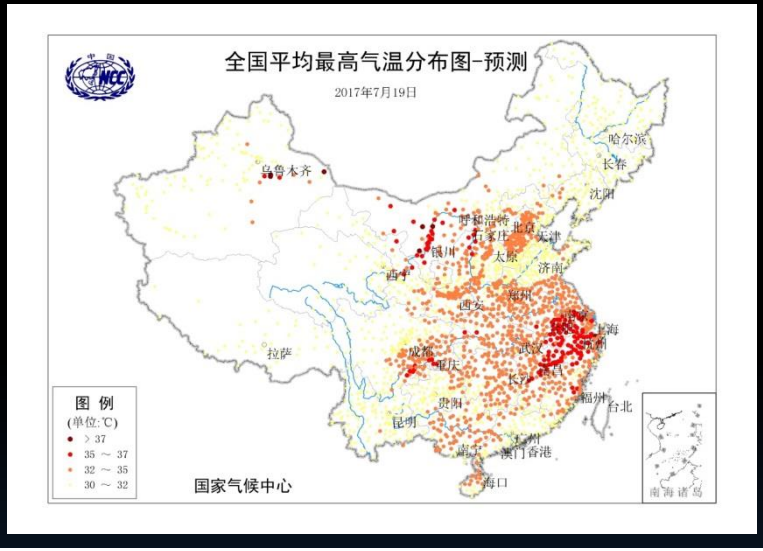


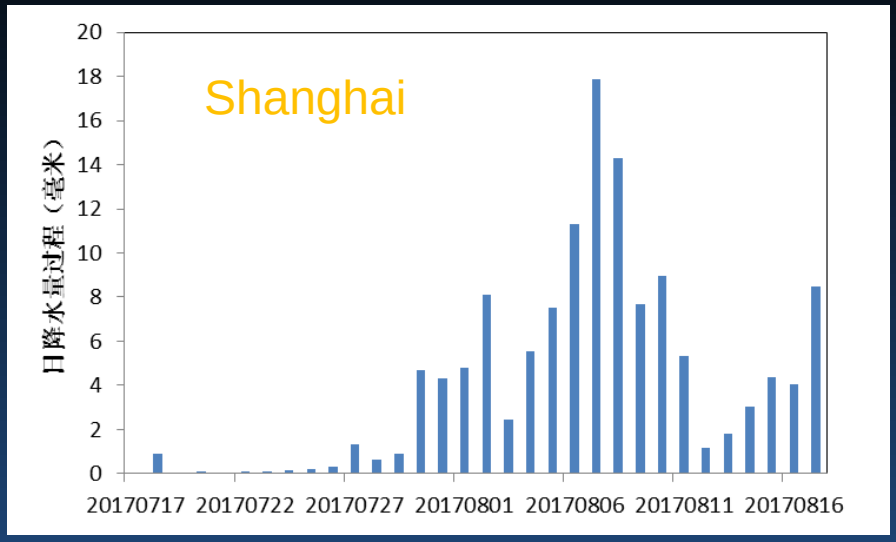
Weather Process prediction of rainstorm and heat wave

Rainstorm prediction

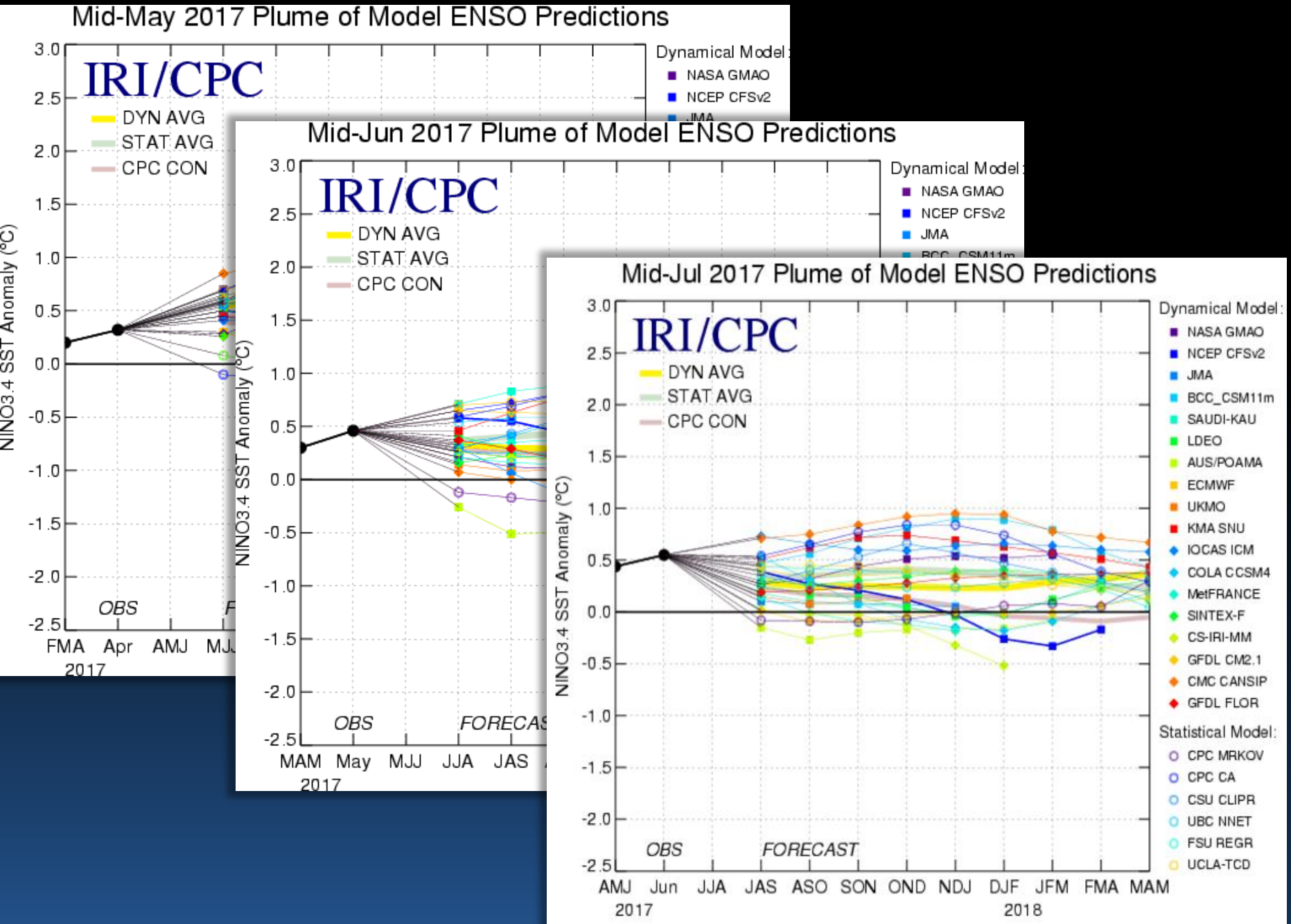


Maximum. Temperature





Daily running-forecast for
Rainstorm and high temperature process in the next 30 days

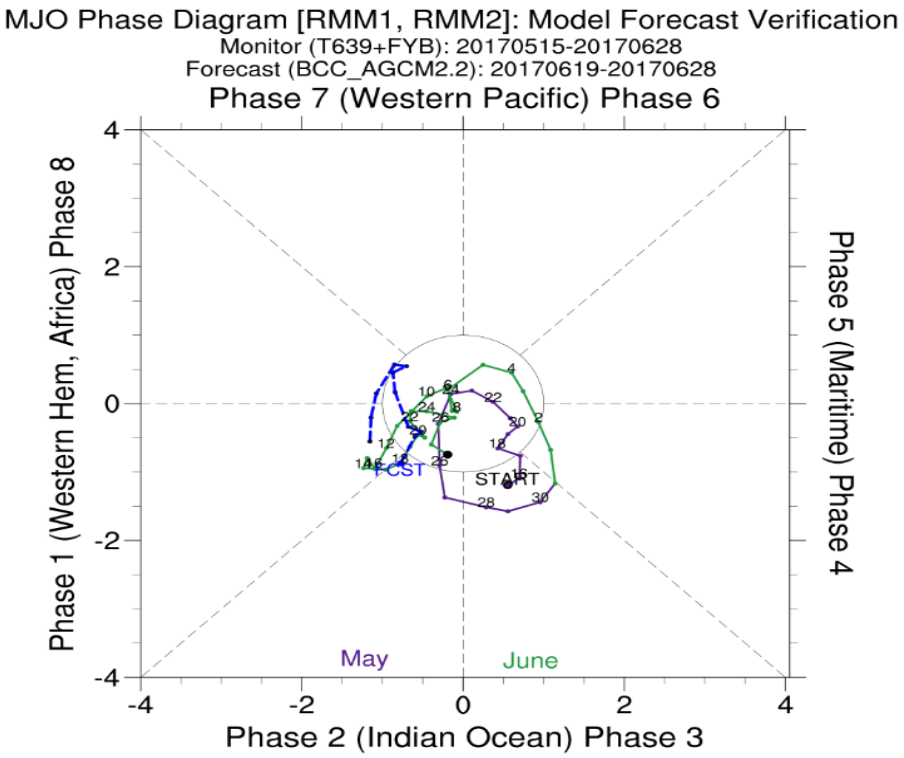

Mid-May 2017 Plume of Model ENSO Predictions
IRI/CPC
DYN AVG
STAT AVG
CPC CON
Dynamical Model:
NASA GMAO
NCEP CFSv2
JMA
NINO3.4 SST Anomaly (°C)
OBS
FMA
Apr
AMJ
2017
Mid-Jun 2017 Plume of Model ENSO Predictions
IRI/CPC
DYN AVG
STAT AVG
CPC CON
Dynamical Model:
NASA GMAO
NCEP CFSv2
JMA
NINO3.4 SST Anomaly (°C)
OBS
FORECAS
MAM
May
MJJ
JJA
JAS
2017
Mid-Jul 2017 Plume of Model ENSO Predictions
IRI/CPC
DYN AVG
STAT AVG
CPC CON
Dynamical Model:
NASA GMAO
NCEP CFSv2
JMA
BCC_CSM11m
SAUDI-KAU
LDEO
AUS/POAMA
ECMWF
UKMO
KMA SNU
IOCAS ICM
COLA CCSM4
MetFRANCE
SINTEX-F
CS-IRI-MM
GFDL CM2.1
CMC CANSIP
GFDL FLOR
Statistical Model:
CPC MRKOV
CPC CA
CSU CLIPR
UBC NNET
FSU REGR
UCLA-TCD
NINO3.4 SST Anomaly (°C)
OBS
FORECAST
AMJ
Jun
JJA
JAS
ASO
SON
OND
NDJ
DJF
JFM
FMA
MAM
2017
2018

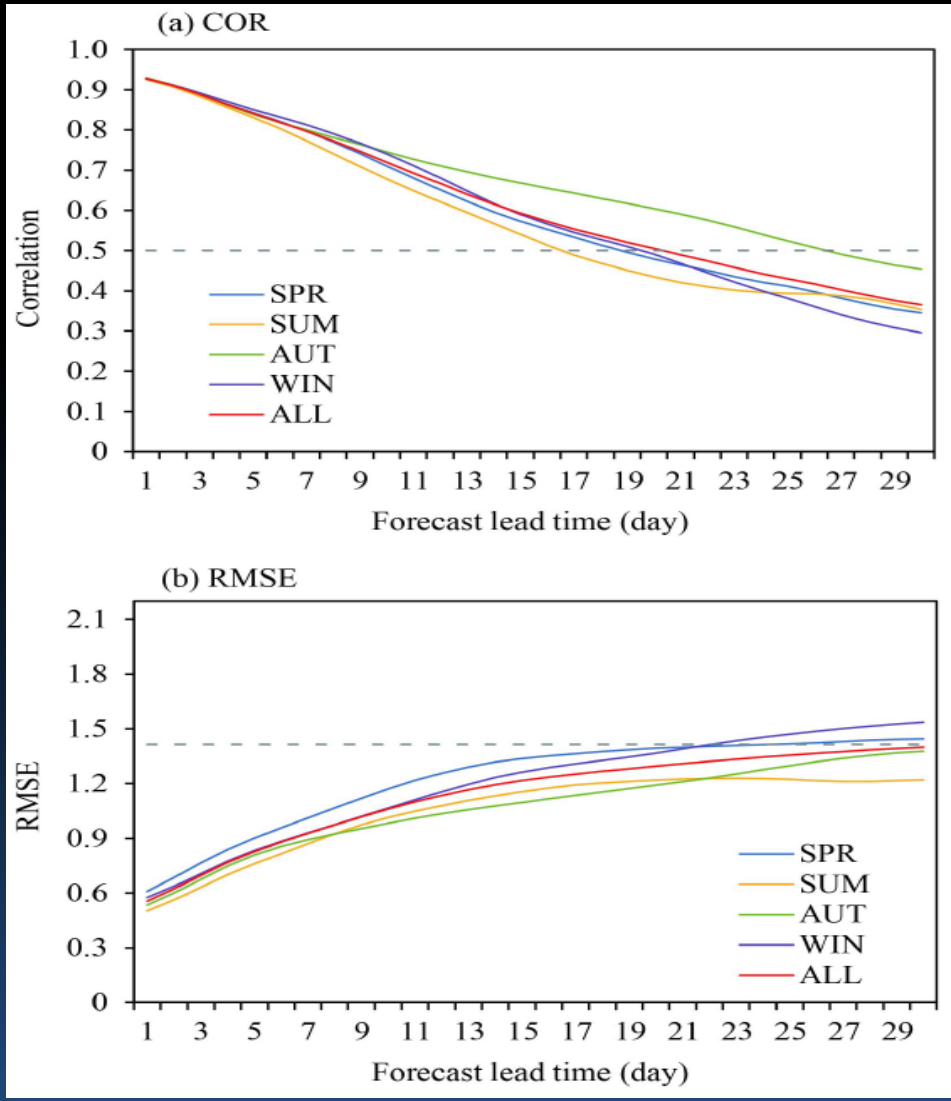
监测 | 预测 | 诊断 | 影响 | 检验

- RMM指数空间位相图（过去45天监测与最近10天预报检验）
- RMM指数空间位相图（过去45天监测与最近20天预报检验）
- 年度实时预报技巧检验(距平相关系数、均方根误差、均方技巧评分)

- T639+FYB+BCC_AGCM2.2
- T639+FYB+BCCCSM1.2
- T639+FYB+T639集合
- NCEP+BCC_AGCM2.2
- NCEP+BCCCSM1.2

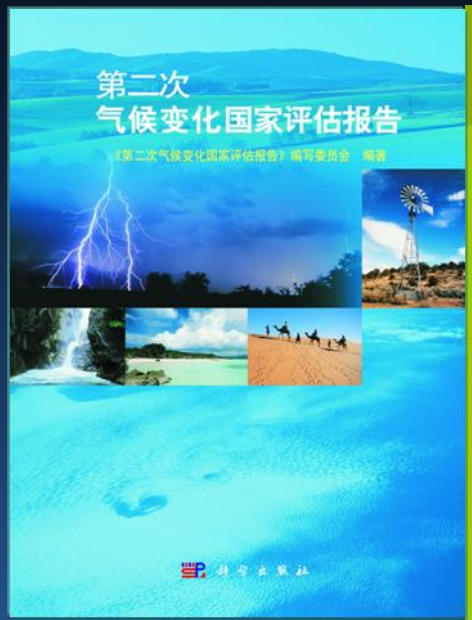
时间：2017 - 6 - 28 开始检索

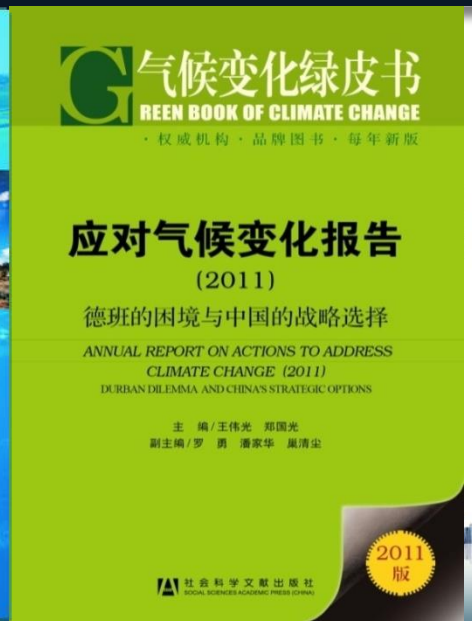


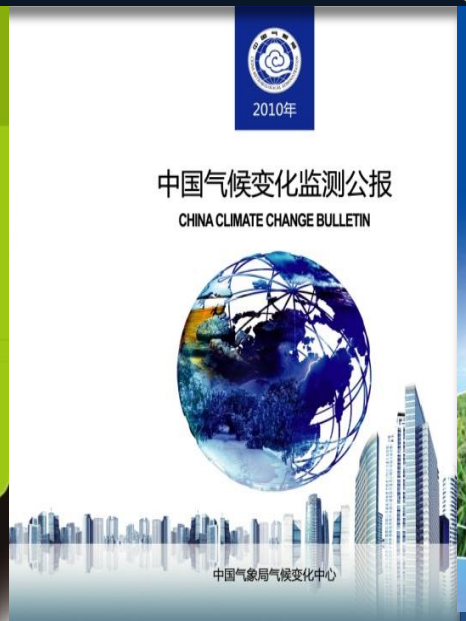


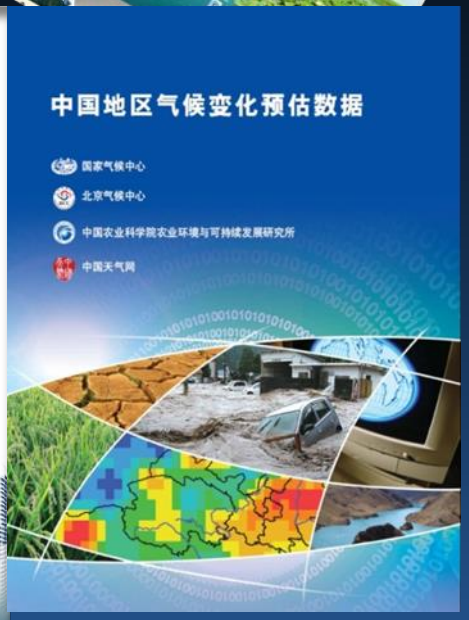
Climate Knowledge

- National Assessment Report On Climate Change
- Green Book On Climate Change
- Climate Change Monitoring Bulletin
- Regional Assessment Report On Climate Change
- Climate Change Projection Dataset For China Region
- ……

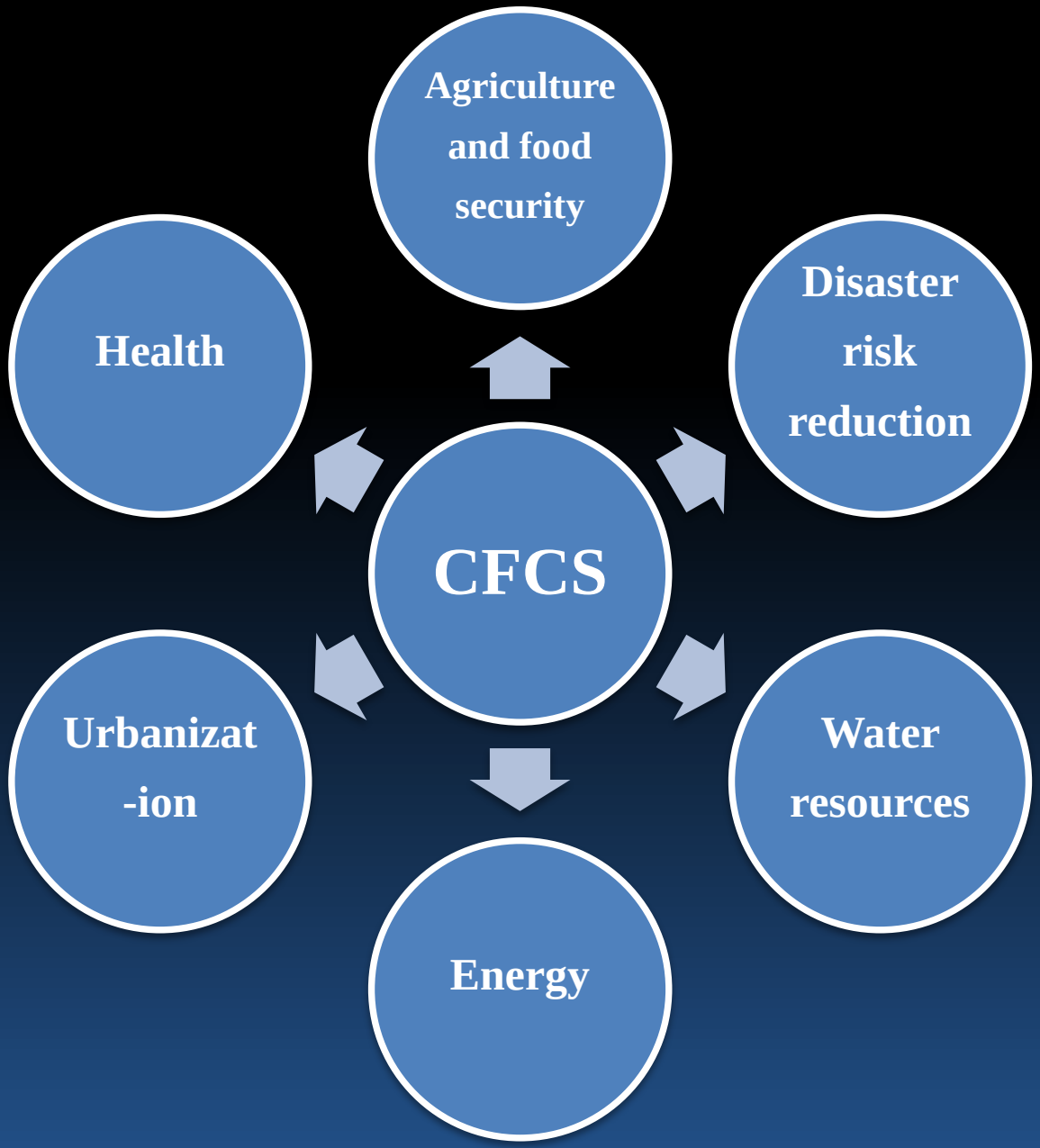




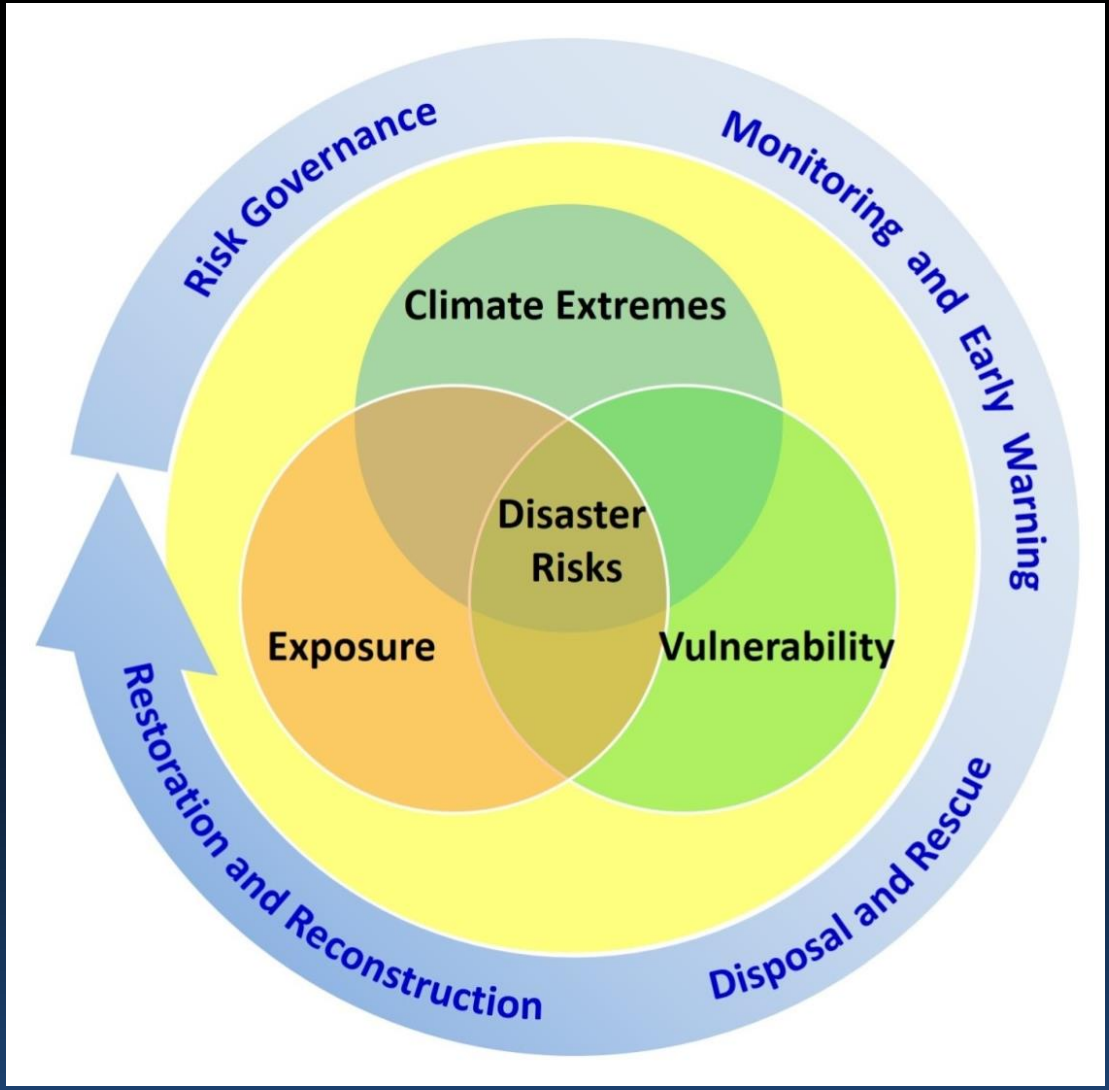




Climate services----CFCS



Practice 1: Disaster Risk Reduction



In this circle chain different users need different climate services.

Working Mechanism for DRR

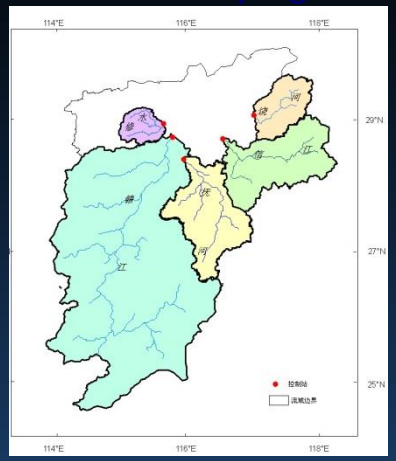
DRR Management

Government Leadership	Inter-Sectors Coordination	Community participation
▪ Organizing and coordinating meteorological disaster prevention and mitigation ▪ Providing fund support for infrastructure and disaster relief	▪ Ensuring the inter-sectors emergency response and interaction based on meteorological disaster warning signals.	▪ Emphasizing the involving of community, NGOs and volunteers ▪ Improving training for the public

Practice 2: Water Resources

VIC –National scale

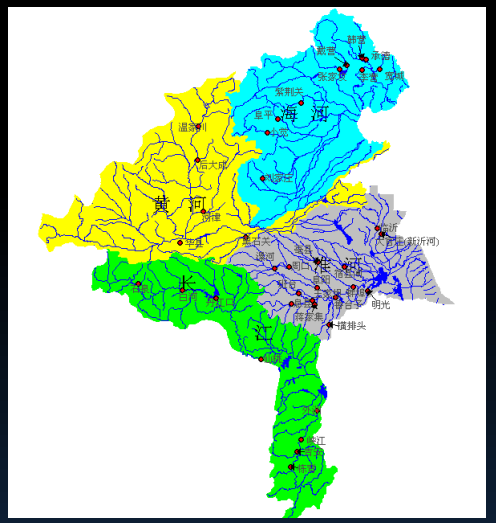
HBV model-Poyang Lake



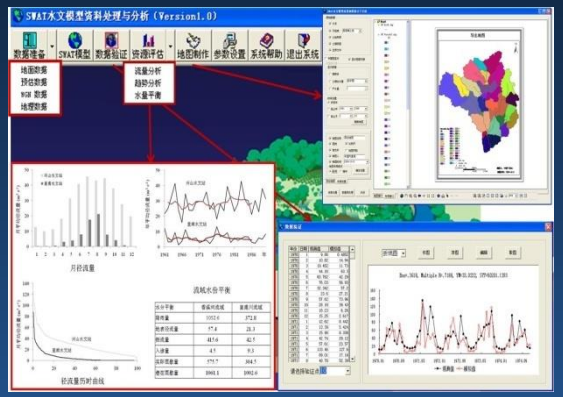
Hydrological modeling for different temporal-spatial scale

- VIC (Variable Infiltration Capacity)
- HBV Model
- Monthly Water Balance Model
- SWAT (Soil Water Assessment Tool)
- Floodarea Model

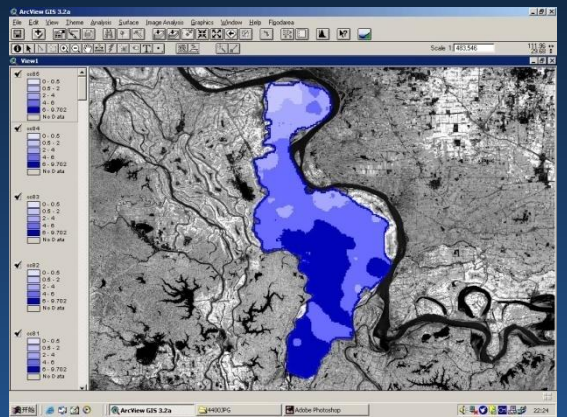
Monthly Water Balance Model - Four main river basin



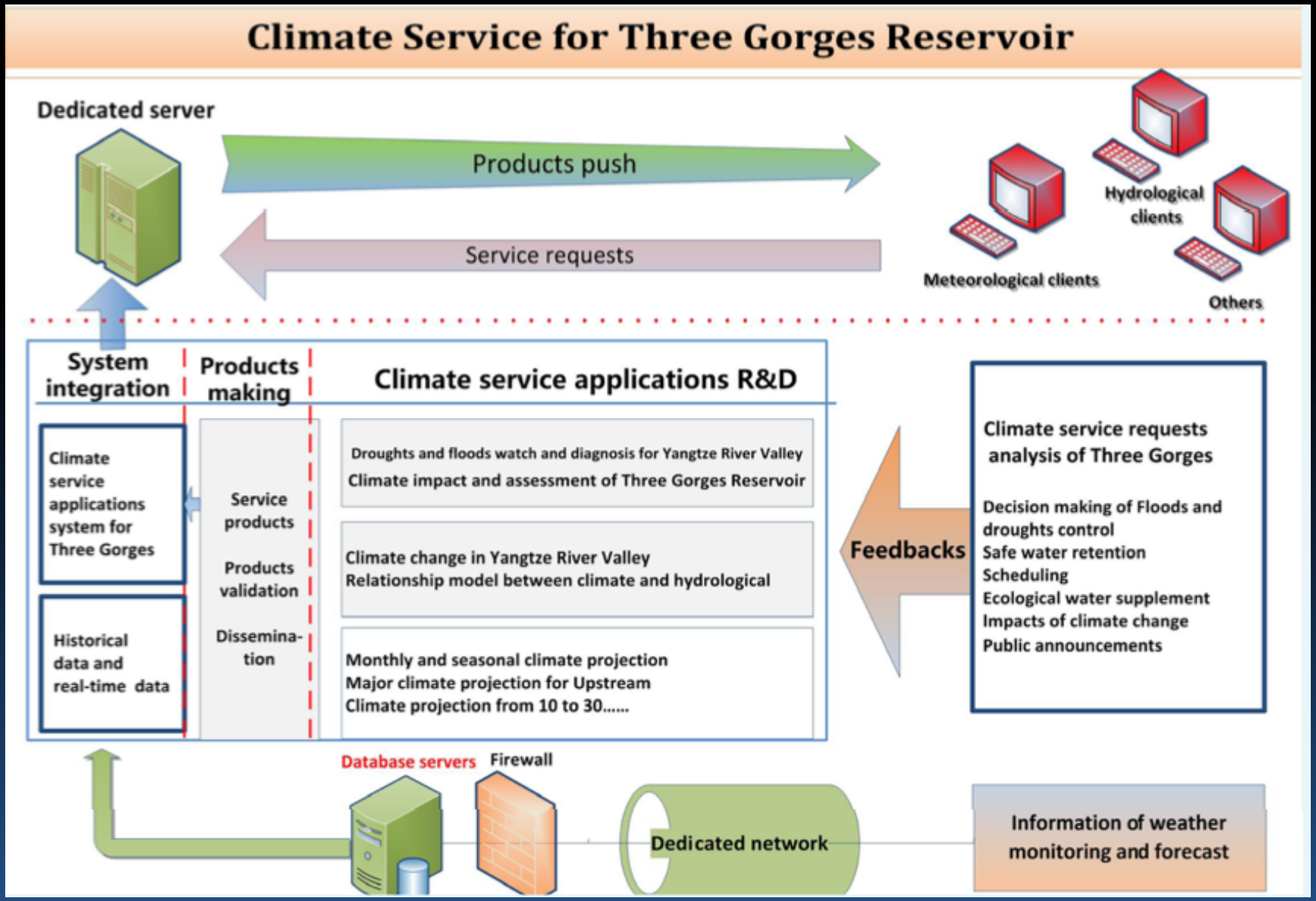
SWAT: Key mesoscale watersheds



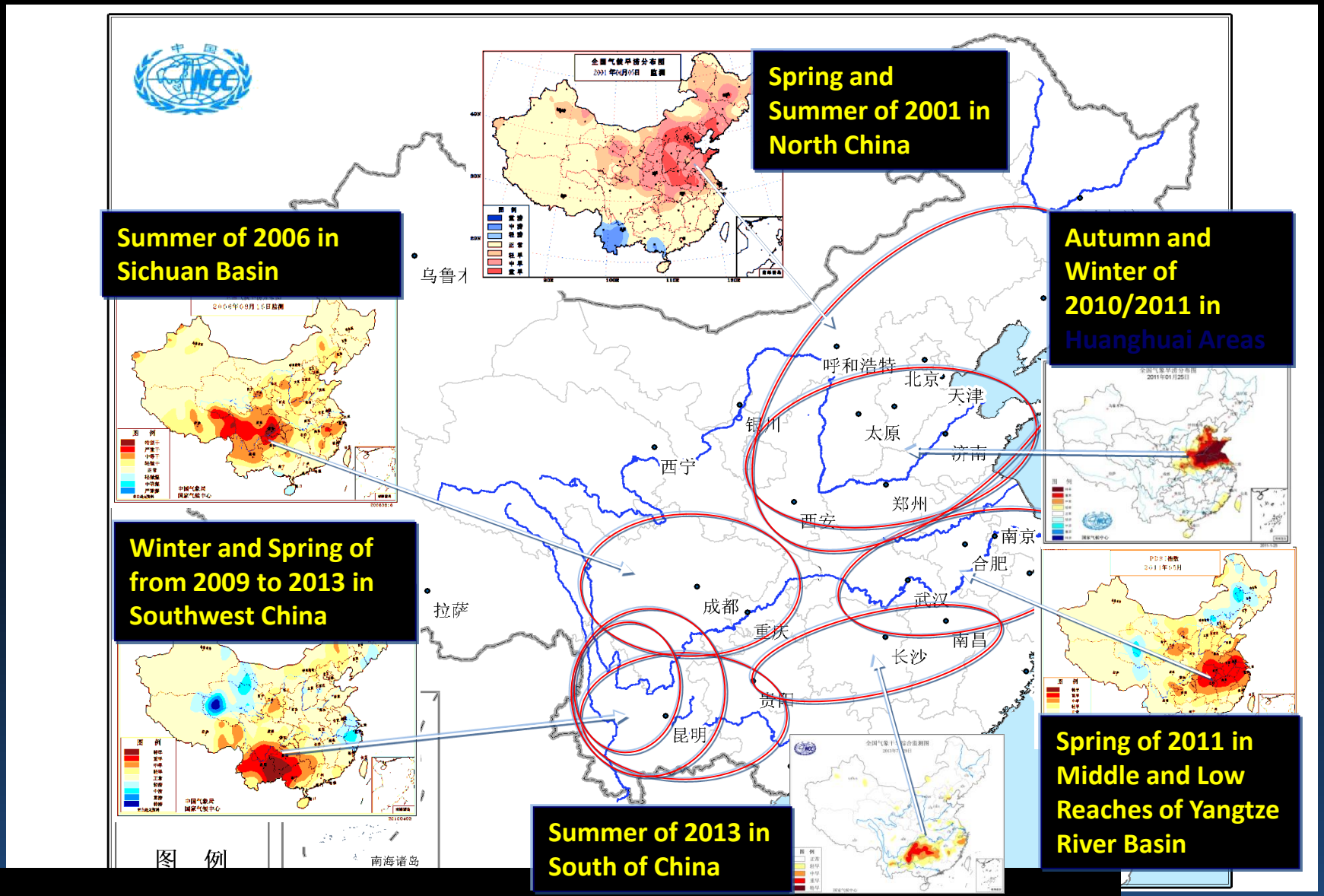
Flood area model-delineation of flooded areas



Pilot Project

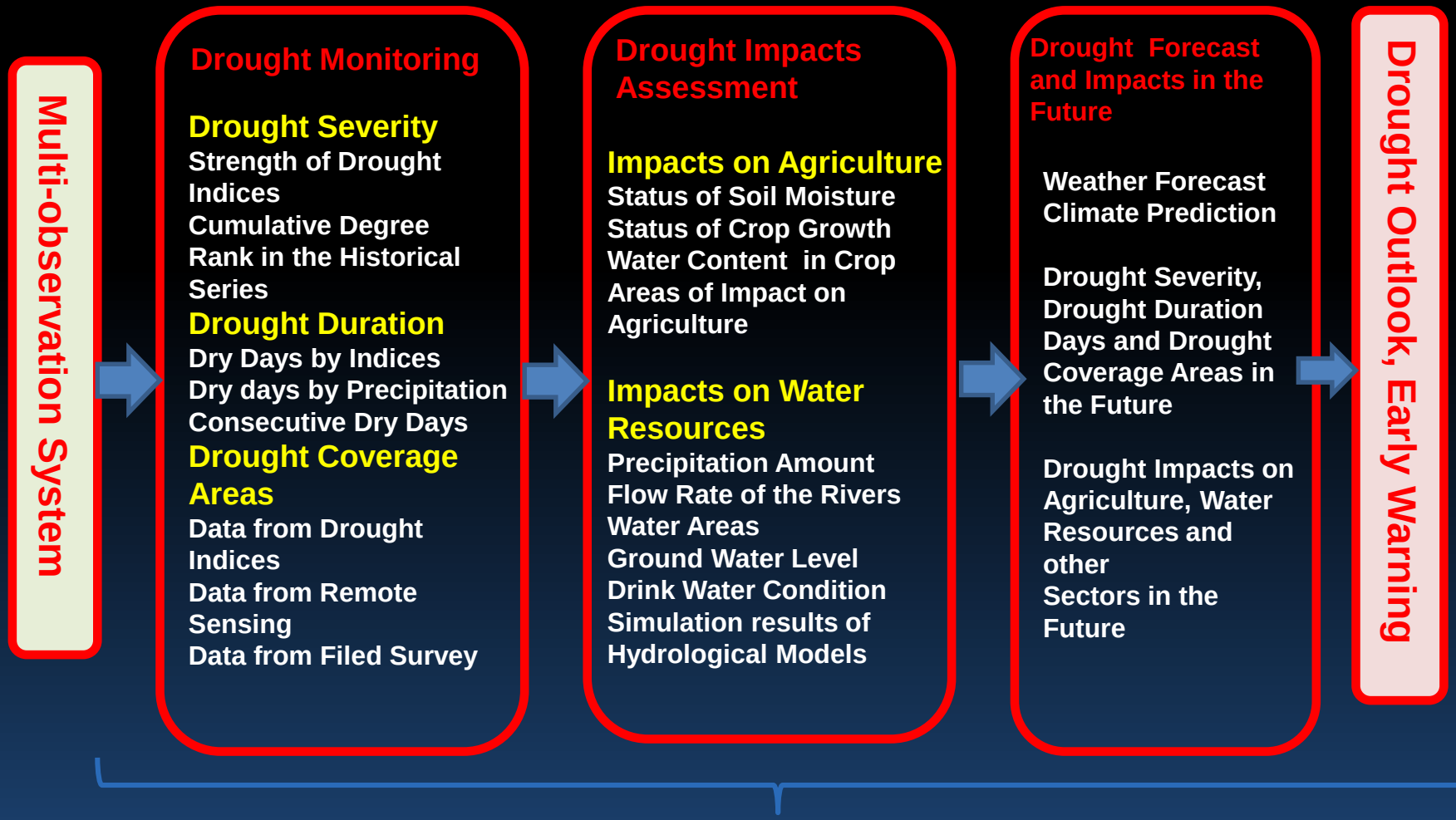


Practice 3: Agriculture

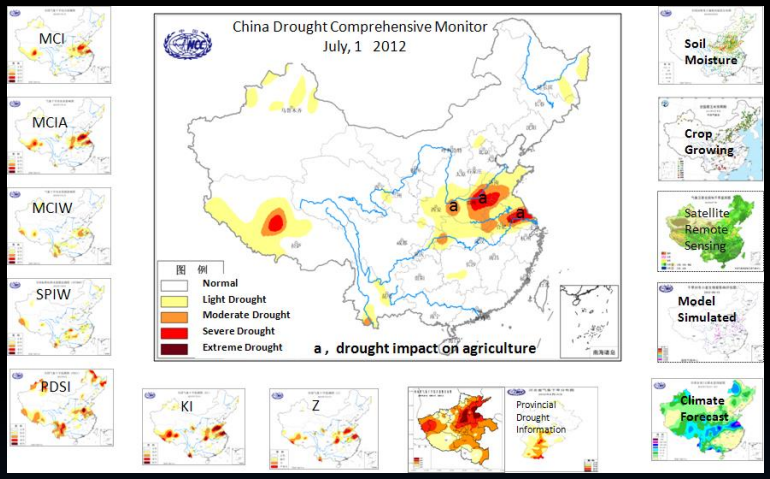


Severe Drought Events Happened in the New Century

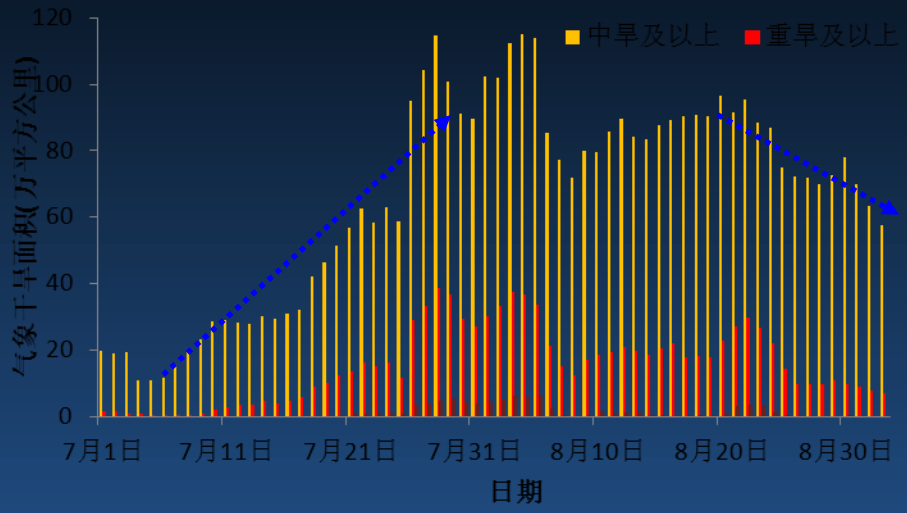
Flow Chart of Integrated Drought Monitoring, Assessment and Forecasting



Severe Drought in the Summer of 2014 in North China



- Drought Monitoring daily
- Provide the drought influence areas daily
- Provide more than 20 drought index, include MCI, SPI, PDSI, Soil Moisture， Satellite Remote Sensing Pictures, etc.
- Issued the drought early warning in Henan, Shanxi and Liaoning provinces.



省份	受灾人口（万人）	饮水困难人口（万人）	农作物受灾面积（万公顷）	农作物绝收面积（万公顷）	直接经济损失（亿元）
辽宁	545.9	32.9	188.2	36.7	95.5
河南	1929.9	114.2	216.3	18.6	72.9
吉林	229.3	0.3	94.3	6.2	45
内蒙古	264.8	50.8	124.4	21.9	37.3
山东	542.4	19.5	56.6	7.4	39
陕西	576.2	47.5	53.3	7.3	33.9
湖北	511.9	96.4	73.3	7.6	22
江苏	475.1		35.7	3.4	9.7
四川	362.6	72.3	49.4	4.2	8.8
河北	245.3	0.6	28.8	2.4	8.3
安徽	420.7	8.1	50.4	1.2	7.3
宁夏	75.6	31.1	16.9	1.1	4.7
山西	35.7	0.6	6.6	0.2	1.6
合计	6215.4	474.3	994.2	118.2	386

Practice 4: Energy

Pilot project: China wind energy resources development and utilization

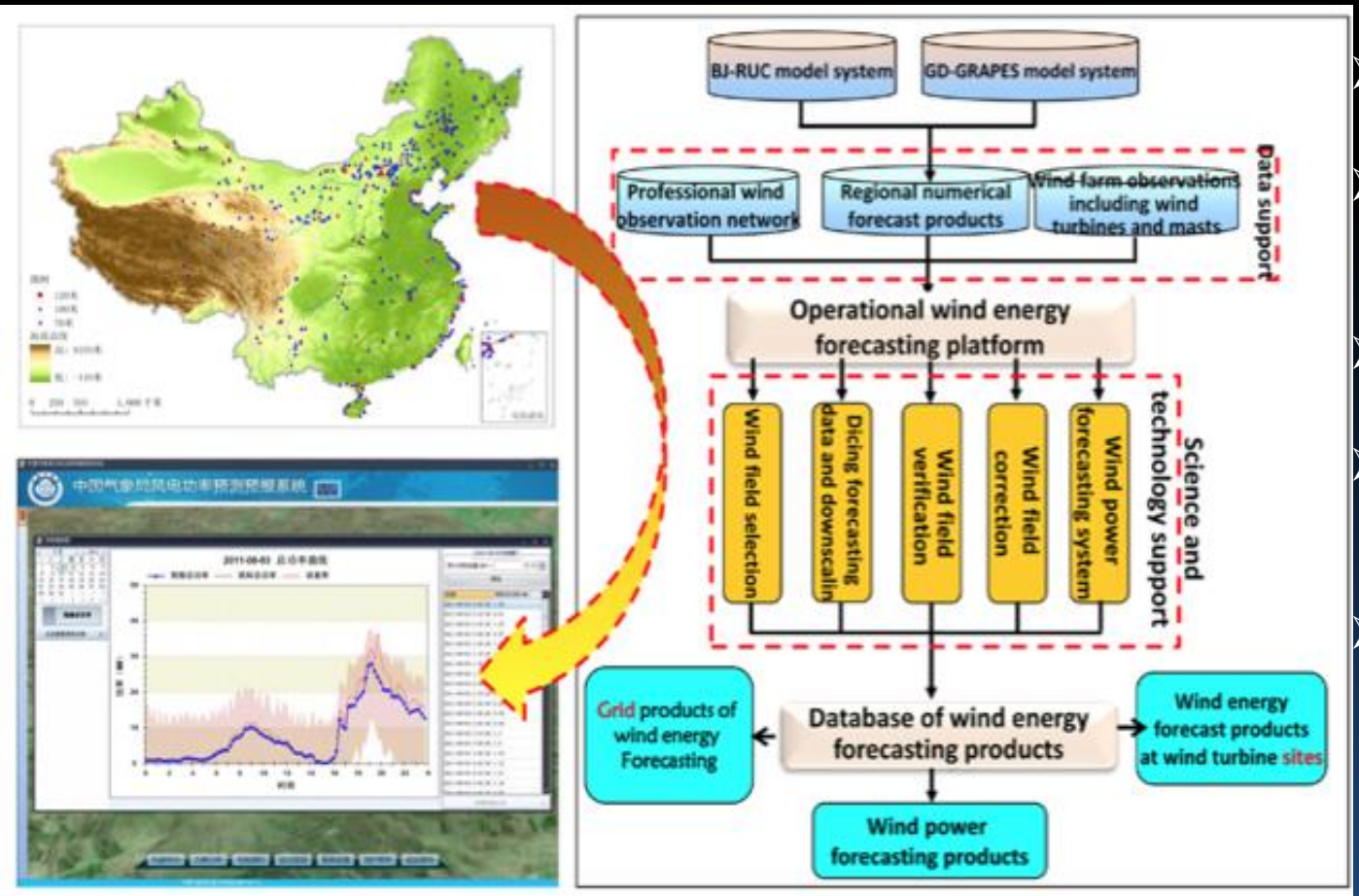
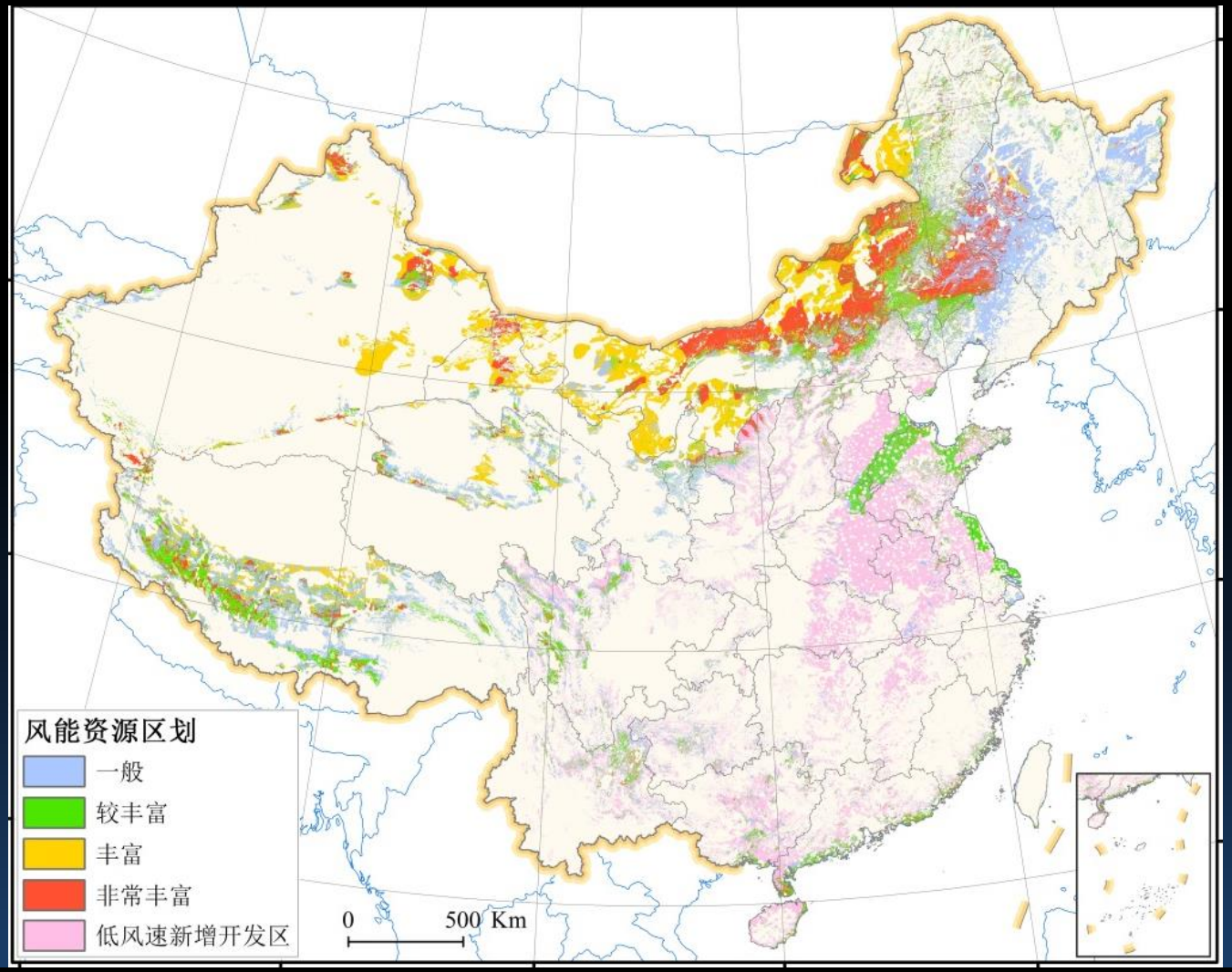


Figure 4 Climate service for wind energy resource development and utilization

- To establish observation network,
- To assess distribution of wind energy resources,
- To develop advanced numerical model,
- To build up the wind power forecasting system,
- To support wind power scientific scheduling and safe operation of the power grids.

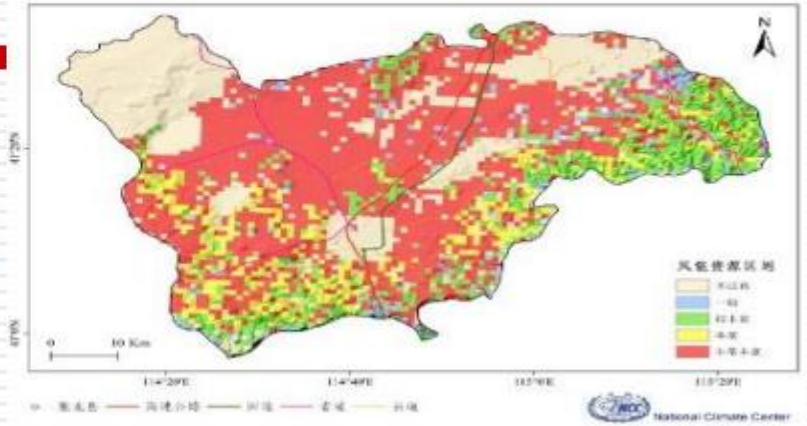
Wind energy distribution in China



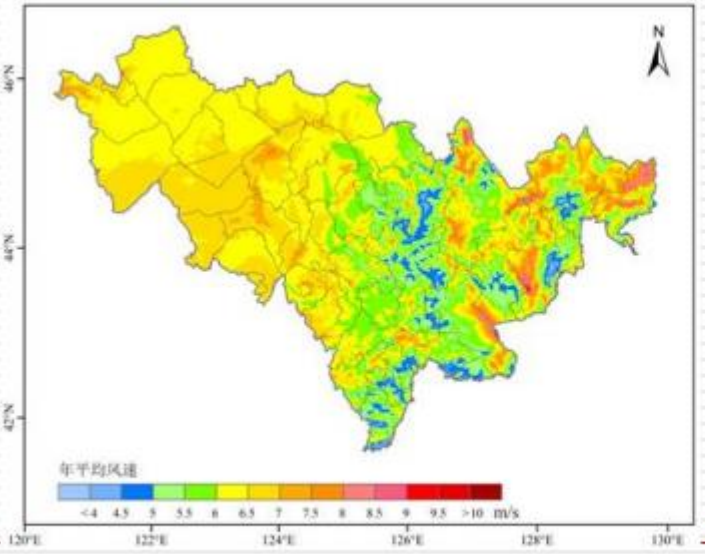
The total technical development capacity of wind energy at 80m reaches 35 billion KW in China

全国2850个县级行政区域
水平分辨率1km*1km
30年（ 1979-2008）平均值
任意高度

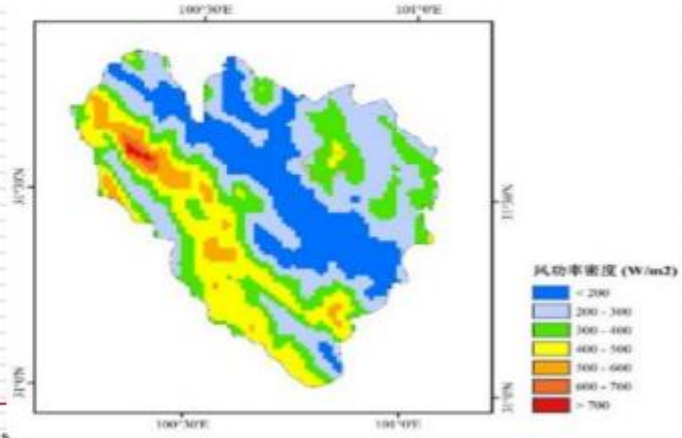
80米高度张北县可利用风能资源分布



80米高度吉林省平均风速分布图



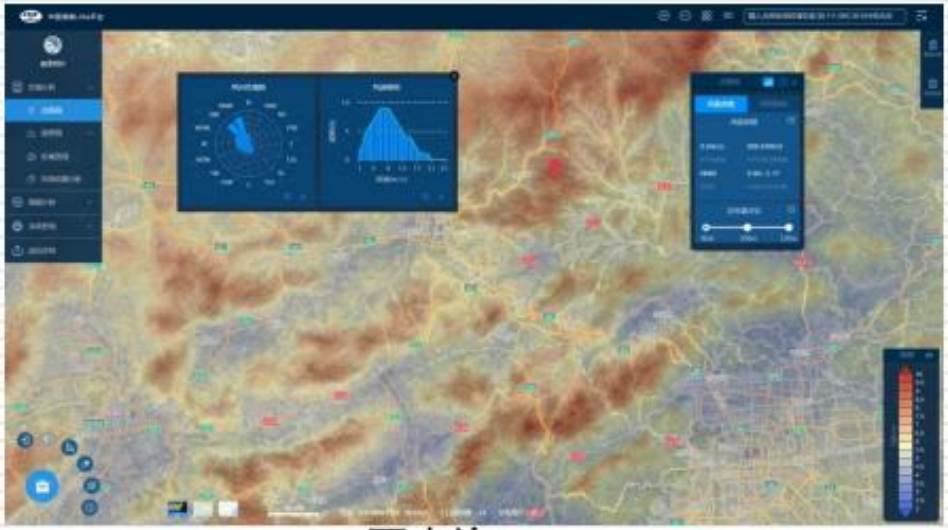
80米高度四川炉霍县平均风功率密度



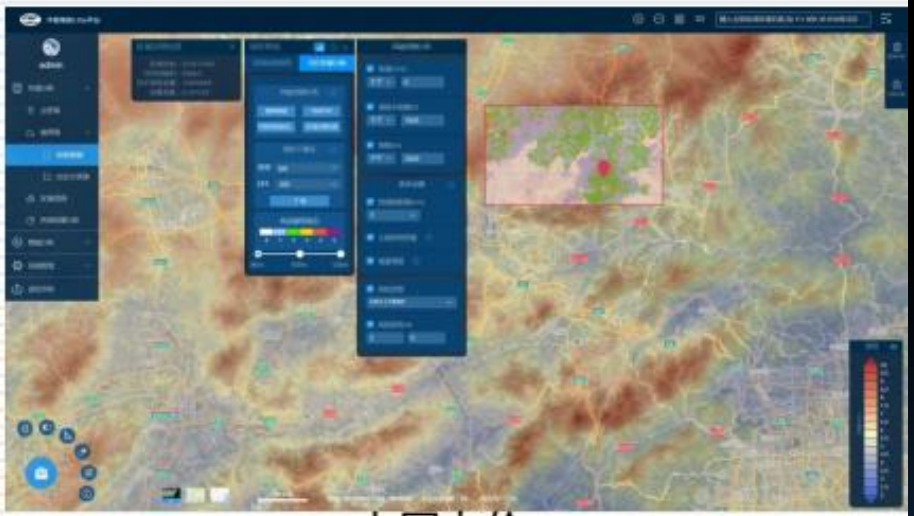
国家气候中心

海装LiGa平台

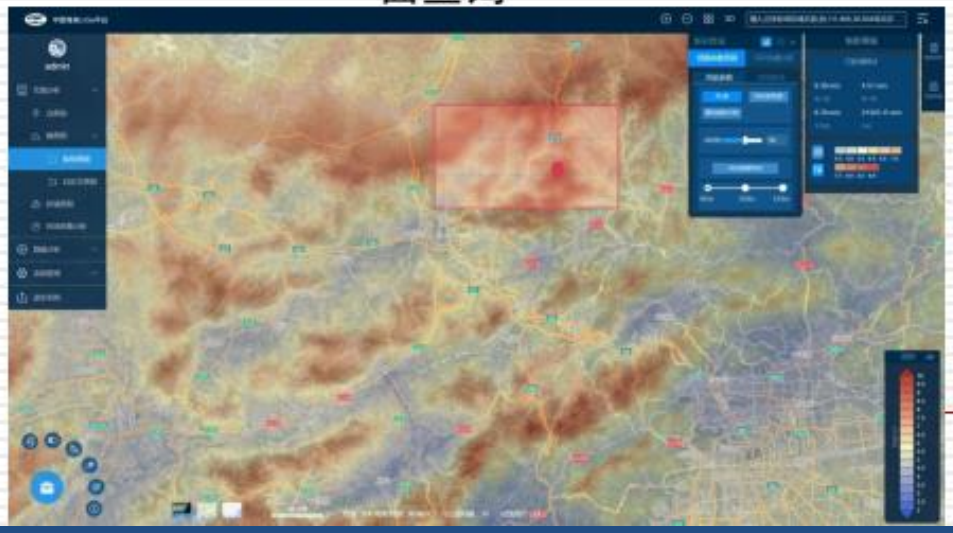
点查询



可开发量

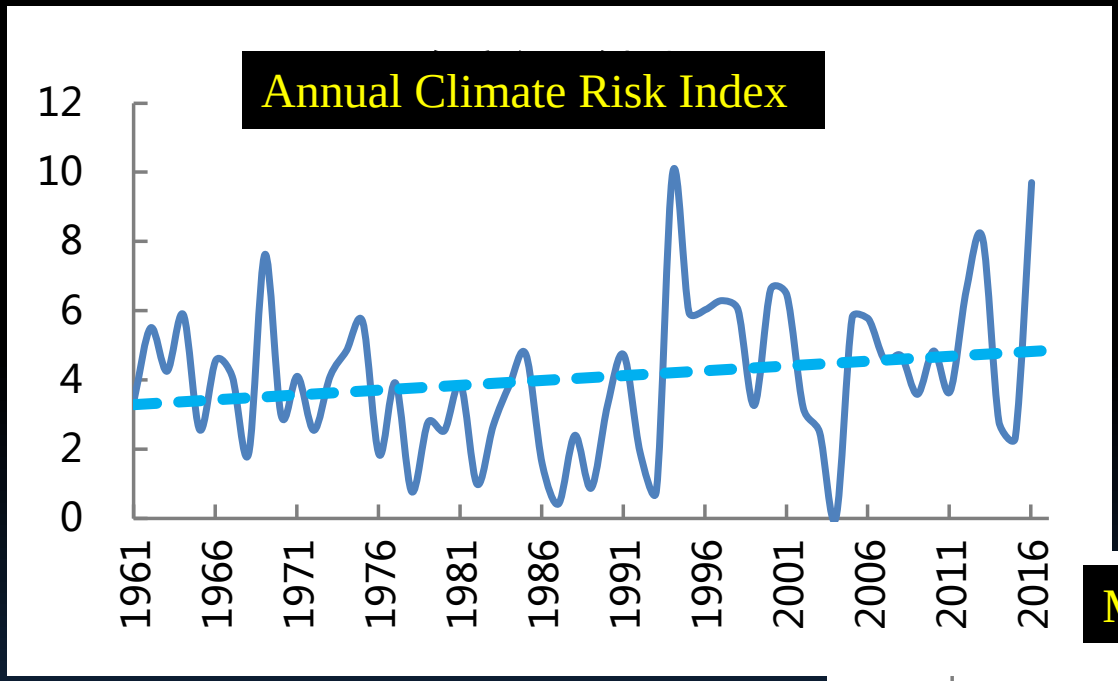


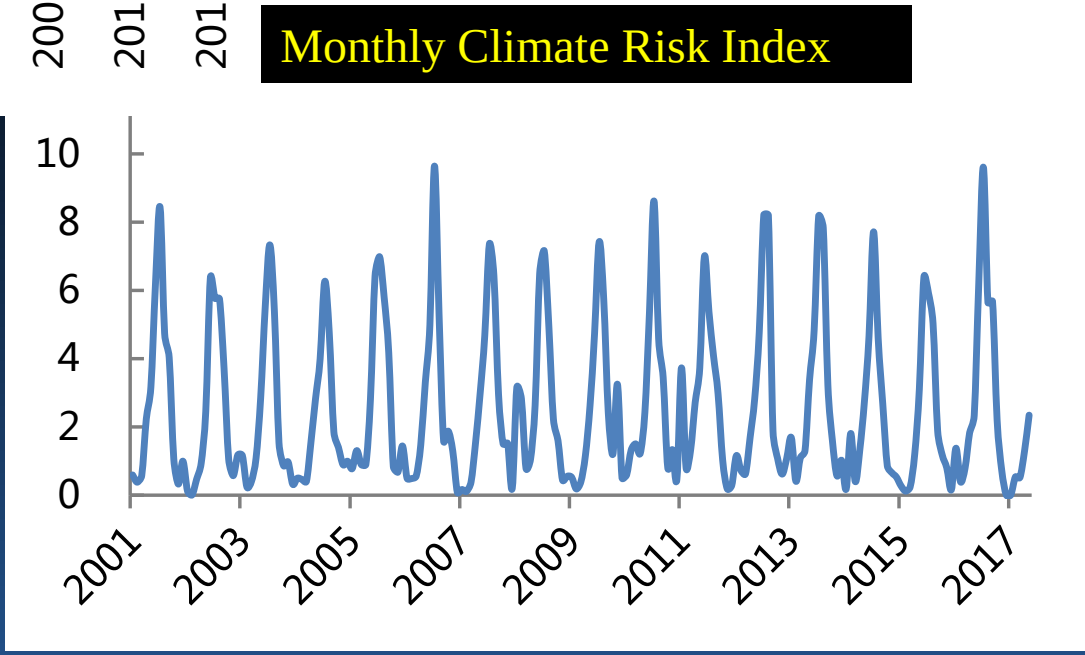
面查询

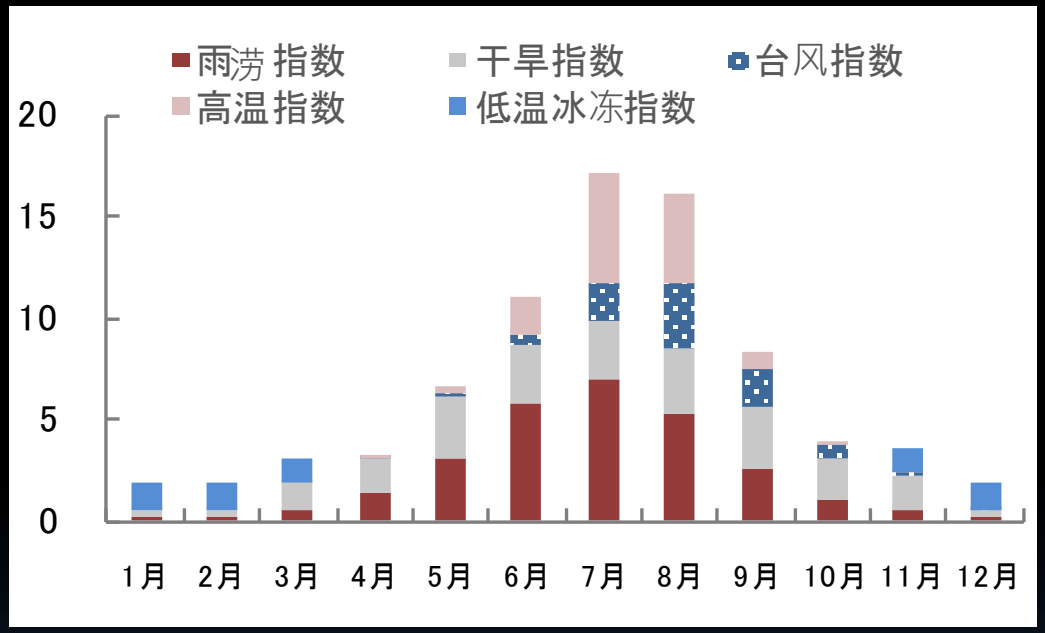


上网电价

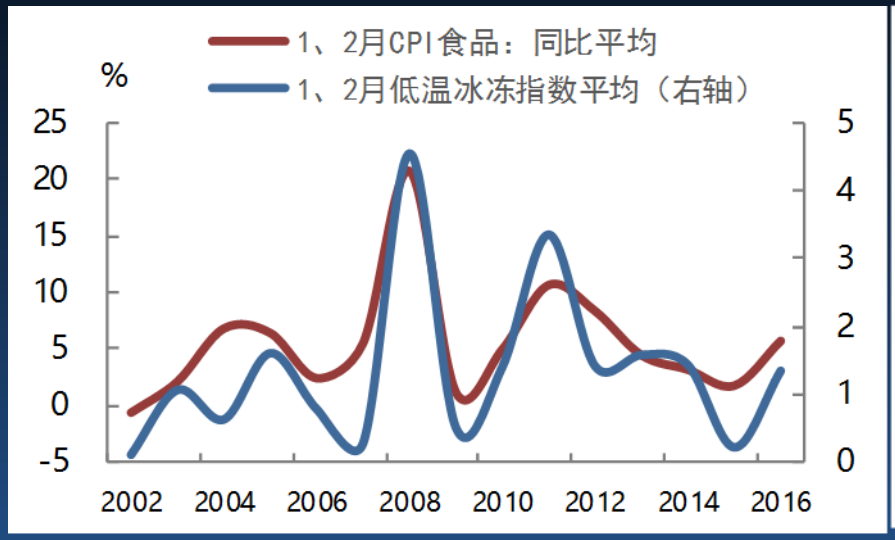
Practice 5: Climate Risk Indices in China



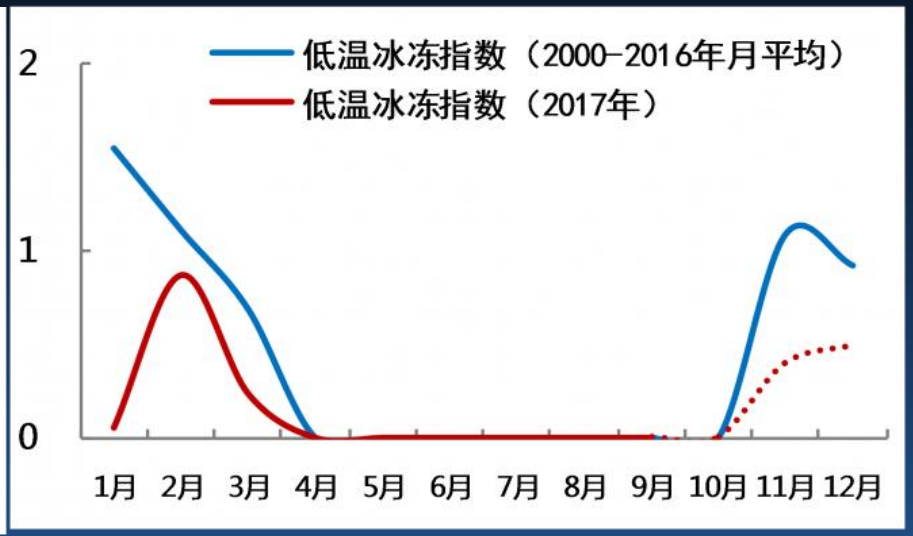


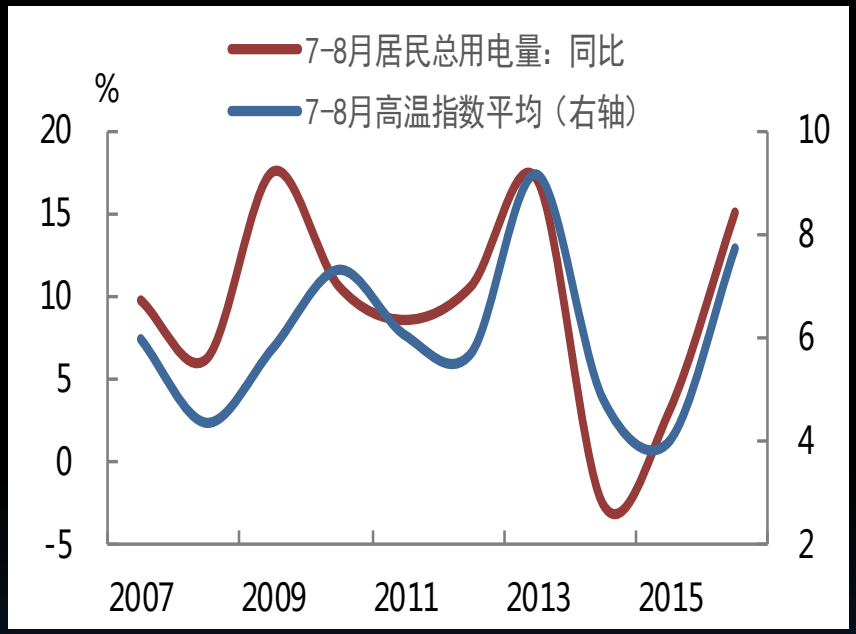


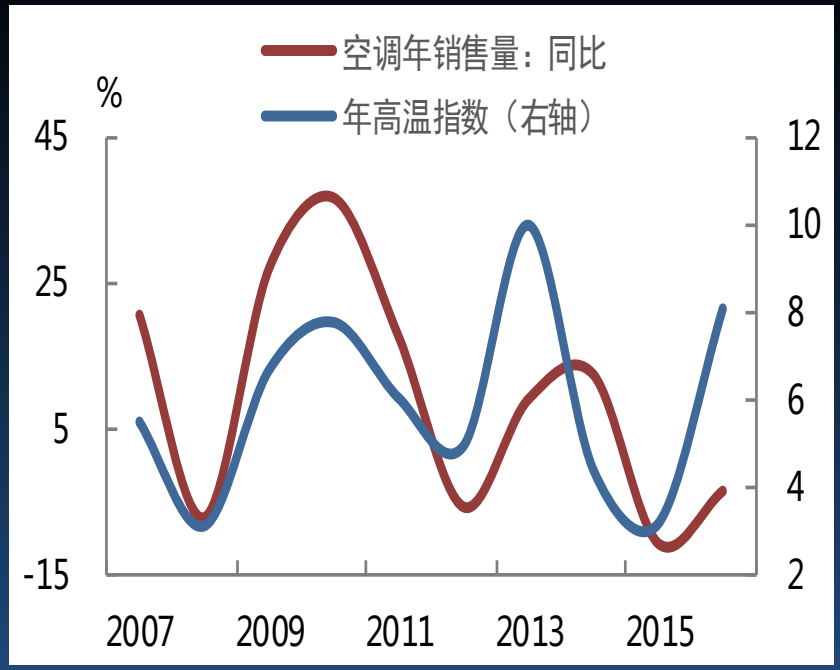
Food CPI month-to-month & Frozen index

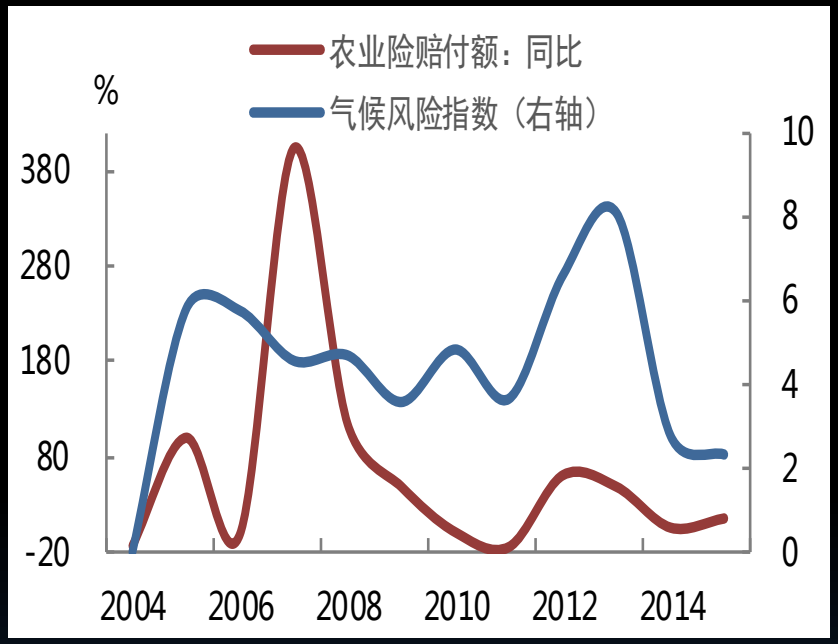


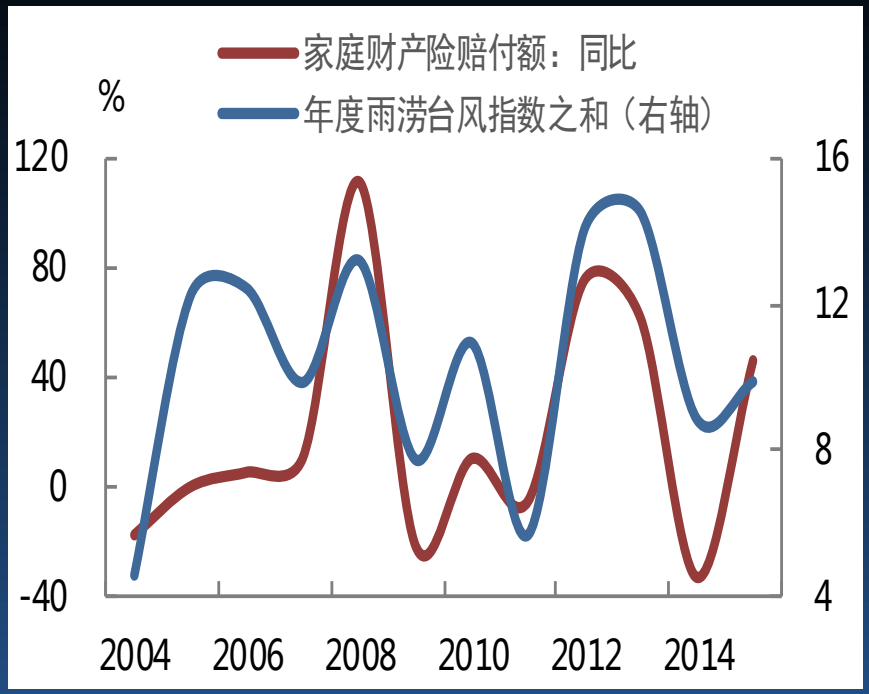
Frozen index prediction

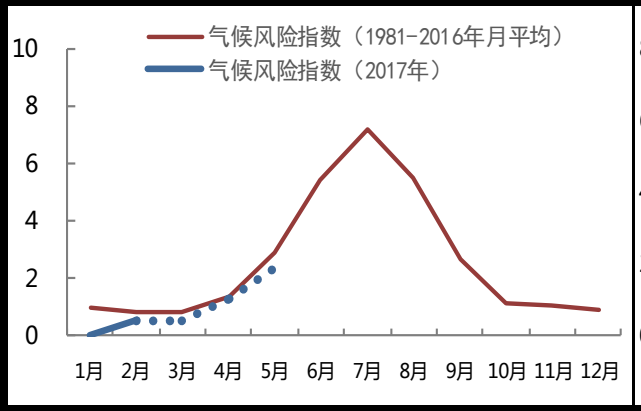


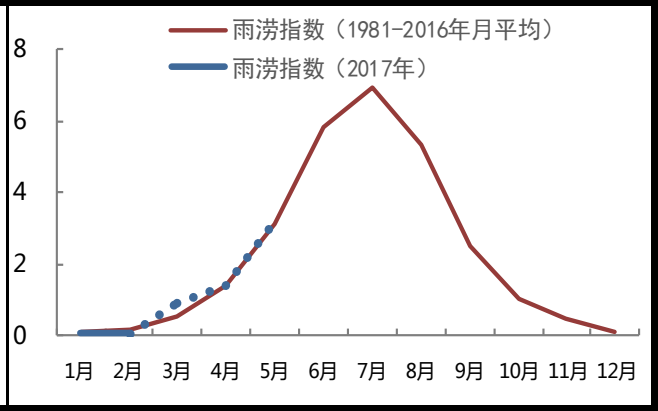

7-8月居民总用电量：同比
7-8月高温指数平均（右轴）
%
20
15
10
5
0
-5
10
8
6
4
2
2007
2009
2011
2013
2015

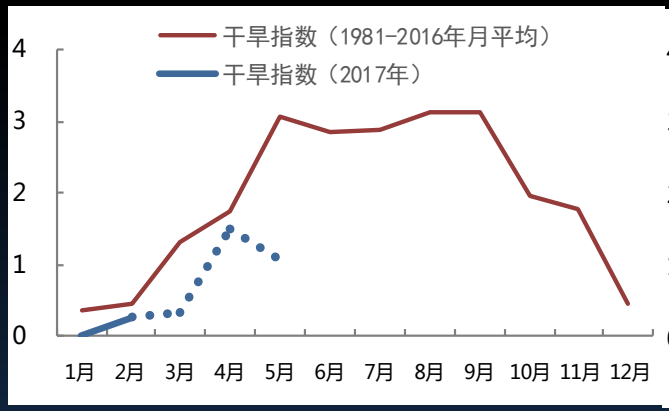

空调年销售量：同比
年高温指数（右轴）
%
45
25
5
-15
12
10
8
6
4
2
2007
2009
2011
2013
2015

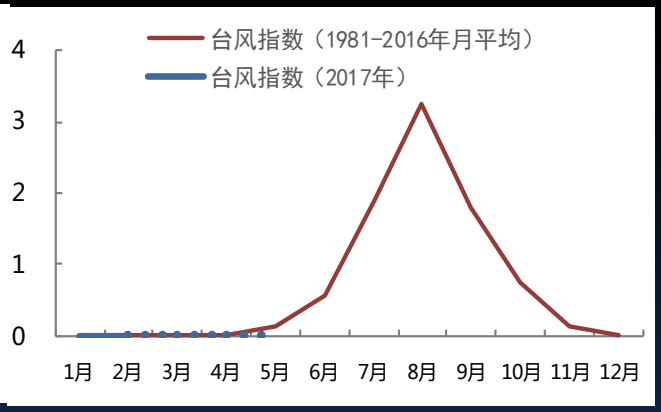

农业险赔付额：同比
气候风险指数（右轴）
%
380
280
180
80
-20
10
8
6
4
2
0
2004
2006
2008
2010
2012
2014


家庭财产险赔付额：同比
年度雨涝台风指数之和（右轴）
%
120
80
40
0
-40
16
12
8
4
2004
2006
2008
2010
2012
2014

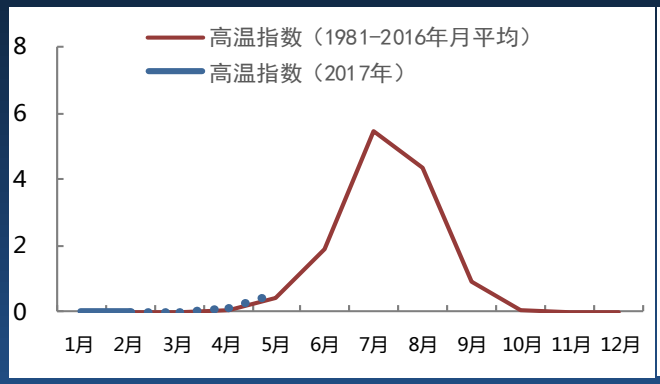

气候风险指数（1981-2016年月平均）
气候风险指数（2017年）
10
8
6
4
2
0
1月 2月 3月 4月 5月 6月 7月 8月 9月 10月 11月 12月

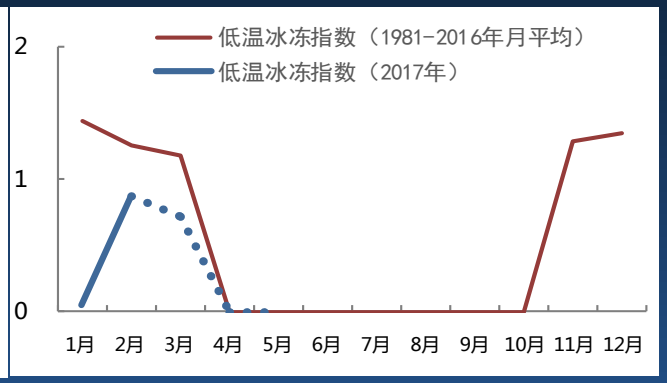

雨涝指数（1981-2016年月平均）
雨涝指数（2017年）
8
6
4
2
0
1月 2月 3月 4月 5月 6月 7月 8月 9月 10月 11月 12月


干旱指数（1981-2016年月平均）
干旱指数（2017年）
4
3
2
1
0
1月 2月 3月 4月 5月 6月 7月 8月 9月 10月 11月 12月


台风指数（1981-2016年月平均）
台风指数（2017年）
4
3
2
1
0
1月 2月 3月 4月 5月 6月 7月 8月 9月 10月 11月 12月

Prediction


高温指数（1981-2016年月平均）
高温指数（2017年）
8
6
4
2
0
1月 2月 3月 4月 5月 6月 7月 8月 9月 10月 11月 12月

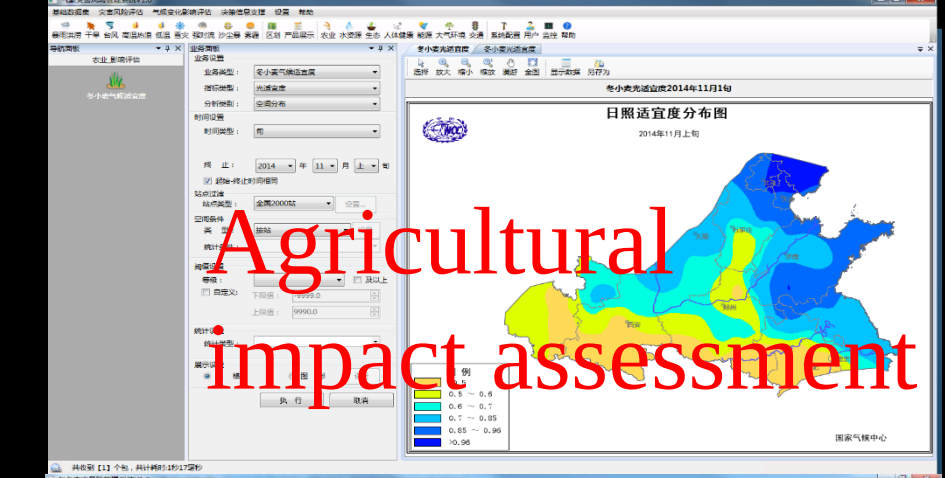

低温冰冻指数（1981-2016年月平均）
低温冰冻指数（2017年）
2
1
0
1月 2月 3月 4月 5月 6月 7月 8月 9月 10月 11月 12月

Climate impact assessment system: to 7 sectors

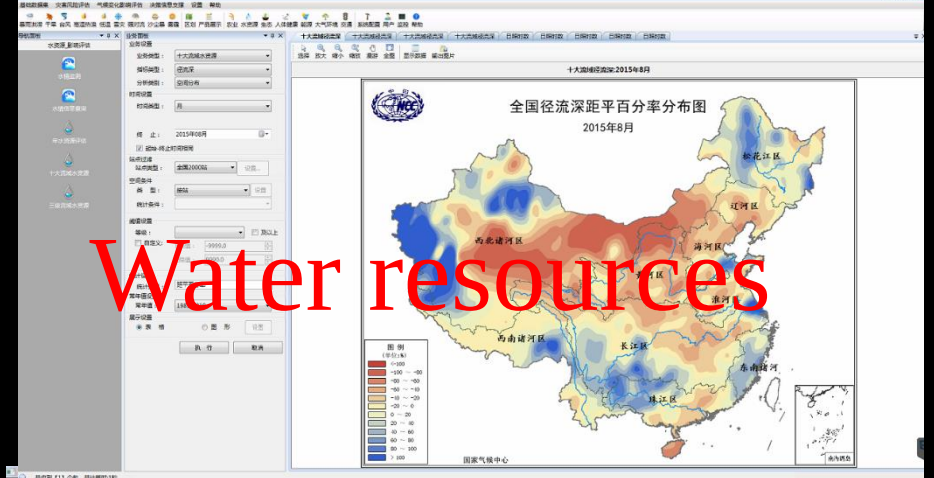
Module name	Algorithm name	Main Contents
Agricultural impact assessment	13 modules	① Agricultural growing season ② Climate suitability ③ Utilization rate of the climate resources ④ Accumulated temperature ⑤ EPIC model, etc.
Water resources assessment	A total of 7 modules	① Annual precipitation resources ② Top 10 watershed precipitation resources ③ Three-level basin precipitation resources ④ Water regime, etc.
Ecosystem assessment	A total of 5 modules	① Soil potential productivity ② NDVI/EVI, etc.
Human health	A total of 9 modules	① Comfort index, etc.
Energy impact assessment	A total of 10 modules	① Wind energy ② Cooling energy consumption, etc.
Atmospheric environmental impact	A total of 10 modules	① Atmospheric environmental capacity ② Air quality index ③ Data query of PM2.5, etc.
Traffic impact	A total of 2 modules	① Unfavorable traffic days, etc.

9 hazards

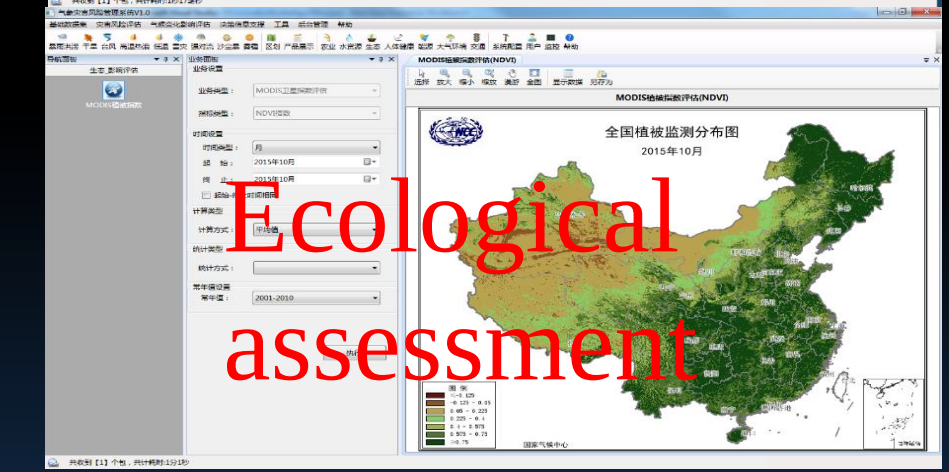
Module name	Algorithm name	Main Contents
Rainstorm flood	A total of 33 modules	① Precipitation analysis: single day precipitation, cumulative precipitation, number of precipitation days, number of precipitation stations, day of the precipitation stations ② Continuous precipitation: maximum continuous precipitation, the longest continuous precipitation ③ Extreme precipitation ④ Rain and water assessment ⑤ Water regime monitoring ⑥ Water information query ⑦ Area statistical analysis ⑧ Rainstorm process ⑨ Next 7 days pre-assessment, etc.
Drought	A total of 11 modules	① Drought MCI index ② Drought indices and corresponding number of drought days, number of drought and Perennial value, equidistant, etc. ③ KA factor view and modification ④ Penman evapotranspiration and Thothwait calculation, query and statistics
Typhoon	A total of 7 modules	① Generate typhoon comprehensive query ② Login typhoon comprehensive query ③ Track query of tropical cyclones ④ On land maintenance time query ⑤ Comprehensive query of tropical cyclone disaster ⑥ Assessment of tropical cyclone disaster ⑦ Analysis of tropical cyclone



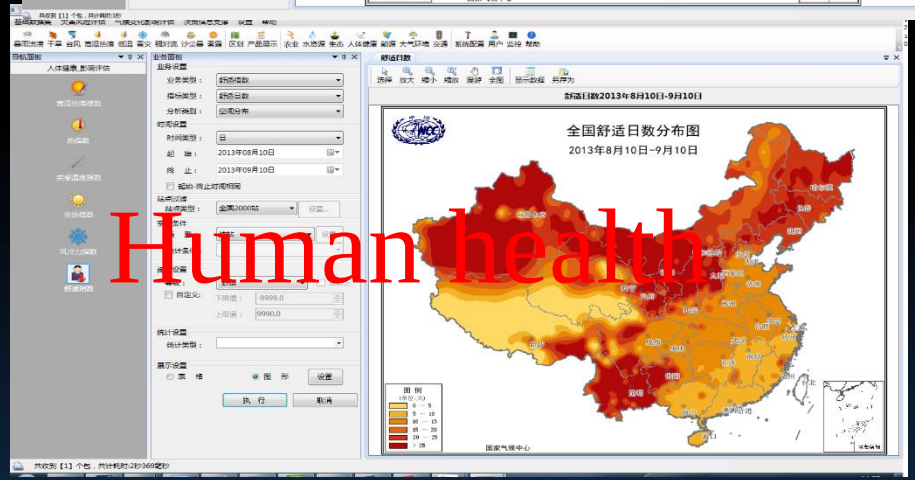
Agricultural impact assessment



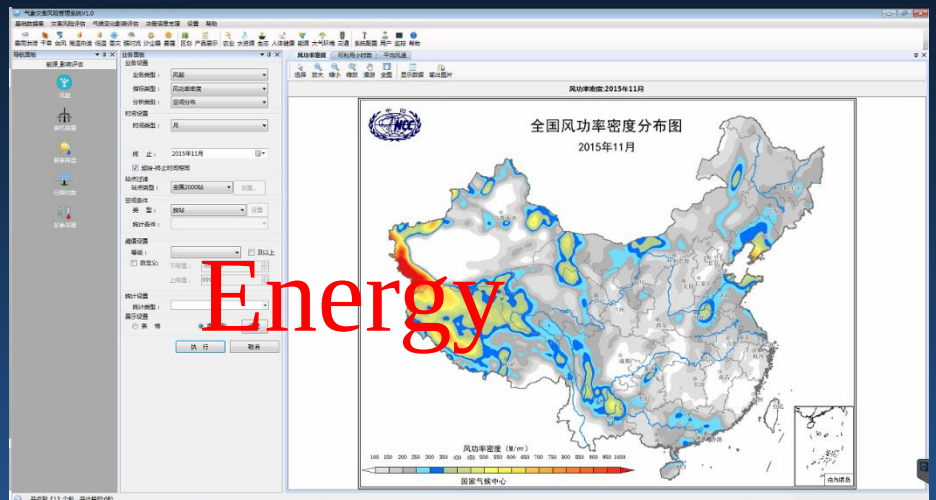
Water resources



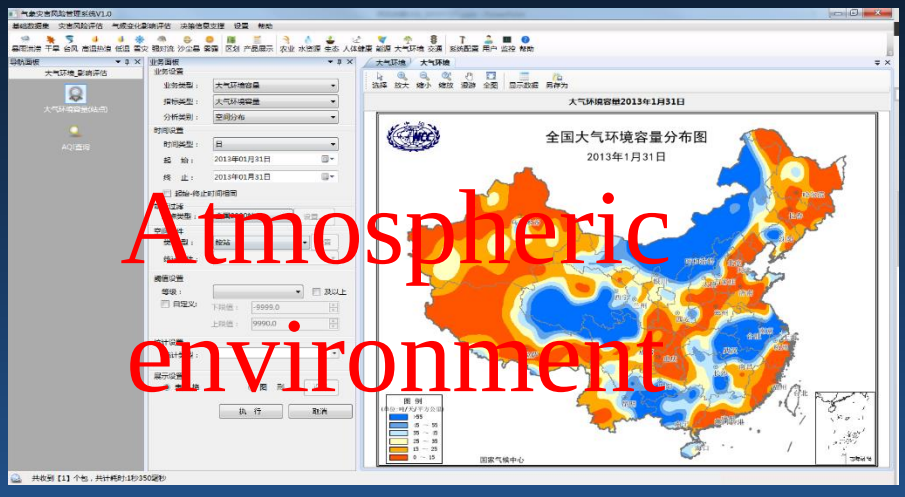
Ecological assessment



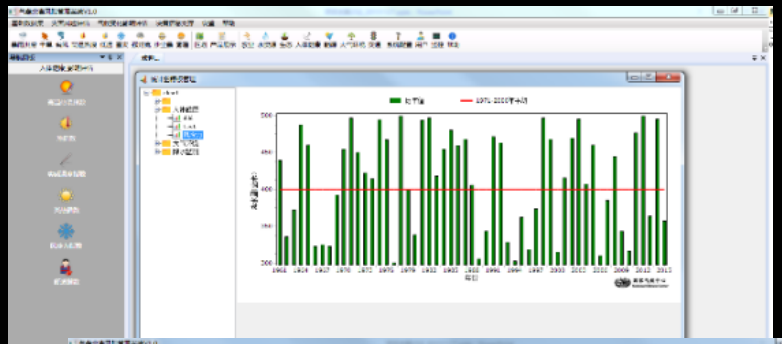
Human health

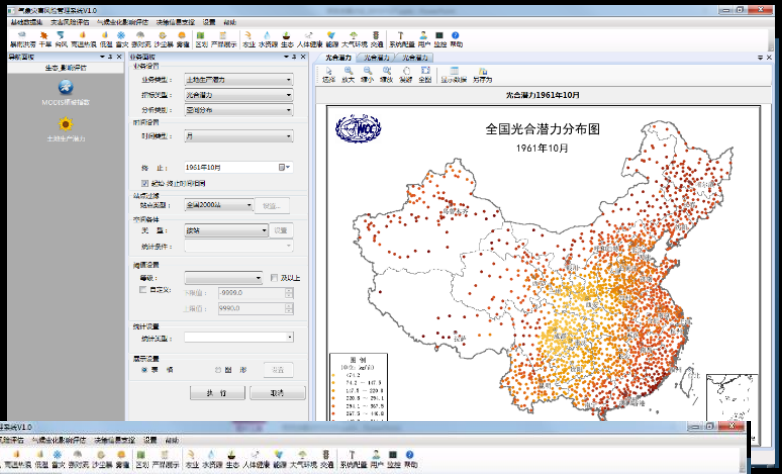


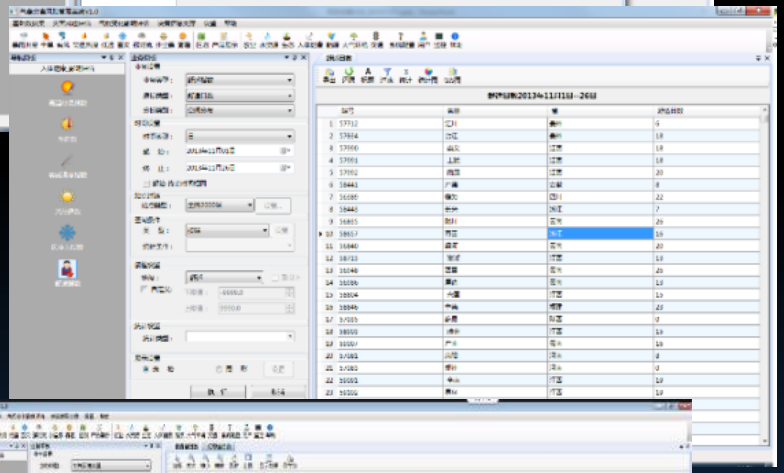
Energy

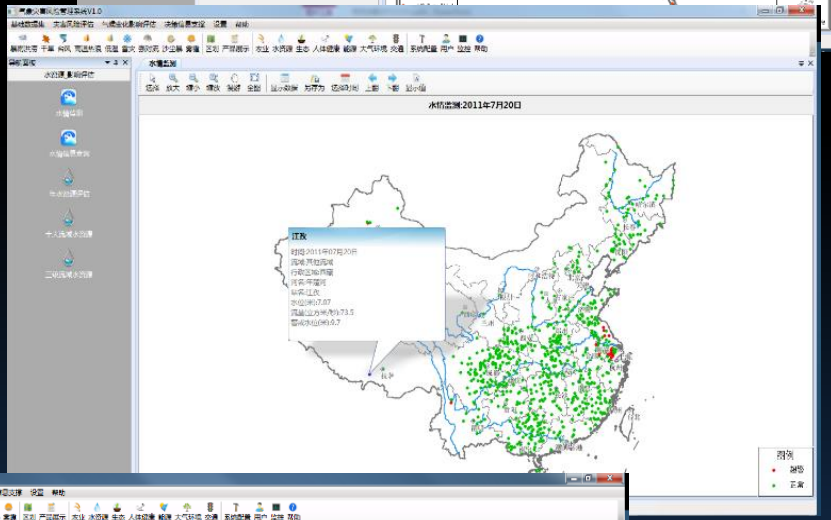


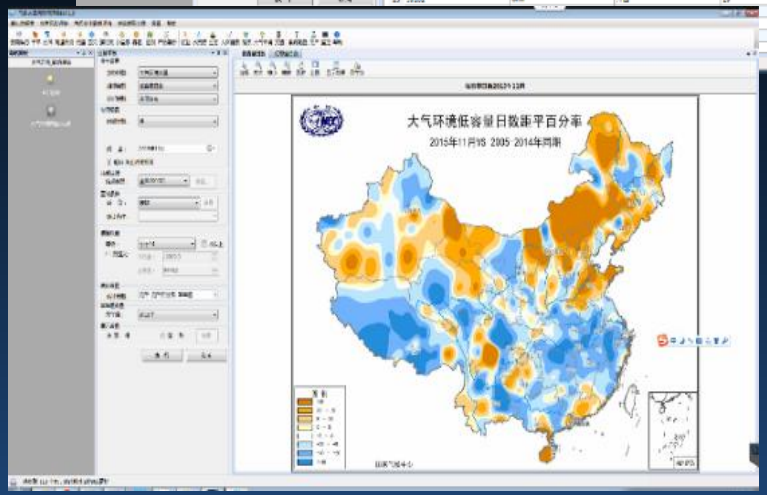
Atmospheric environment

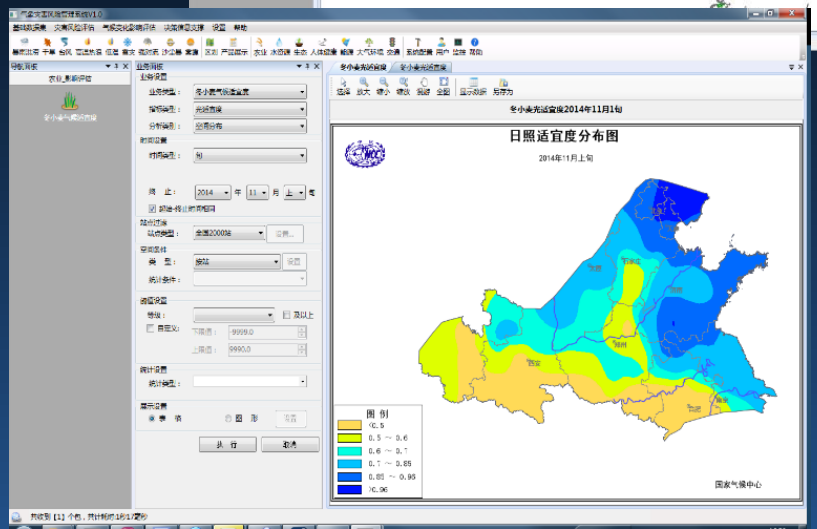



全国光合潜力分布图
1961年10月

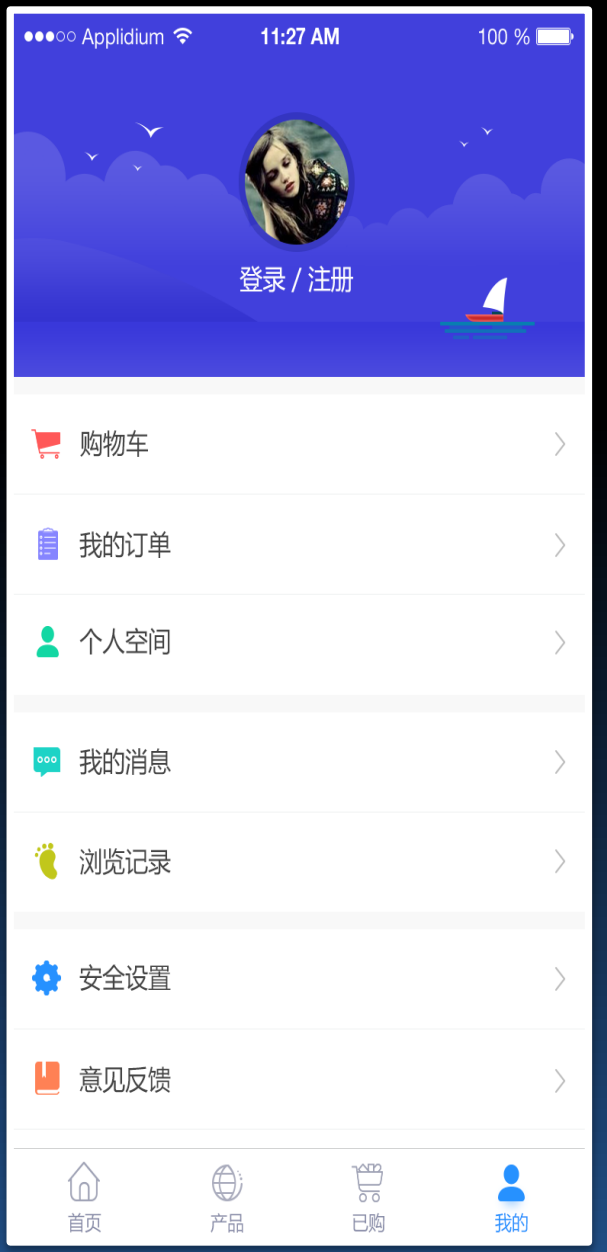



水情监测:2011年7月20日

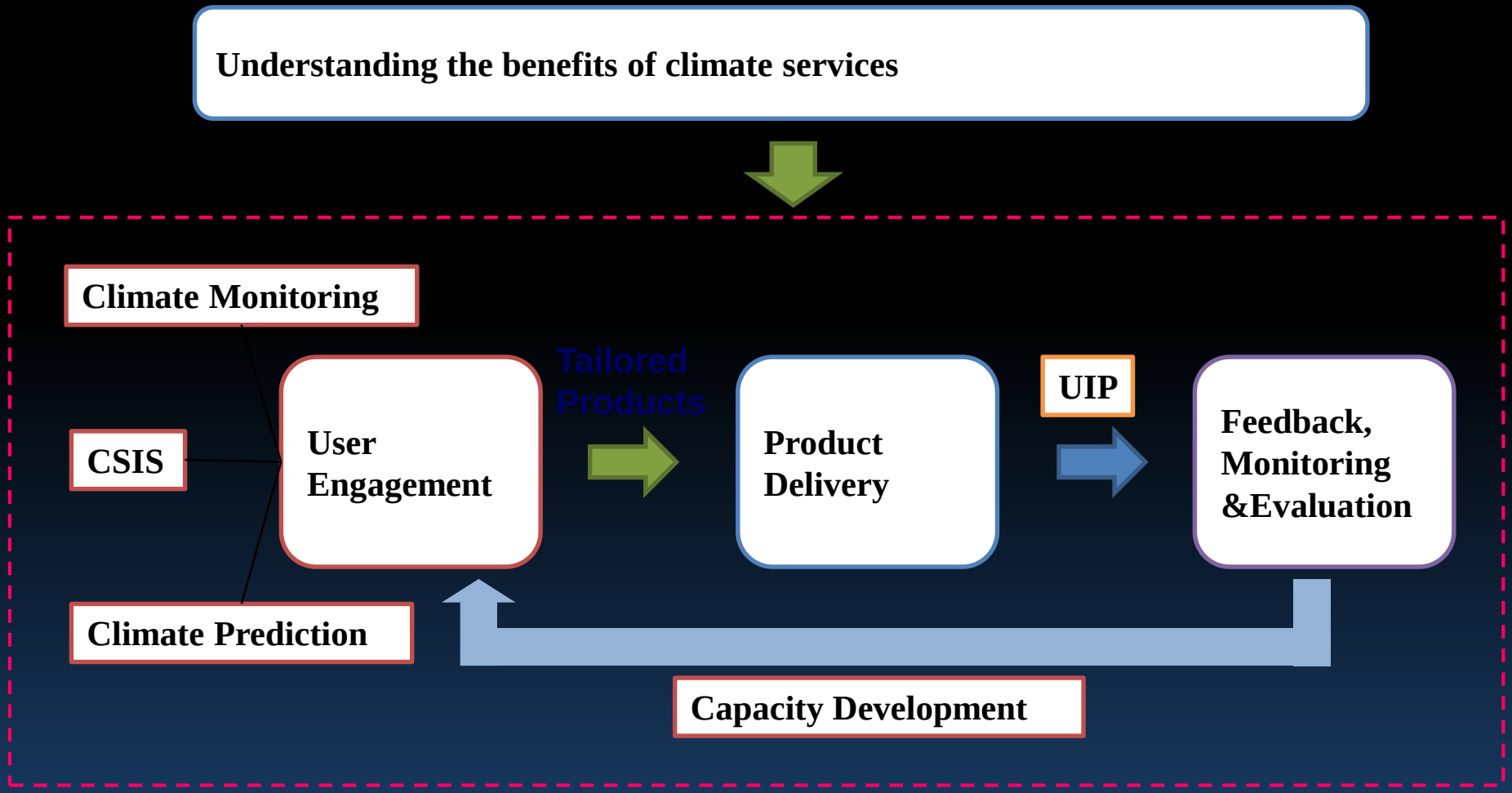

大气环境低容量日数距平百分率
2015年11月15 2005 2014年同期


冬小麦光适宜度2014年11月1旬
日照适宜度分布图
2014年11月上旬
国家气候中心

Practice :6 Climate Service Panel (APP/Mall)



Lessons and Experiences: How to Transfer from Climate Science to Climate Sevice



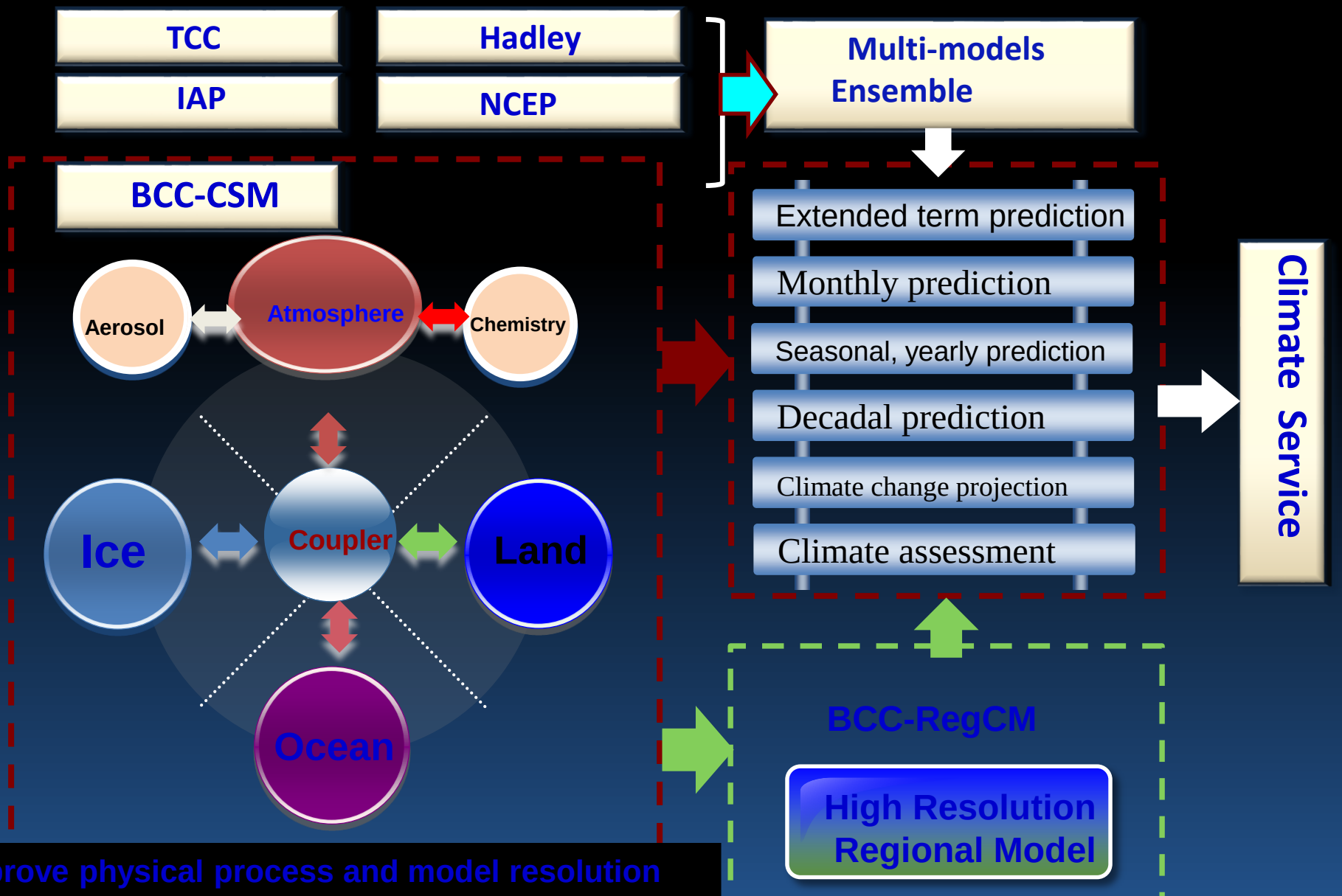
Process of developing climate services

Services are developed through thorough and ongoing engagement between providers and users.

Future Development

- ✓To enrich the data pool
- ✓To provide more timely, accurate and tailored climate services
- ✓To construct seamless forecasting system
- ✓To help users better understand the climate knowledge and get benefits from it
- ✓To extend climate service area to help society plan for and adapt to climate variability and climate change, keep climate security
- ✓To develop Climate Service Panel (CLAP) in three years

CFCS keep going



Climate Knowledge,

Put into Practice