GIS and its Applications in National Meteorological Operational System

Huanping WU

Beijing Climate Center/National Climate Centre ,CMA

University of Gothenburg, Sweden

26th European Working Group on Operational Meteorological Workstations (EGOWS)

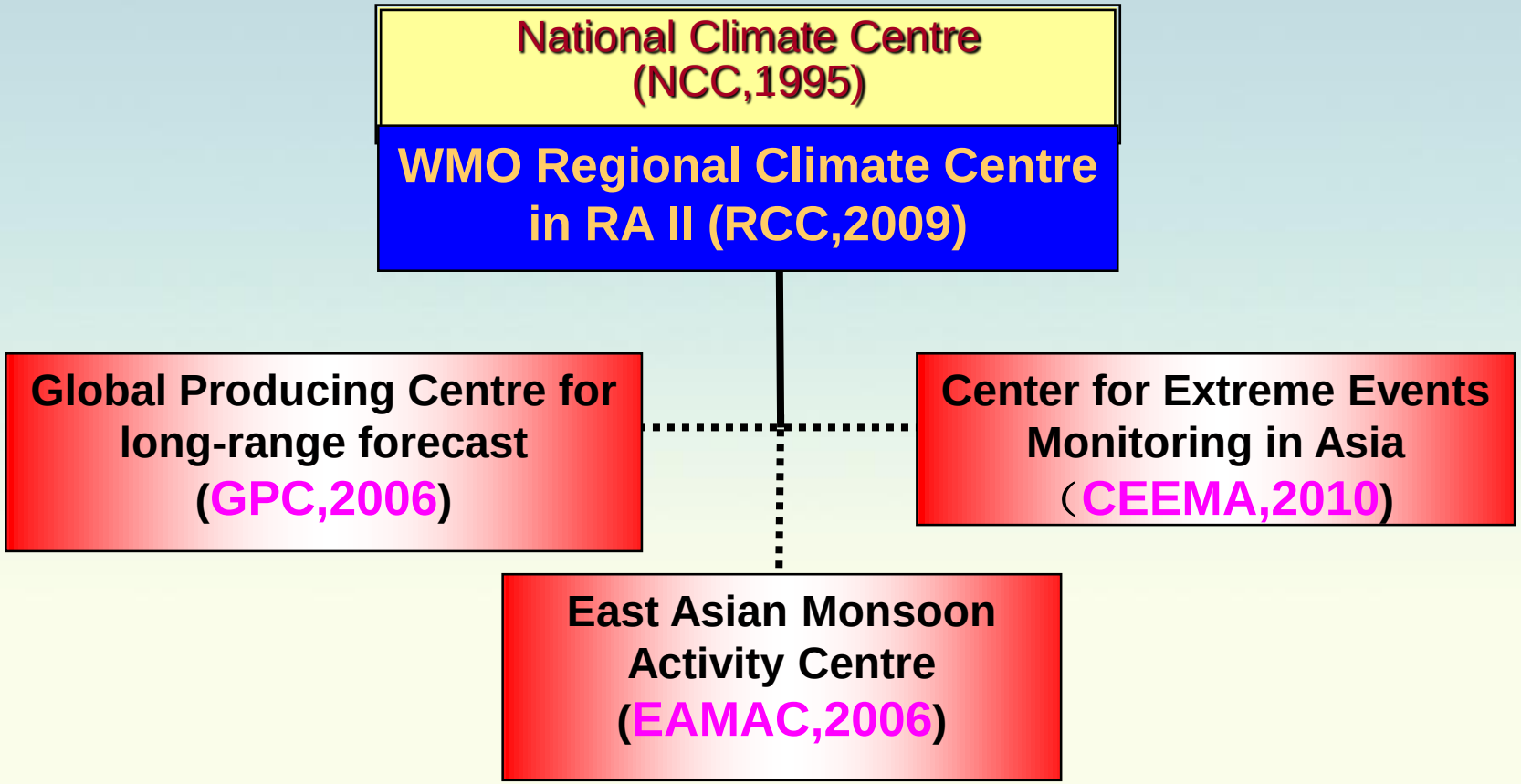
Visualisation in Meteorology week 2015

ECMWF Reading, Sept.28-Oct.2, 2015

Outline

1. Brief Introduction of NCC
2. Overview of GIS and its in Meteo.
3 GIS in National Meteo. Operational System

1.Brief Introduction of BCC

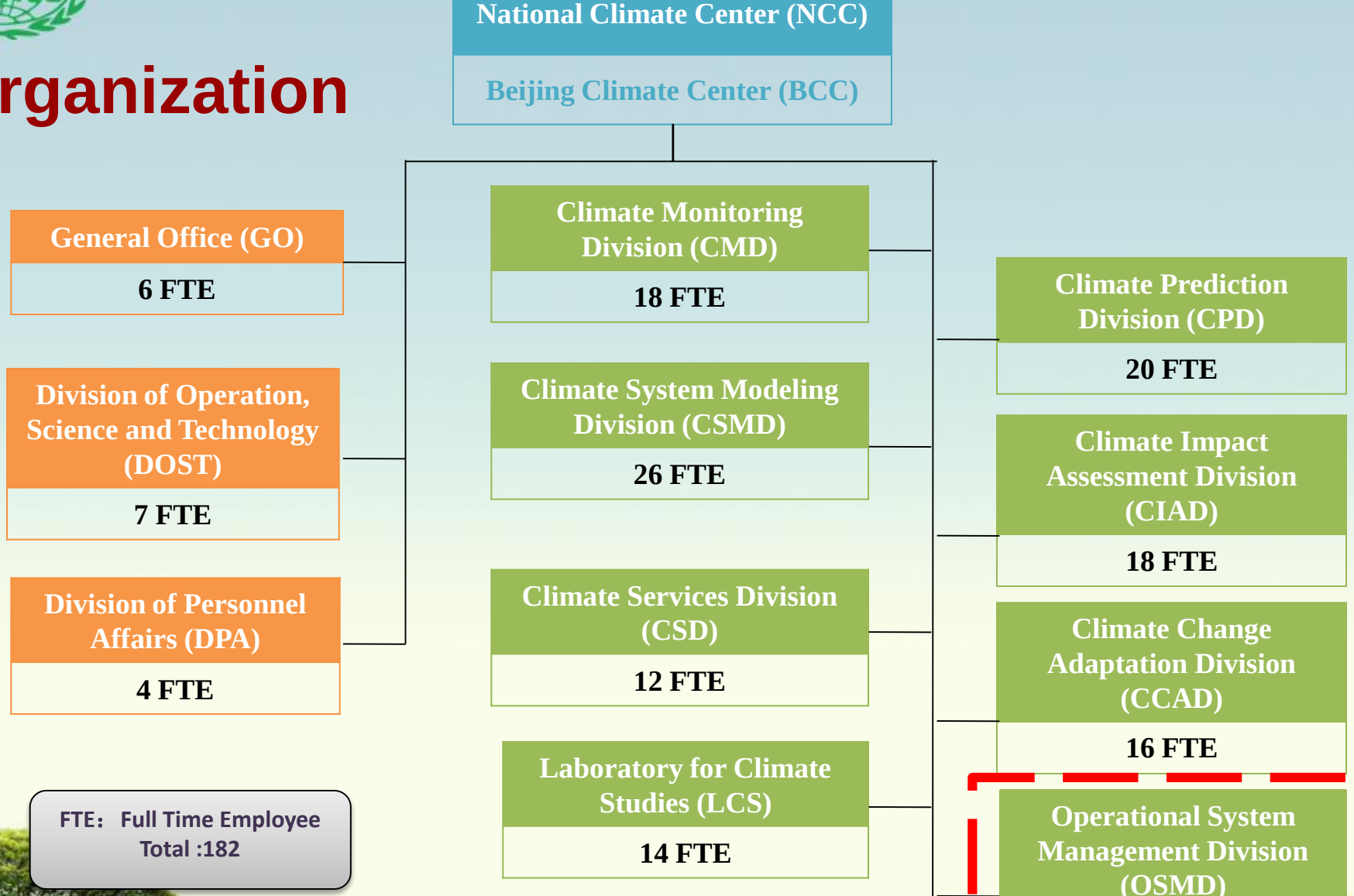


The Role of Beijing Climate Center

Mission

- To monitor and diagnose global atmospheric and oceanic conditions, as well as extreme climate events , especially in East Asia
- To issue global climate predictions and impact assessments at monthly, seasonal and inter-annual time scales, particularly in East Asia
- To implement GFCS in China
- To do research on climate and climate change issues

Organization



FTE： Full Time Employee
Total :182

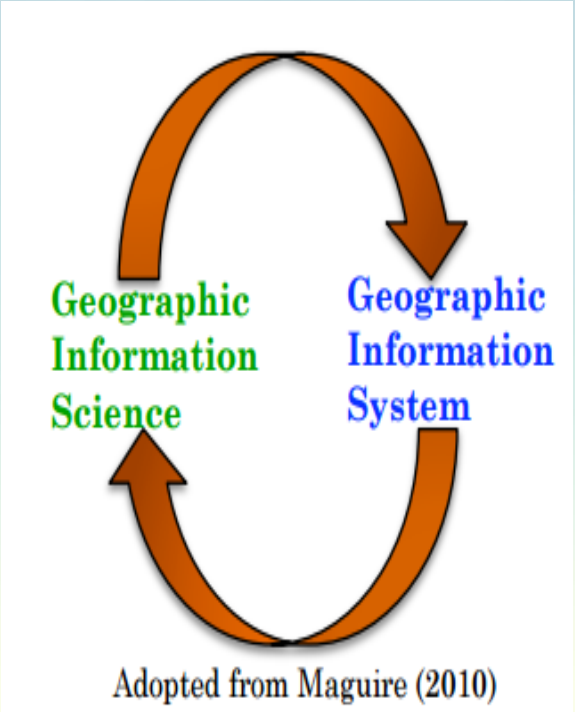
Outline

1. Brief Introduction of NCC
2. Overview of GIS and its in Meteo.
3 GIS in National Meteo. Operational System

What does GIS stand for?

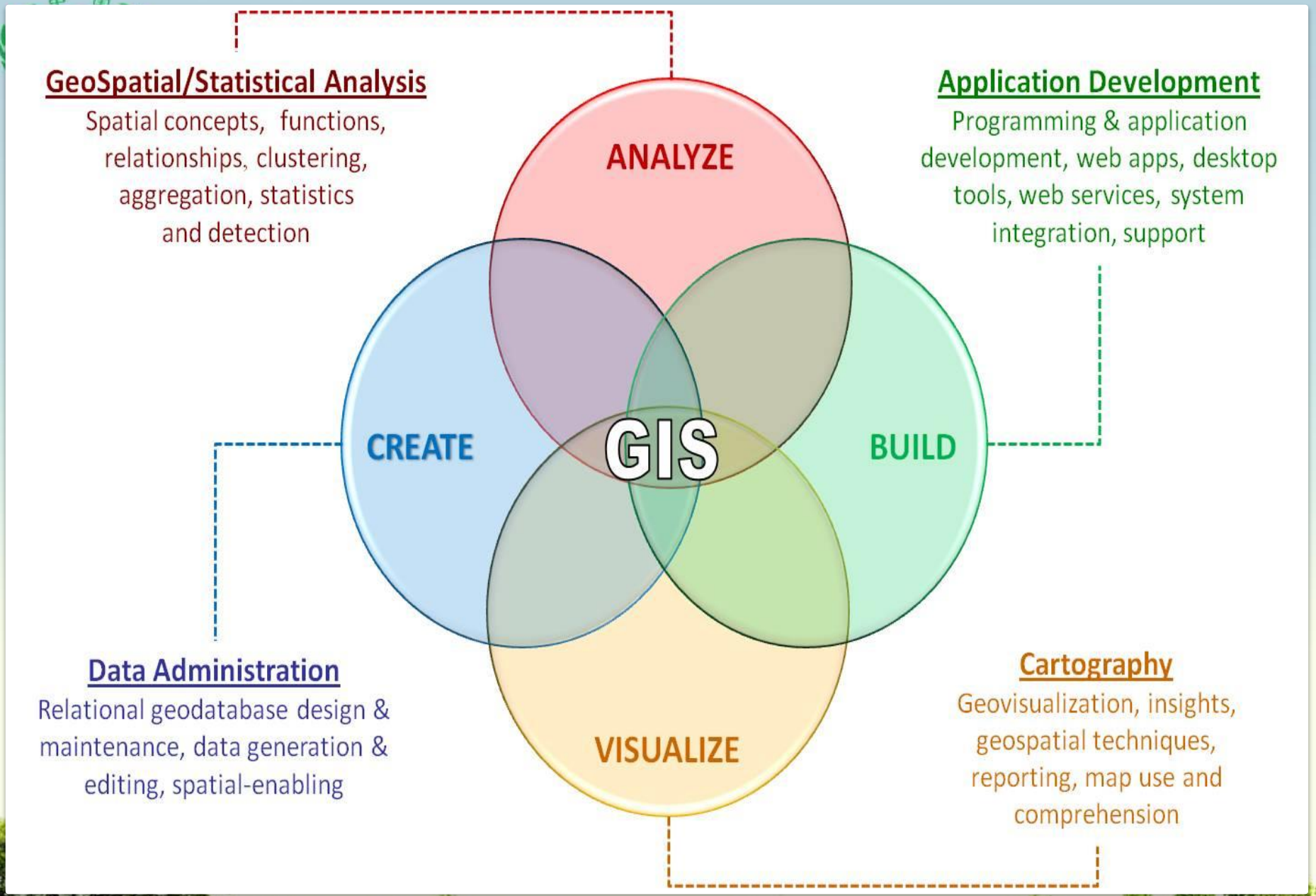
- **Geographic Information System**
- is a system designed for storing, analyzing, and displaying spatial data
- is the use of hardware, software, people, procedures, and data
- focuses on the processes and methods that are used to sample, represent, manipulate and present information about the world (Goodchild, 1992) .

- **Geographic Information Science**
- is the science concerned with the systematic and automatic processing of spatial data and information with the help of computers
- is the theory behind how to solve spatial problems with computers
- presents a framework for using information theory, spatial analysis and statistics, cognitive understanding, and cartography (Longley et al., 2005).



Adopted from Maguire (2010)

Taken from YUJI MURAYAMA



Taken from Kenvision Techniks Ltd

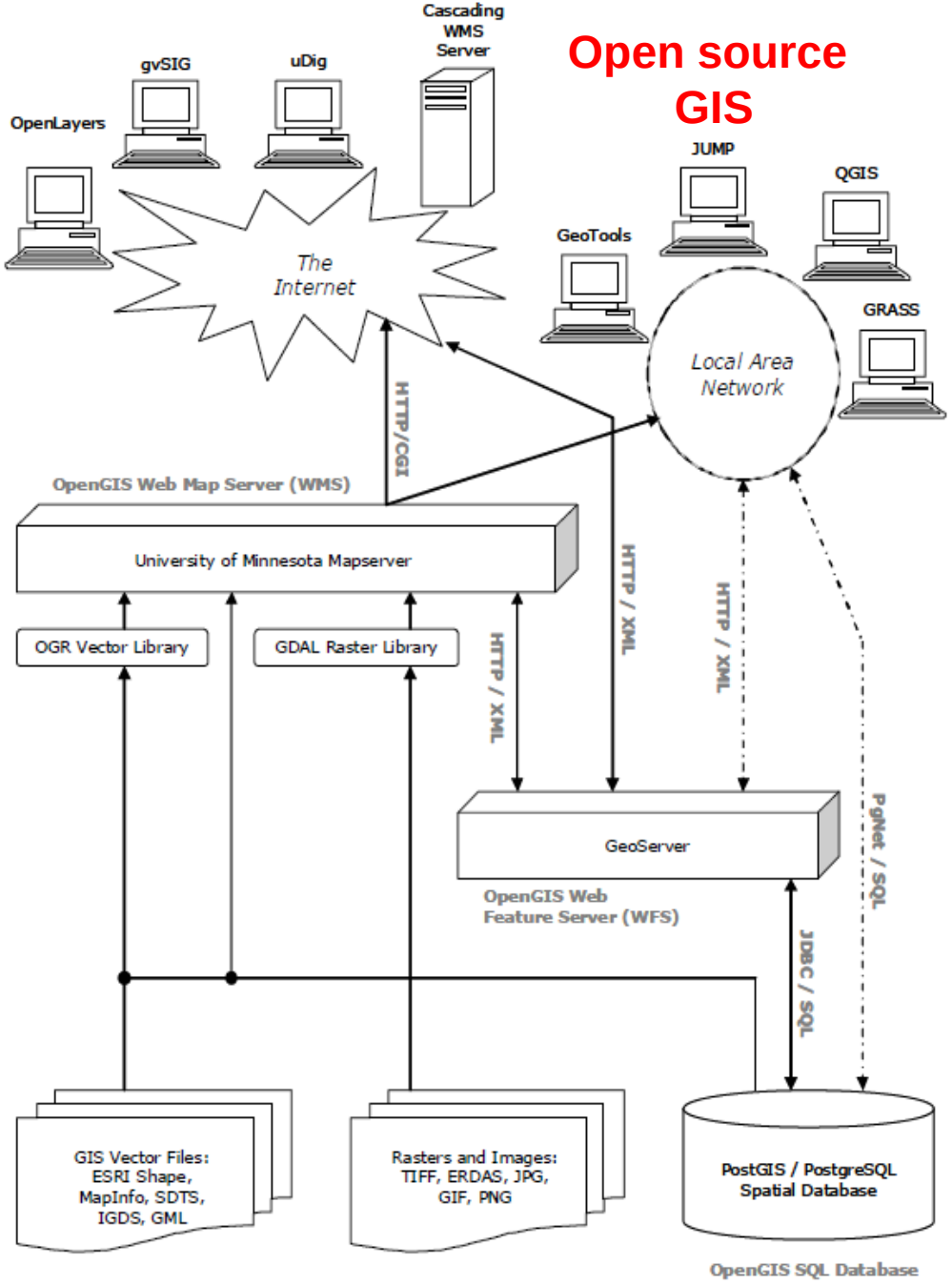
GIS Has Evolved

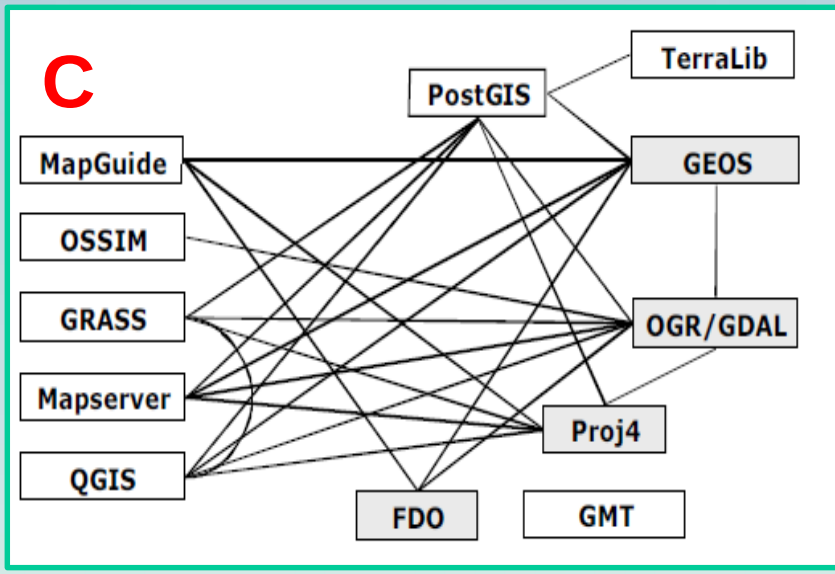
Use is Augmented, not replaced

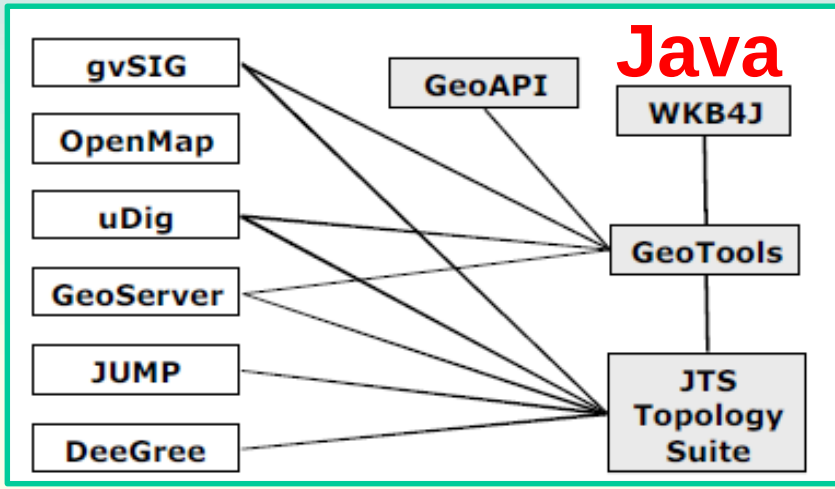
esri China BEIJING

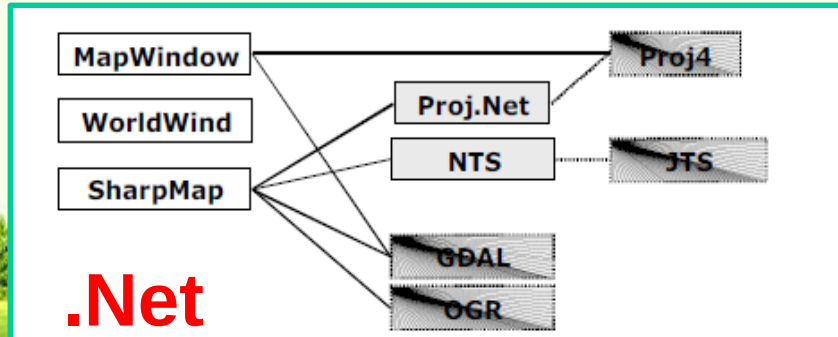
Taken from ESRI UC

Open source GIS









Refractions RESEARCH

NCAR GIS PROGRAM GEOGRAPHIC INFORMATION SYSTEMS

https://gis.ucar.edu/

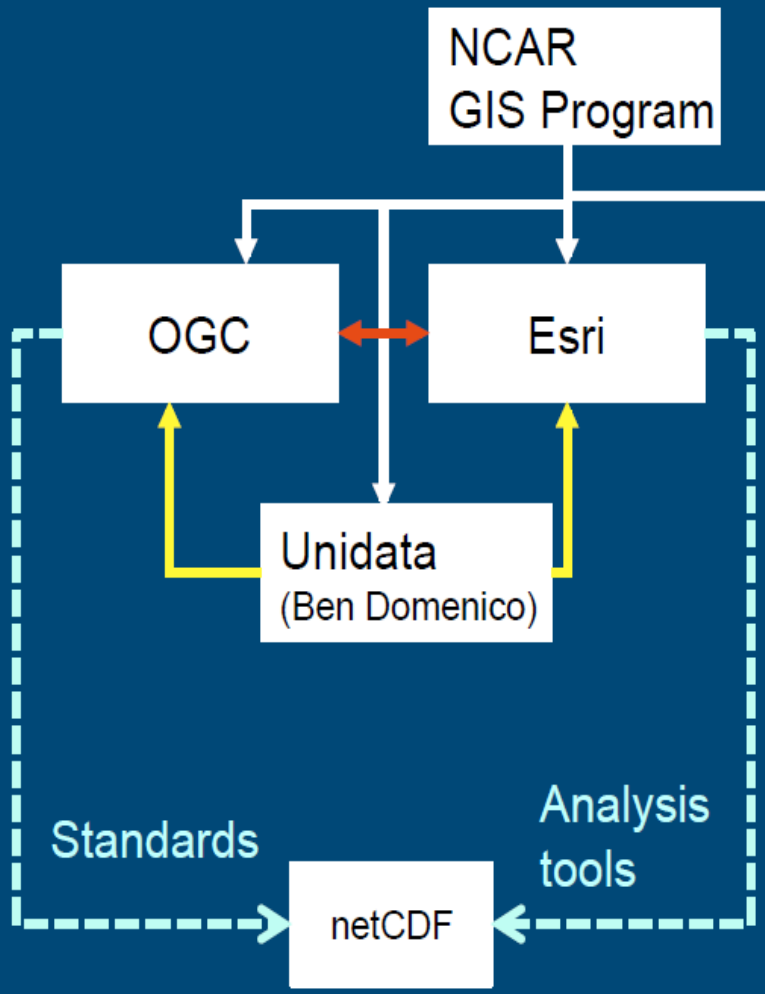
2001

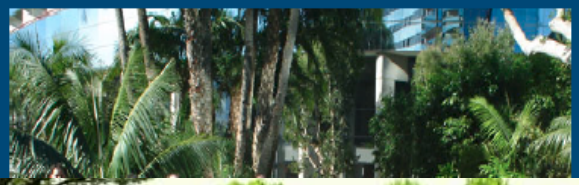
NCAR Geographic Information Systems (GIS) Initiative
National Center for Atmospheric Research

- To promote and support the use of GIS as both an analysis and an infrastructure tool in atmospheric research
- To address broader issues of data management and geoinformatics within atmospheric and related geo- and social sciences
- To integrate geospatial knowledge across disciplines

- Regular Workshops *on GIS in Weather, Climate and Impacts(Aug. 2002:1st,Jul. 2005 : 2nd,Oct.2008: 3rd)*
  24-26 Jun. 2015: Incorporating GIS Into the Atmospheric Science Curriculum

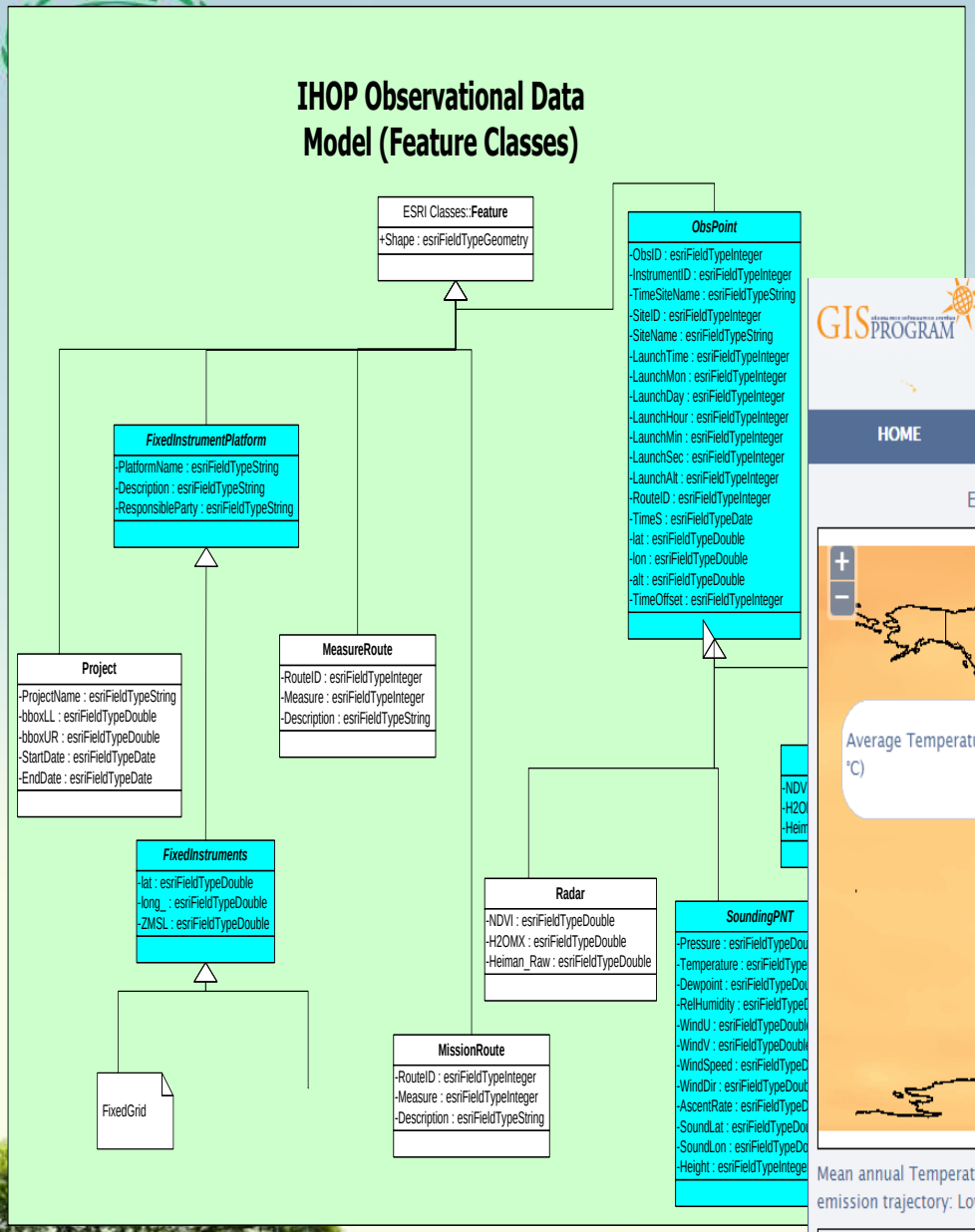
Partnerships

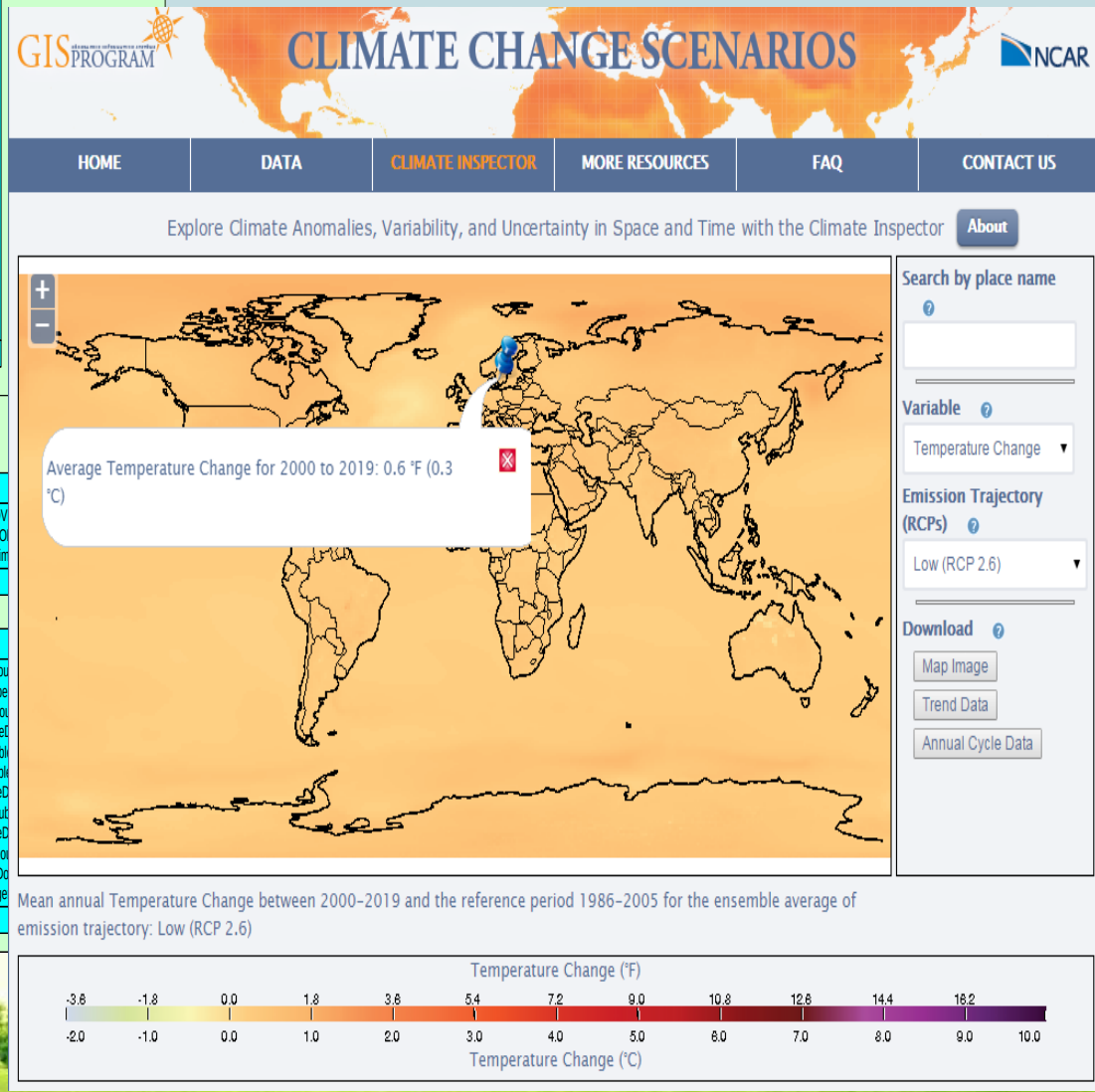




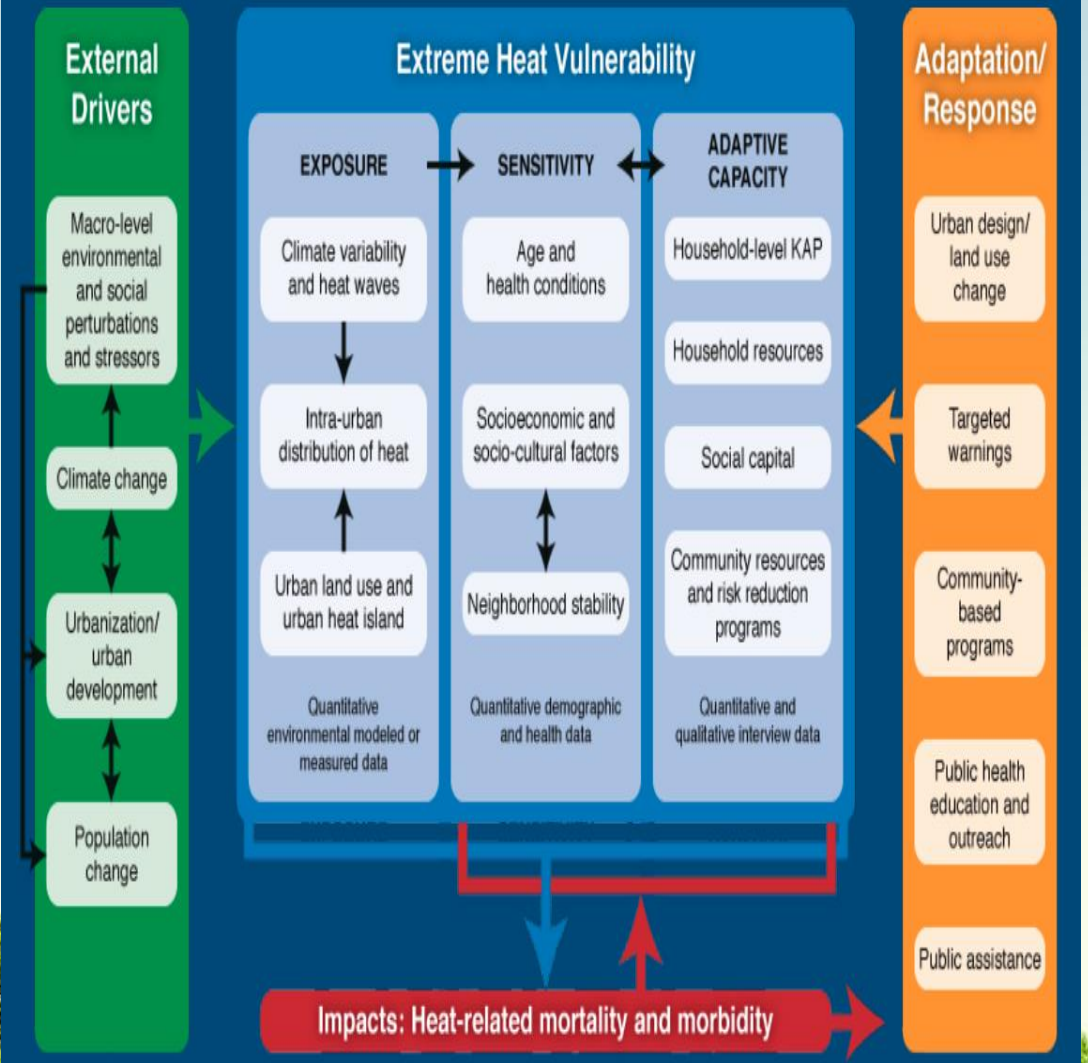
- **OGC-NCAR MOU**
  - Development of OGC technology within the atmospheric sciences and to extend OpenGIS specifications to include the geospatial processing needs of the atmospheric community
  - Outcome: CF-netCDF is an OGC standard
- **Esri – NCAR MOU**
  - Advancing GIS technical methods and technologies; Exploring the development of atmospheric information and models within GIS domains
  - Outcome: netCDF CF in ArcGIS
- **Atmo-GIS community workshops 2004-08**

Taken from the report "GIS in Meteorology and Climate Science", Olga Wilhelmi and Jennifer Boehnert

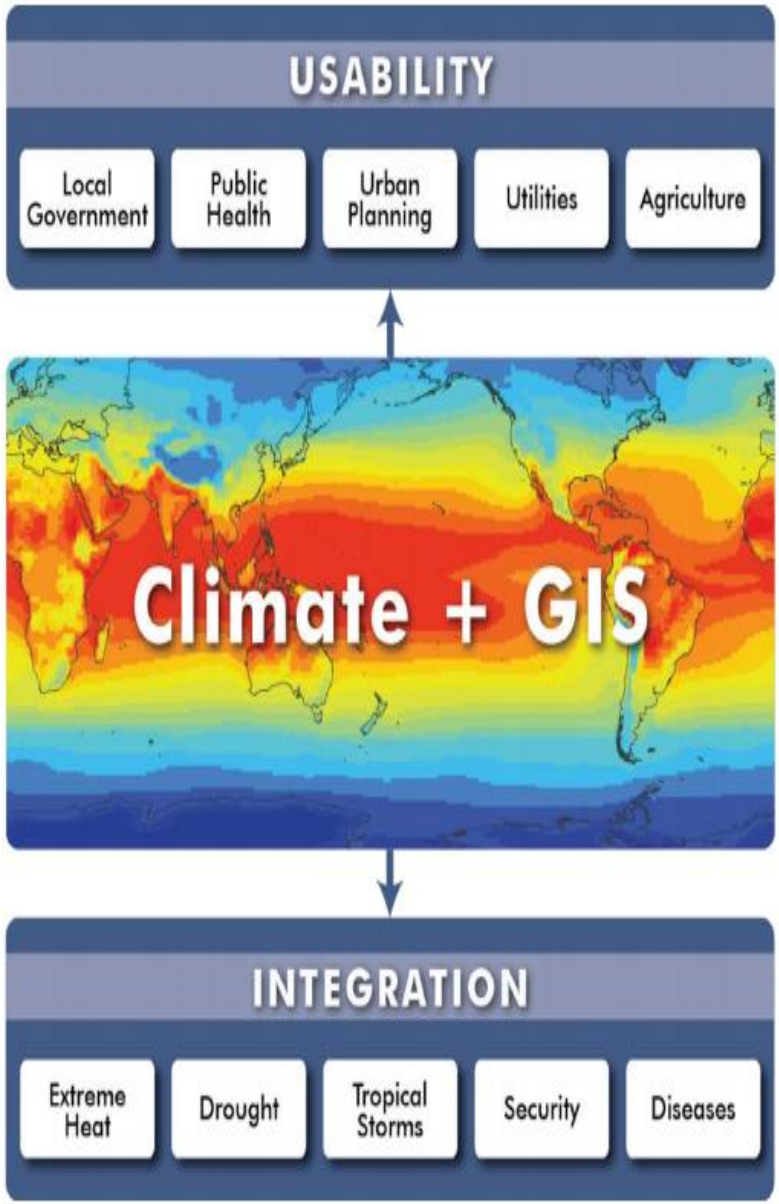

IHOP Observational Data Model (Feature Classes)
ESRI Classes::Feature
+Shape : esriFieldTypeGeometry
ObsPoint
-ObsID : esriFieldTypeInteger
-InstrumentID : esriFieldTypeInteger
-TimeSiteName : esriFieldTypeString
-SiteID : esriFieldTypeInteger
-SiteName : esriFieldTypeString
-LaunchTime : esriFieldTypeInteger
-LaunchMon : esriFieldTypeInteger
-LaunchDay : esriFieldTypeInteger
-LaunchHour : esriFieldTypeInteger
-LaunchMin : esriFieldTypeInteger
-LaunchSec : esriFieldTypeInteger
-LaunchAlt : esriFieldTypeInteger
-RouteID : esriFieldTypeInteger
-TimeS : esriFieldTypeDate
-lat : esriFieldTypeDouble
-lon : esriFieldTypeDouble
-alt : esriFieldTypeDouble
-TimeOffset : esriFieldTypeInteger
FixedInstrumentPlatform
-PlatformName : esriFieldTypeString
-Description : esriFieldTypeString
-ResponsibleParty : esriFieldTypeString
Project
-ProjectName : esriFieldTypeString
-bboxLL : esriFieldTypeDouble
-bboxUR : esriFieldTypeDouble
-StartDate : esriFieldTypeDate
-EndDate : esriFieldTypeDate
MeasureRoute
-RouteID : esriFieldTypeInteger
-Measure : esriFieldTypeInteger
-Description : esriFieldTypeString
FixedInstruments
-lat : esriFieldTypeDouble
-long_ : esriFieldTypeDouble
-ZMSL : esriFieldTypeDouble
FixedGrid
Radar
-NDVI : esriFieldTypeDouble
-H2OMX : esriFieldTypeDouble
-Heiman_Raw : esriFieldTypeDouble
MissionRoute
-RouteID : esriFieldTypeInteger
-Measure : esriFieldTypeInteger
-Description : esriFieldTypeString
SoundingPNT
-Pressure : esriFieldTypeDou
-Temperature : esriFieldType
-Dewpoint : esriFieldTypeDou
-RelHumidity : esriFieldTypeI
-WindU : esriFieldTypeDouble
-WindV : esriFieldTypeDouble
-WindSpeed : esriFieldTypeD
-WindDir : esriFieldTypeDoub
-AscentRate : esriFieldTypeD
-SoundLat : esriFieldTypeDo
-SoundLon : esriFieldTypeDo
-Height : esriFieldTypeIntege


GIS PROGRAM
CLIMATE CHANGE SCENARIOS
NCAR
HOME
DATA
CLIMATE INSPECTOR
MORE RESOURCES
FAQ
CONTACT US
Explore Climate Anomalies, Variability, and Uncertainty in Space and Time with the Climate Inspector
About
Average Temperature Change for 2000 to 2019: 0.6 °F (0.3 °C)
Search by place name
Variable
Temperature Change
Emission Trajectory (RCPs)
Low (RCP 2.6)
Download
Map Image
Trend Data
Annual Cycle Data
Mean annual Temperature Change between 2000–2019 and the reference period 1986–2005 for the ensemble average of emission trajectory: Low (RCP 2.6)
Temperature Change (°F)
-3.6 -1.8 0.0 1.8 3.8 5.4 7.2 9.0 10.8 12.6 14.4 16.2
-2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0
Temperature Change (°C)

Integration of atmospheric and social data



Wilhelmi and Hayden (ERL, 2010)



Integration of atmospheric data with GIS provides usable climate information to decision makers and supports interdisciplinary research projects.

- **Workshop reports**
- **A New book： is aimed at meteorologists, climatologists, and GIS practitioners interested in integrating weather and climate data into their GIS workflows.**

GEOGRAPHIC INFORMATION SYSTEMS IN WEATHER, CLIMATE, AND IMPACTS

BY OLGA V. WILHELMI AND JEFFREY C. BRUNSKILL

A group representing the GIS and atmospheric communities discussed benefits and limitatio of using GIS in atmospheric sciences research, applications, and data sharing.

The National Center for Atmospheric Research (NCAR) conducted a workshop to explore the role of the Geographic Information System (GIS) in the atmospheric sciences. More than 70 representatives from academia, the private sector, and the government participated in the workshop on "GIS in Weather, Climate, and Impacts" on 12–14 August in Boulder, Colorado. Sponsored and organized by the NCAR GIS Initiative, the workshop initiated discussion about the potential benefits of geographic information science (GIScience) and systems to research and applications at NCAR/UCAR (the University Corporation for Atmospheric Science) and to the atmospheric science community in general. The goals of the workshop were

- To explore the role of GIS as an integratin for weather/climate research and applicati NCAR/UCAR and in the geosciences comm
- To foster collaborations in interdisciplinar based studies in meteorology, climatolog related geo- and social science research.
- To improve communication between th demic, private, and government sectors in w and climate GIS applications.

The workshop was a forum for researchers neers, providers of weather and climate data ar vices, commercial GIS vendors, and educators cuss the benefits and limitations of curren technology, develop strategies for incorporatir into atmospheric science research, and impro derstanding of the value of spatial data and geog methods of spatial analysis in meteorology and tology. The meeting centered upon the use of weather–climate research and applications; st the-art GIS and remote sensing technology; an ics involving data, visualization, and interoper (Table 1). Workshop participants developed a ent set of recommendations for future actio

AFFILIATIONS: WILHELMI—Environmental and Societal Impacts Group, National Center for Atmospheric Research,* Boulder, Colorado; BRUNSKILL—Department of Geography, State University of New York, Buffalo, New York
*National Center for Atmospheric Research is sponsored by the National Science Foundation.
CORRESPONDING AUTHOR: Olga Wilhelmi, NCAR, P.O. Box 3000, Boulder, CO 80307-3000
E-mail: olgaw@ucar.edu
DOI: 10.1175/BAMS-84-10-1409
In final form 4 April 2003
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Report from the 2nd NCAR Workshop on GIS in Weather, Climate and Impacts

by Olga Wilhelmi (NCAR/ISSE)

Introduction

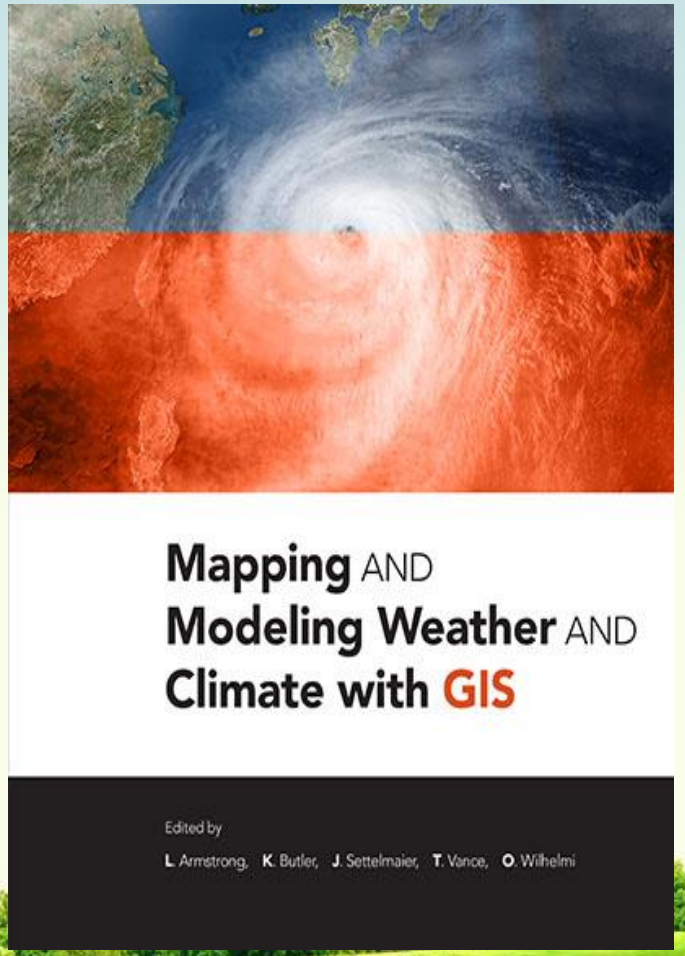
Earth system science community is challenged not only with integration of complex physical processes into weather forecast and climate prediction models but also with understanding the interactions between climate, environment, and society, and integrating societal and environmental information with weather and climate. In addition, climate- and weather-related policy and decision-making largely depend on usability of earth system science output and accessibility of data.

Over the past two decades Geographic Information Systems (GIS) tools and methods have been widely used in many societal sectors and academic disciplines for data integration, analysis and decision-making. Geographic information science and technology have evolved from the requirements of a GIS community which until recently did not include atmospheric scientists. To introduce GIS to atmospheric science community, in 2001, NCAR created a GIS Strategic Initiative. The Initiative has been an interdisciplinary effort to foster collaborative science, spatial data interoperability, and knowledge sharing with GIS. With the goal to integrate data and knowledge across disciplines the GIS Initiative aims to bridge communities of atmospheric scientists, data managers and the GIS community at large.

As a step towards fuller integration of the Earth system sciences and bridging atmospheric and GIS communities, on July 6-8, 2005, NCAR GIS Initiative held its 2nd community workshop on *GIS in Weather, Climate and Impacts*. The workshop brought together sixty five representatives from academia, the private sector, the government, and several international organizations. The workshop program included plenary sessions, panel discussions, poster session, and break-out sessions of interdisciplinary working groups. The workshop proceedings are available on-line at http://www.gis.ucar.edu/05workshop/index.html. Summary of workshop discussions and recommendations are presented below.

Previous Workshops in the Series

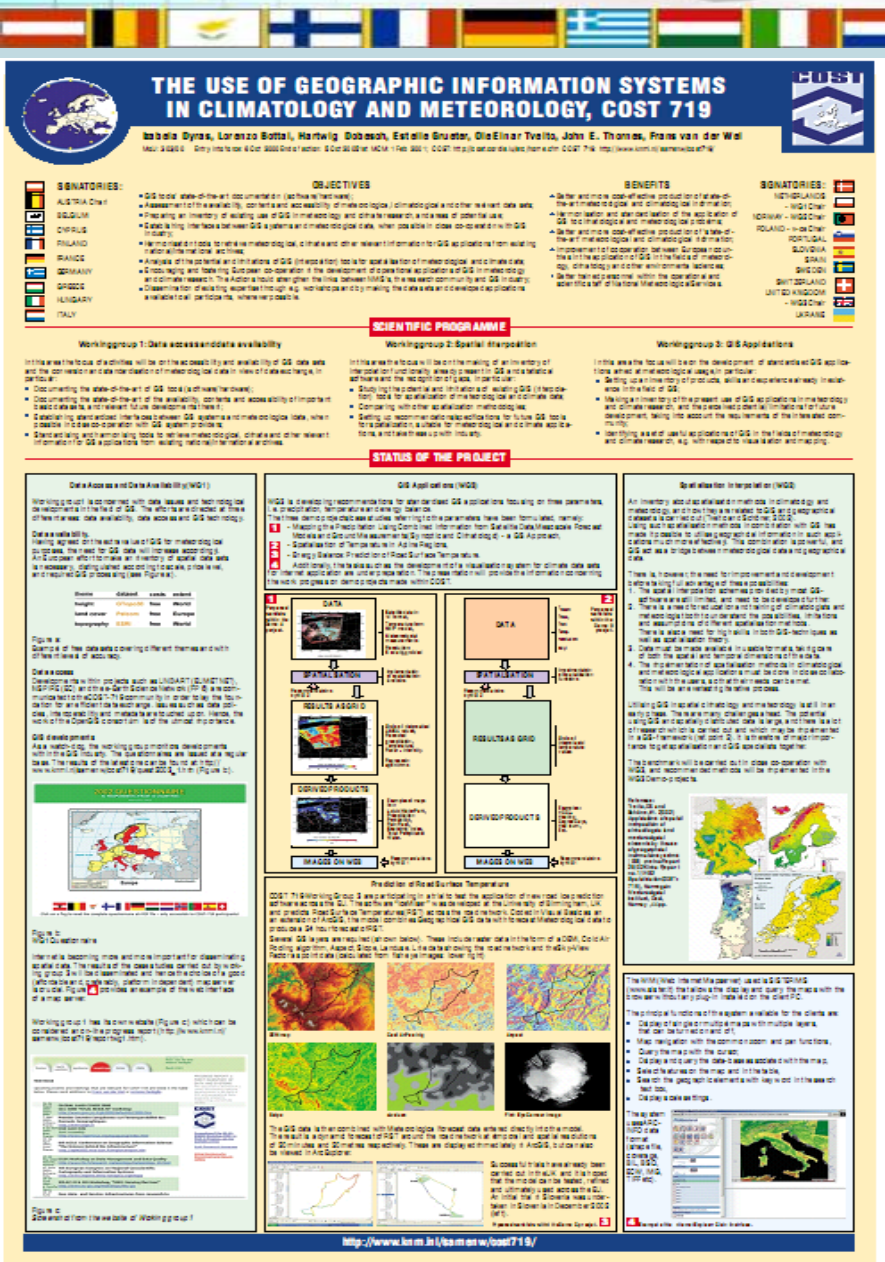
This workshop is second in its series of workshops organized by the NCAR GIS Initiative. First community workshop on *GIS in Weather, Climate and Impacts* took place in August 2002 in Boulder, Colorado. The proceedings of the 1st workshop are available on-line at http://www.gis.ucar.edu/02workshop/index.html and summarized in 2003 *BAMS* article by Wilhelmi and Brunskill.



COST-719

the use of GIS in climatology & meteorology

http://www.cost.eu/COST_Actions/essem/719?management



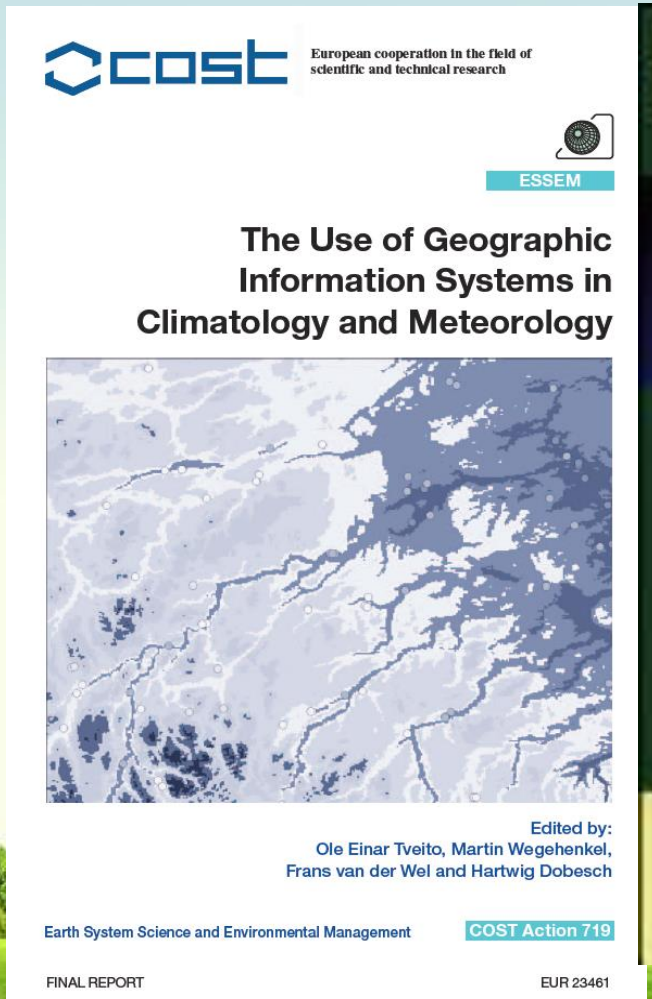
- Participants: from 20 European counties
- Period: 2001-2006

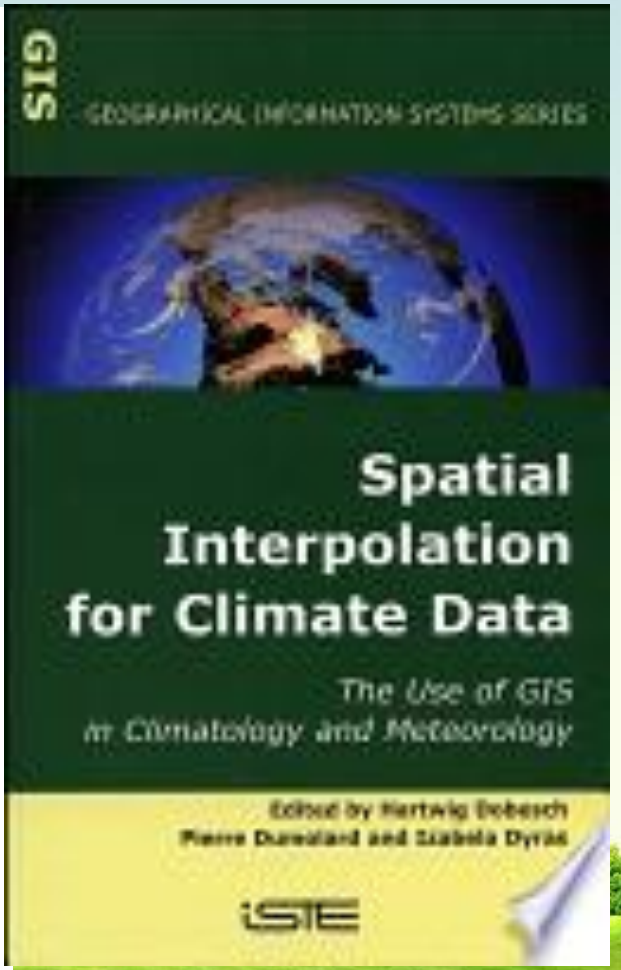
- Working Group 1：GIS Technology and Spatial Data

- Working Group 2:Spatialisation of climatological and meteorological information with the support of GIS

- Working Group 3:GIS Applications
- After 2006:University of Grenoble

- Meteorological Applications (Vol. 12 - N° 1) - **Special Issue on the use of GIS in Climatology and Meteorology**
- **Report:** The Use of Geographic Information Systems in Climatology and Meteorology Spatial Interpolation for Climate Data





Atmospheric Special Interest Group

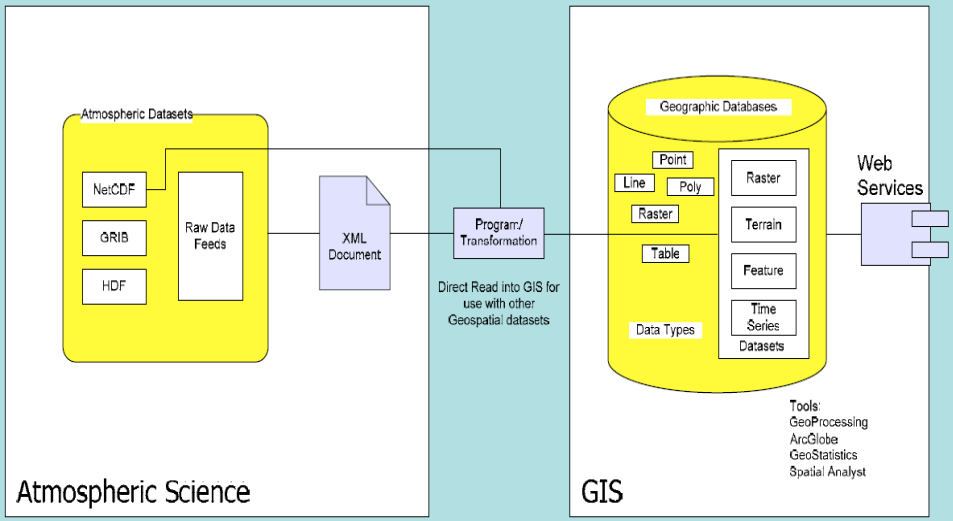
August , 2003, ASIG was found.
NCAR, ESRI, Unidata, Meteorlogix, Raytheon, Pacific Disaster Center, US Air Force, National Weather Service, and several other NOAA labs (PMEL, NGDC, ATDD, USDOC

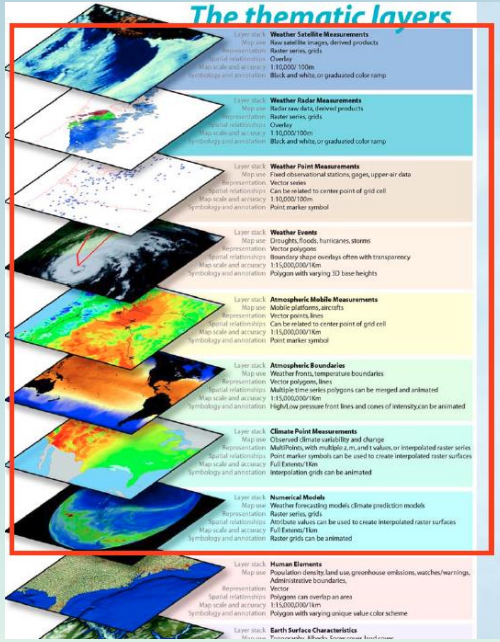
Climate, Weather, and Atmospheric Events and Activities

The Esri International User Conference and Esri Education pre-conference have many presentations and events with hundreds of topics covered. To help you find your way to the Climate, Weather, and Atmospheric activities, we have prepared a more focused agenda.

Esri Education GIS Conference:	July 18 – 21, San Diego Marriott Marquis
Esri User Conference:	July 20 – 24, San Diego Convention Center

Challenges remaining

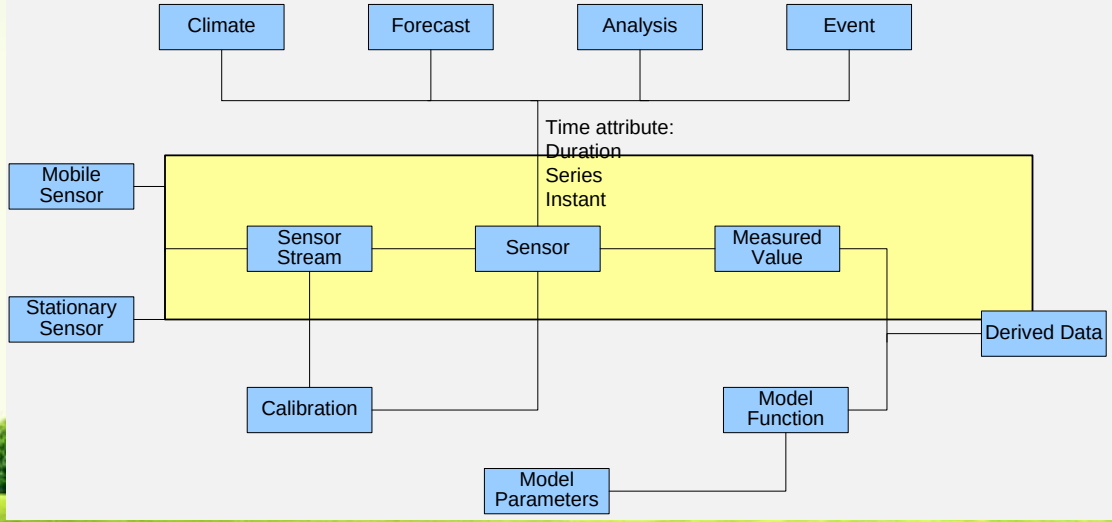




The Thematic Layers (draft)

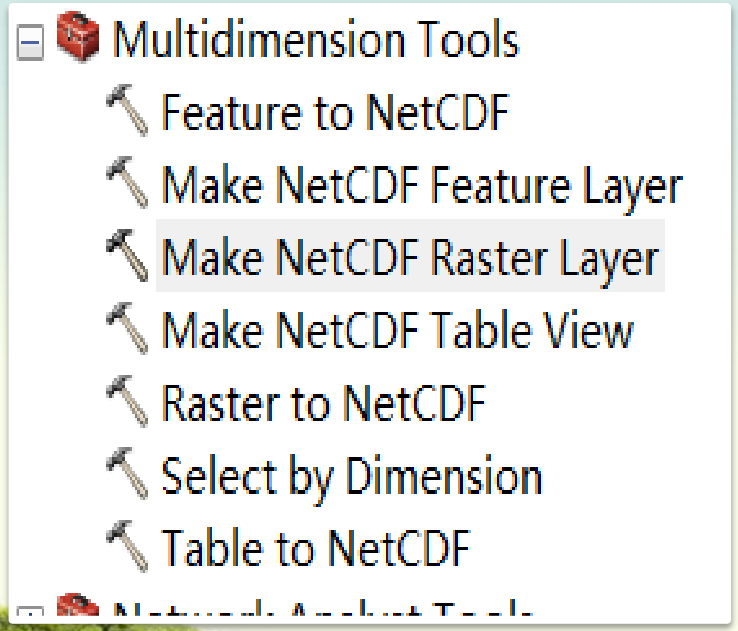
Weather *Satellite* Measurements
Weather *Radar* Measurements
Weather *Point* Measurements
Weather Events
Atmospheric Mobile Measurements
Atmospheric Boundaries
Climate Point Measurements
Numerical Models
Human Elements
Earth Surface Characteristics

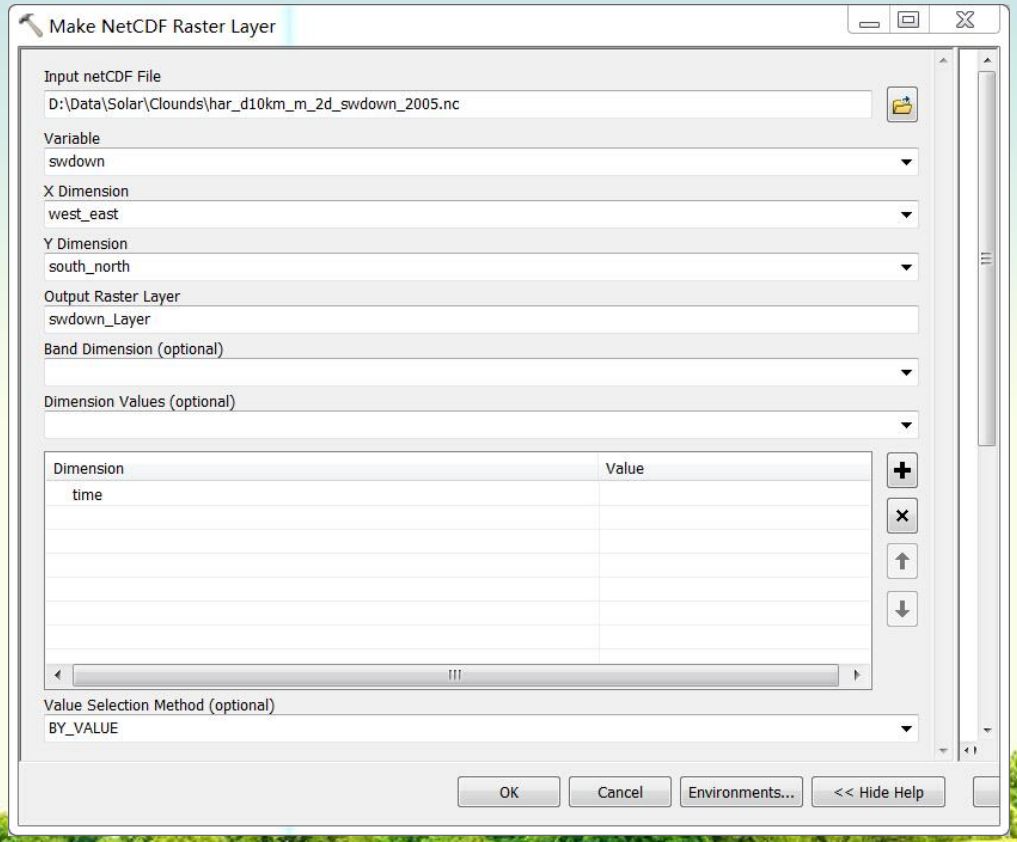
Atmospheric Concepts



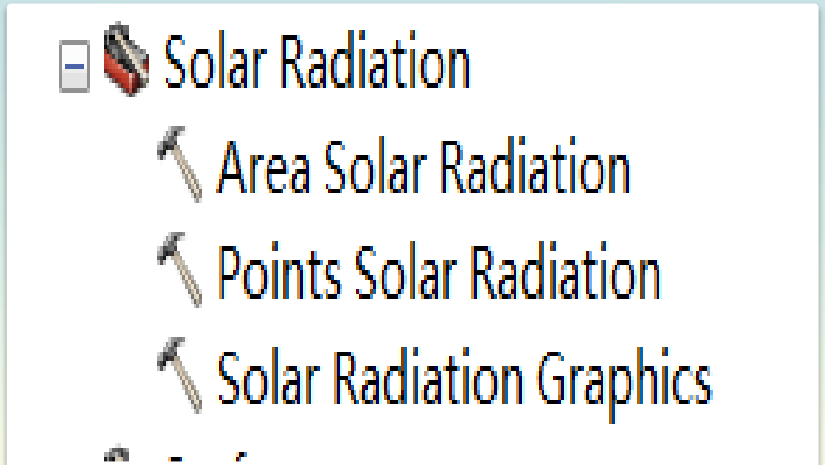
NetCDF in ArcGIS

- Atmospheric community – ESRI collaboration □ Since 2006 release of ArcGIS 9.2 NetCDF CF format can be read in GIS





ArcGIS Solar Analyst



Points Solar Radiation

Input raster

Input points feature or table

Output global radiation features

Height offset (optional)
0

Latitude (optional)
45

Sky size / Resolution (optional)
200

Time configuration (optional)
Multiple days in a year

Date/Time settings

Year: 2015

Start day: 5

End day: 160

Day interval (optional)
14

Hour interval (optional)
0.5

Create outputs for each interval (optional)

Topographic parameters

Z factor (optional)
1

Slope and aspect input type (optional)
FROM_DEM

Calculation directions (optional)
32

Radiation parameters

Zenith divisions (optional)
8

Azimuth divisions (optional)
8

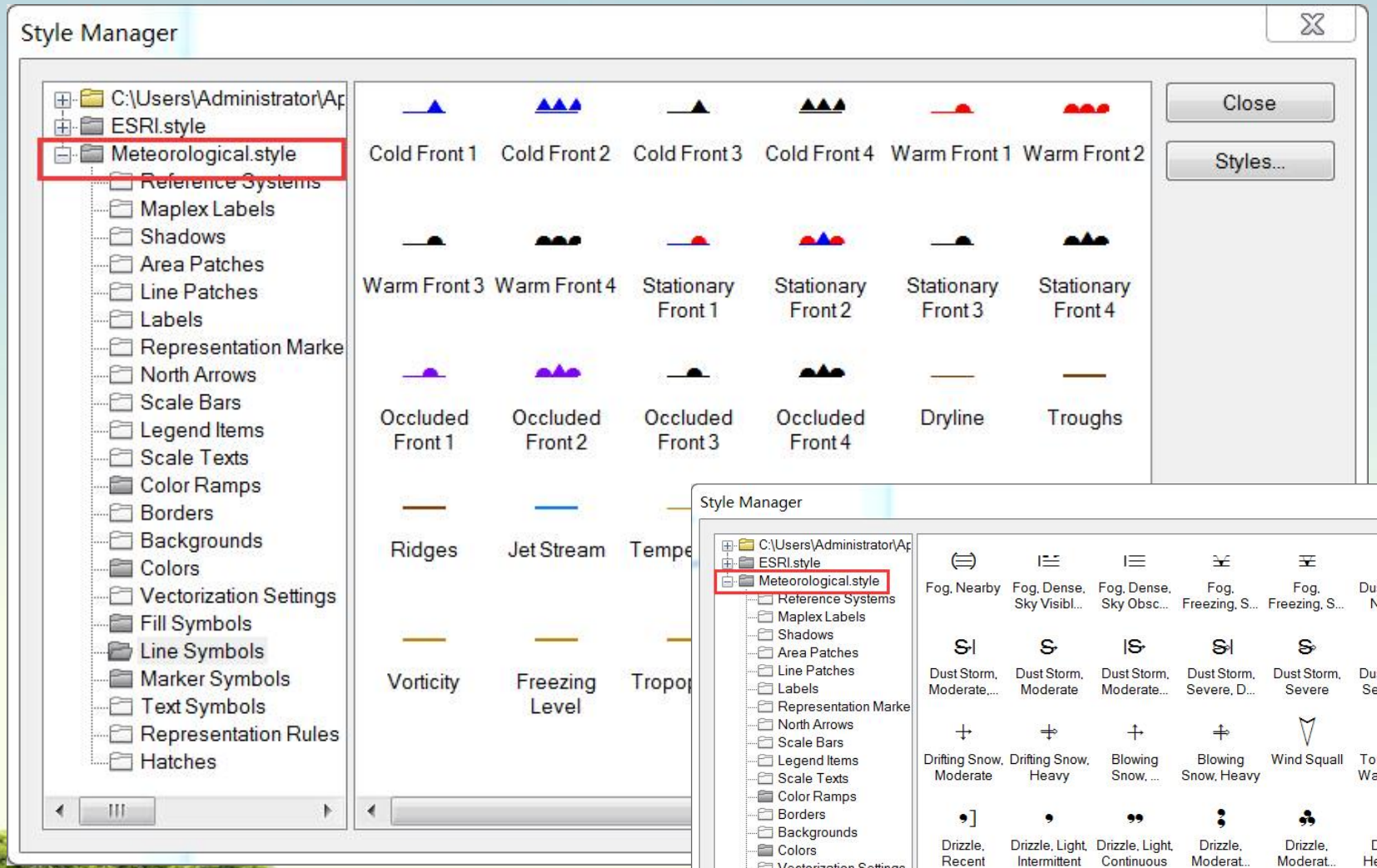
Diffuse model type (optional)
UNIFORM_SKY

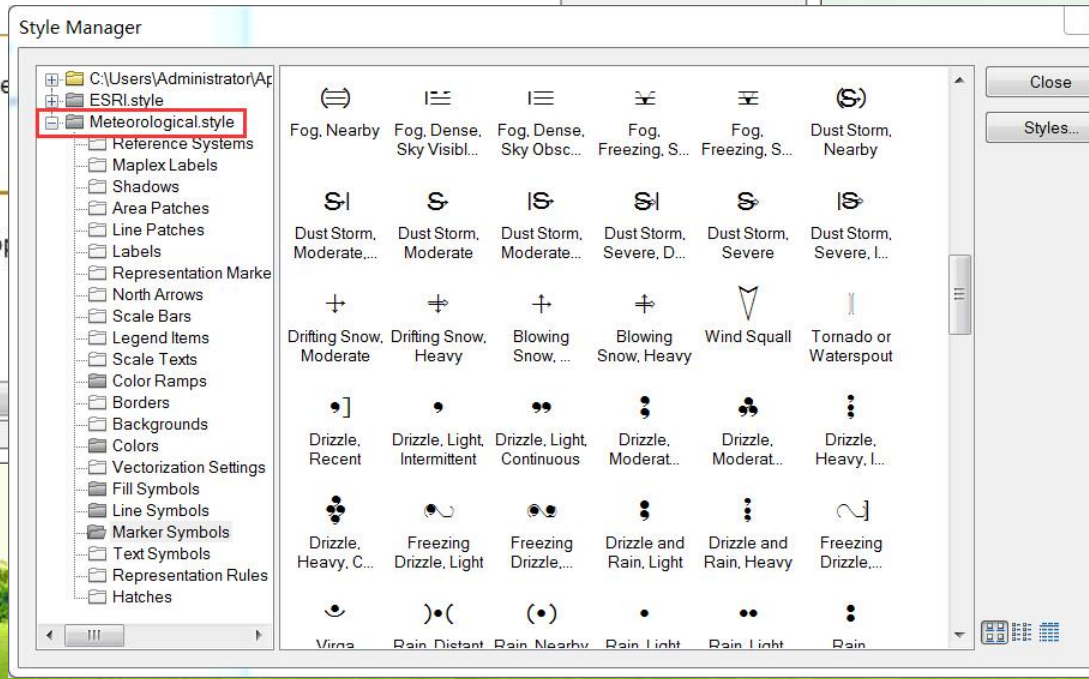
Diffuse proportion (optional)
0.3

Transmittivity (optional)
0.5

OK | Cancel | Environments... | << Hide Help

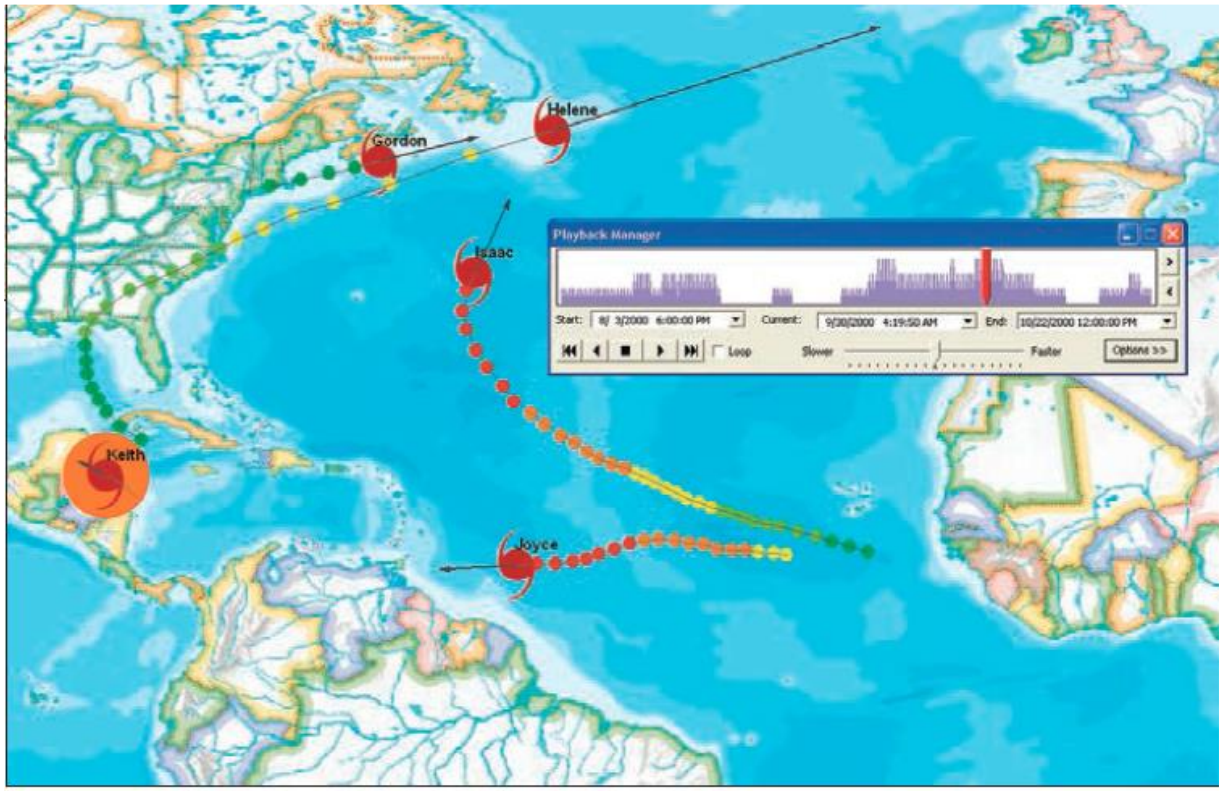
Meteo. Symbol Library in ArcGIS





TC Tracking In ArcGIS

- Tracking Analyst Tools
  - Concatenate Date And Time Fields
  - Make Tracking Layer
  - Track Intervals To Feature
  - Track Intervals To Line



ArcGIS Tracking Analyst maps paths of people, assets, vehicles, or events. In this case, hurricane tracks in the Atlantic Ocean are visualized. Current locations are easily distinguished from past locations, allowing you to see where the hurricanes have traveled from, and directional vectors (arrows) show their likely paths.

Many NOAA agancies are now utilizing GIS on a daily basis

- National Weather Service(NWS)
- National Climatic Data Center(NCDC,ECEI)
- National Operational Hydrologic Remote Sensing Center
- Storm Prediction Center(SPC)
- River Forecast Centers(RHC)
- National Hurricane Center(NHC)
- National Center for Atmospheric Research(NCAR)
- Many others……

GIS In NWS

- Over 300 users of GIS in NWS
  - Representing all classes of GIS
    - Desktop, Server, and Mobile
  - Collaborate via email list serve
  - Regional representatives meet monthly via telecon
- GIS formatted data (shape files) used as map backgrounds for AWIPS
- Prototypes for server and mobile applications
- National project to set-up governance & coordination of national projects (OSIP 06-003)

Taken from Kari Sheets slides, NWS

National Oceanic and Atmospheric Administration's

National Weather Service

Site Map | News | Organization | Search | NWS | All NOAA | Go

Local forecast by "City, St"

City, St | Go

Sign-up for Email Alerts

XML RSS Feeds

Warnings
Current
By State/County...
UV Alerts

Observations
Radar
Satellite
Snow Cover
Surface Weather...
Observed Precip

Forecasts
Local
Graphical
Aviation
Marine
Hurricanes
Severe Weather
Space Weather
Fire Weather

Text Bulletins
By State
By Message Type
National

Forecast Models
Numerical Models
Statistical Models...
MOS Prod
GFS-LAMP Prod

Climate
Past Weather

National Weather Service GIS Data Portal

Many of the National Weather Service data sets are available in formats that are able to be imported directly into Geographic Information Systems (GIS downloadable shapefiles, web services and even KML files.

This page is a work-in-progress. As more data is made available in these formats, links to the data will be added to these pages. Click one of the GIS fo start exploring the NWS GIS data currently available! Questions?

KML

Keyhole Markup Language (KML) is used by a variety of GIS and mapping applications and the specifications are freely available to the public and avai community without charge or restriction. KML is an XML-based language for managing the display of three-dimensional geospatial data in the programs Maps, Google Mobile, ArcGIS Explorer, WorldWind and other GIS viewers . The word Keyhole is an earlier name for the software that became Google produced in turn by Keyhole, Inc, which was acquired by Google in 2004. (more about KML)

Shapefile

Shapefiles are a geospatial vector data format for geographic information systems software. Shapefiles spatially describe points, lines and polygons. A refers to a collection of files with ".shp", ".shx", ".dbf", and other extensions on a common prefix name (i.e., "lakes.shp"). SHP files can be viewed in GIS more sophisticated GIS applications. (more about Shapefiles)

National Weather Service Base maps are available in Shapefiles. The AWIPS map database catalog contains background map data in Shapefile format National Weather Service (NWS) for use by the user community. These data consist of a variety of official NWS forecast zones and county designation addition other data that might be of interest and that are used by the (NWS) Advanced Weather Information Processing System (AWIPS) are available

Web Services/Geo located Images

This page contains links to data that are distributed via web server technology in the Open Geospatial Consortium (OGC). In addition, some of the NW geo-referenced image files such as geo-gifs.

NWS Alerts as CAP

National Weather Service

Climate Prediction Center

Home | Site Map | News

HOME > GIS Data > GIS Data

CPC GIS DATA

(Shapefile & Raster)

NOTE: If you have any questions concerning any of the GIS data provided here, please contact the person responsible for the data.

Data in Support of the US Drought Monitoring

Contact: David.Miskus@noaa.gov

Soil Moisture	Evaporation	Precipitation	Runoff	Temperature

NOTE: Information about the USDM products is found at: http://www.cpc.noaa.gov/products/Soilmst_Monitoring/

Drought Outlooks

Contact: David.Miskus@noaa.gov

Drought Outlooks

Daily Gridded Precipitation Analysis

Contact: Wei.Shi@noaa.gov

CPC Unified Global Gauge Daily Precipitation Analysis	Metadata

Precipitation Estimates

Contact: Nicholas.Novella@noaa.gov

Africa & Asia

Daily Gridded Temperature Analyses (C)

Contact: Wei.Shi@noaa.gov

United States (Tmax & Tmin)	Metadata

Sea Surface Tempearture

Contact: Nicholas.Novella@noaa.gov

Global

Temperature and Precipitation Forecasts

Contact: Kenneth.Pelman@noaa.gov

6-10 day, 8-14 day, Monthly & Seasonal

Weather Hazard Assessments

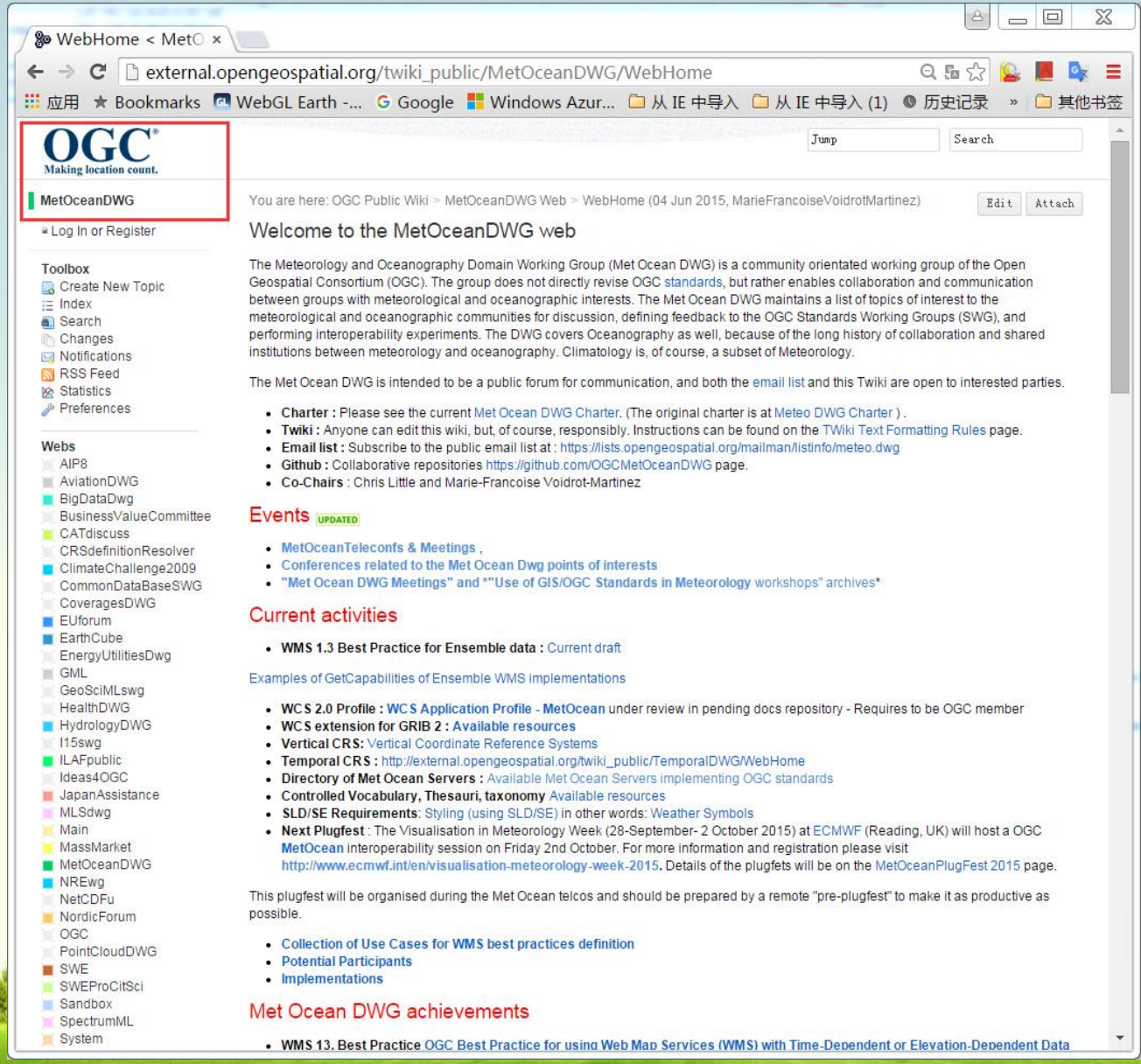
United States Contact: Kenneth.Pelman@noaa.gov	Africa, Afghanistan, Central America & Hispaniola Contact: Nicholas.Novella@noaa.gov	Global Tropics Contact: Jon.Gottschalck@noaa.gov

Interoperability Between GIS and Meteo.

OGC
Making location count.

MetOceanDWG

- The Meteorology and Oceanography Domain Working Group (Met Ocean DWG) is a community orientated working group of the Open Geospatial Consortium (OGC)
- Members: UKMO, M-F, DWD, ECWMF, EUMETSAT, Met.no, FMI, CMC, NOAA, KNMI,
- Workshops on the Use of GIS/OGC Standards in Meteorology



GIS In Meteo. Education

UNIVERSITY OF MARYLAND

GEORGE MASON UNIVERSITY

GEOG 309

UNIVERSITY of NORTH CAROLINA ASHEVILLE

ATMS 373-02

Northern Illinois University
Your Future, Our Focus

GEOG 498

FIFTY YEARS OF TRANSFORMING LIVES
1965 2015
METROPOLITAN STATE UNIVERSITY OF DENVER

UIW
UNIVERSITY OF THE INCARNATE WORD

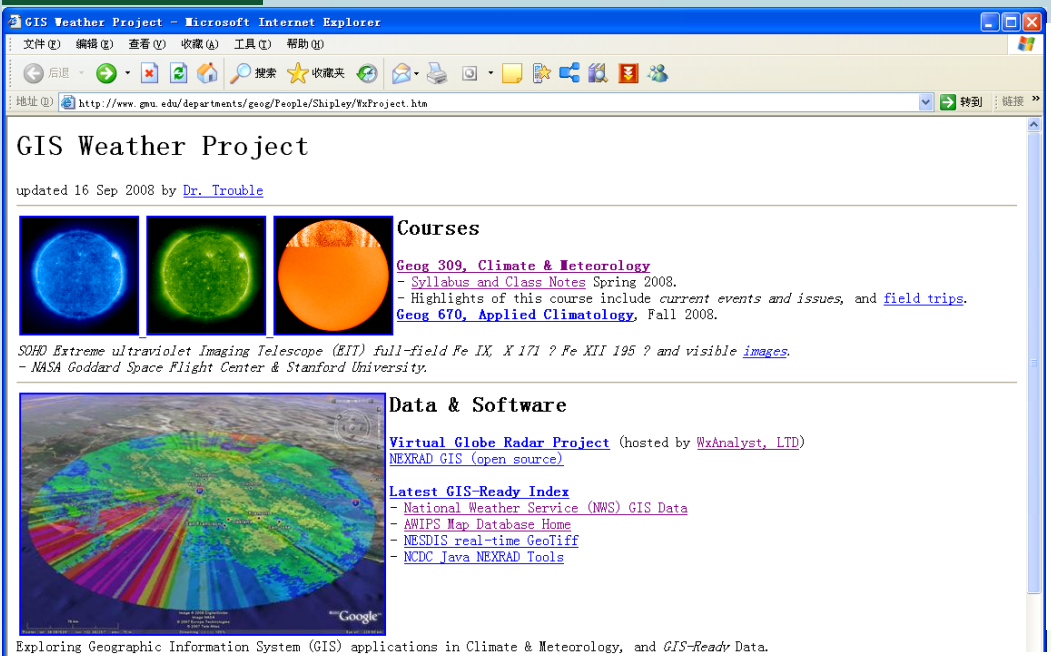
METR 3355

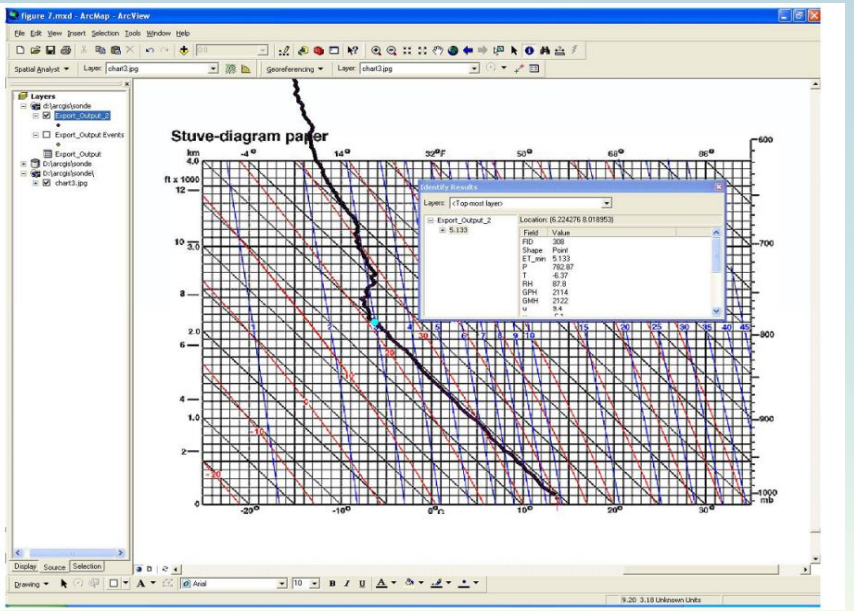
LUND UNIVERSITY

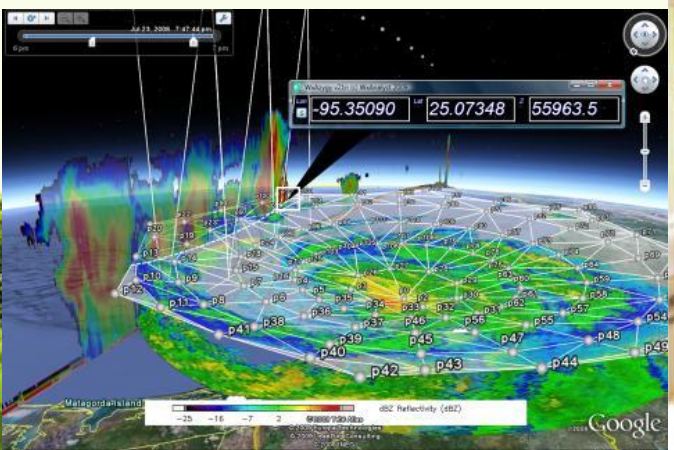
GÖTEBORGS UNIVERSITET

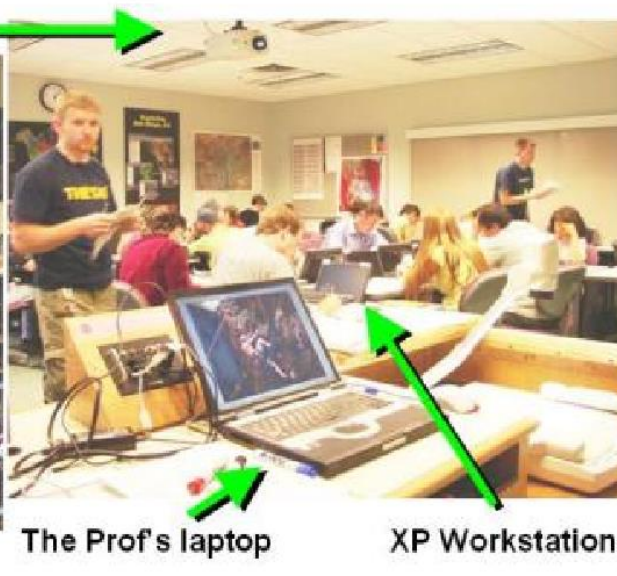
… …

Classroom Exercises in GIS Meteorology









Outline

1. Brief Introduction of NCC
2. Overview of GIS and its in Meteo.
3 GIS in National Meteo. Operational System

Who is working with GIS in CMA

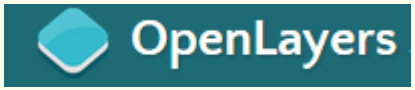
- National Meteorological Center(NMC)
- National Climate Center(NCC)
- National Satellite Meteorological Center(NSMC)
- National Meteorological Information Center(NMIC)
- CMA Public Meteorological Service Center(PMSC)
- CMA Meteorological Observation Centre(MOC)
- Chinese Academy of Meteorological Sciences(CAMS)

What kind of GIS software is being used in CMA

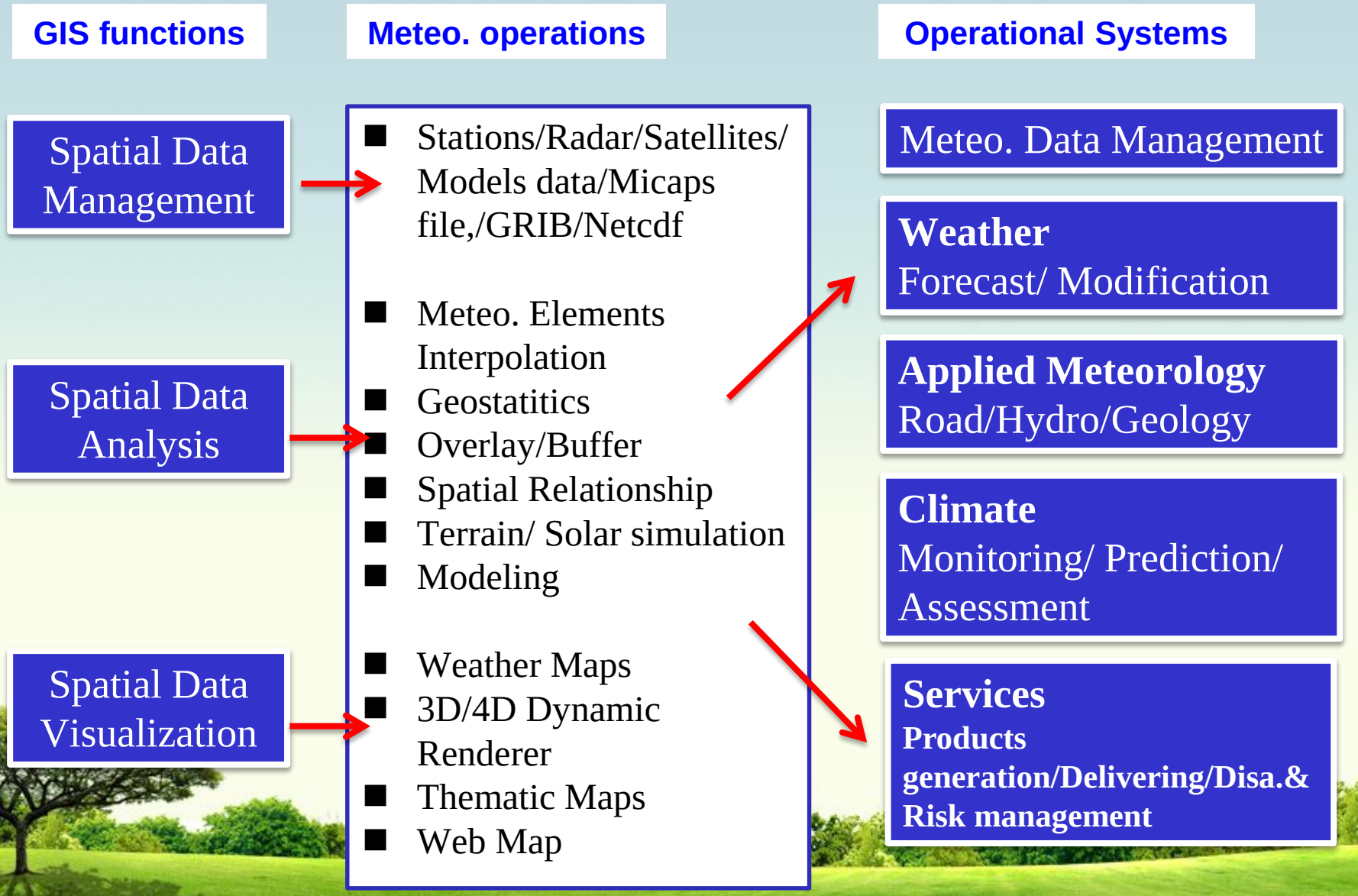
- Commercial products:
  - ESRI ArcGIS Desktop Engine Server
  - Super map
  - Baidu/Google Map API

- Open Source GIS:
  - Sharmap/ QGIS/ Openlayers /SAGA/Geotools/Worldwind

SuperMap



Which aspects is GIS being used in Meteo. In CMA



How to use GIS

Component/Internet

MESIS : ArcEngine
MEDIAS : ArcEngine
EMSS : ArcGIS Flex
NMCTC: ArcGIS Flex
CAgMSS: ArcEngine/ArcGIS Desktop

Multi-Dimension

MeteGIS: Supermap3D
MESIS : ArcEngine 3D

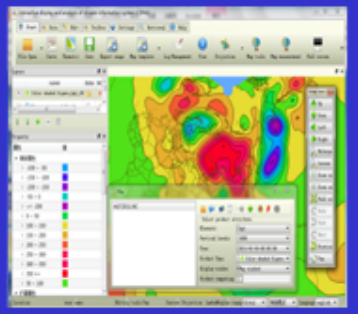
GIS Applications
(Data management, analysis, visualization)

Workflow

MSPGS: Geoprocessing
TextGen: Geoprocessing
AppliedMete: Geoprocessing

Open Source

CIPAS1.0: QGIS
MICAPS3.0: Sharp map



Some Applications in Operational System

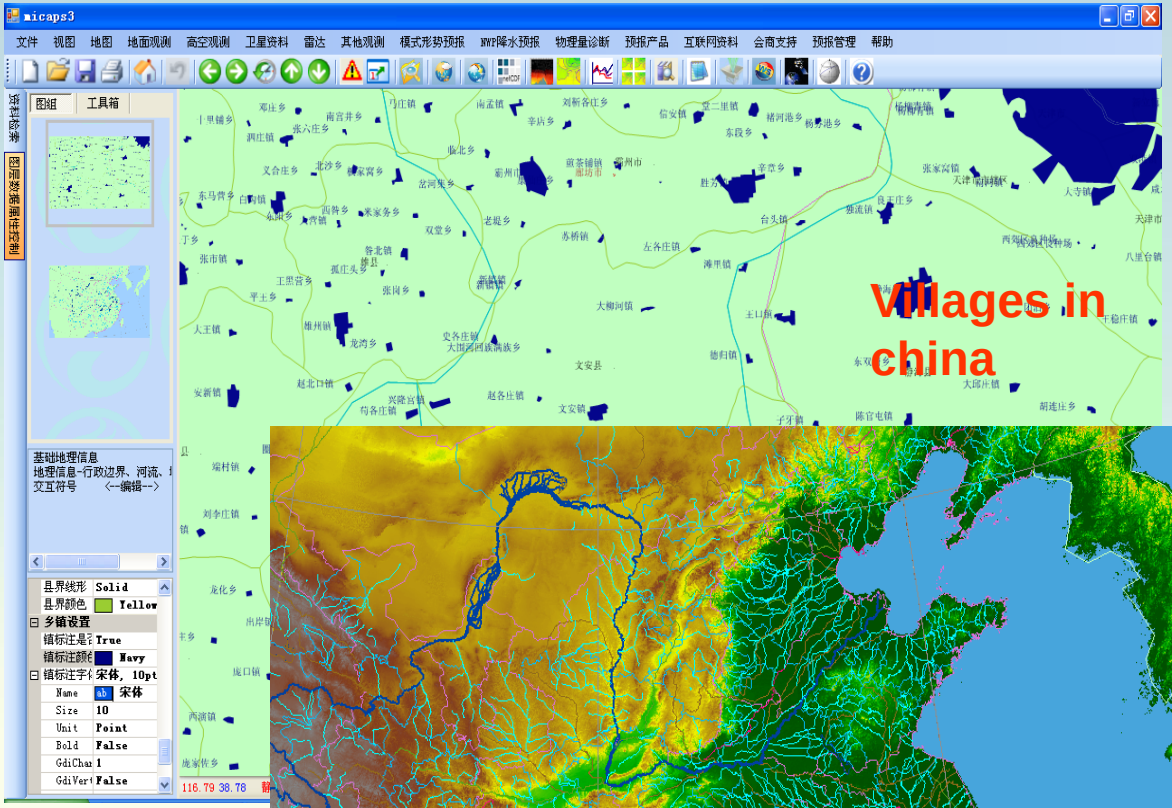
- **MICAPS**: (Weather forecast)
- **CIPAS**: (Climate Prediction)
- **MESIS/MSPGS**: (Meteo. Services)
- **MEDIAS** (Impaction &Assessment)

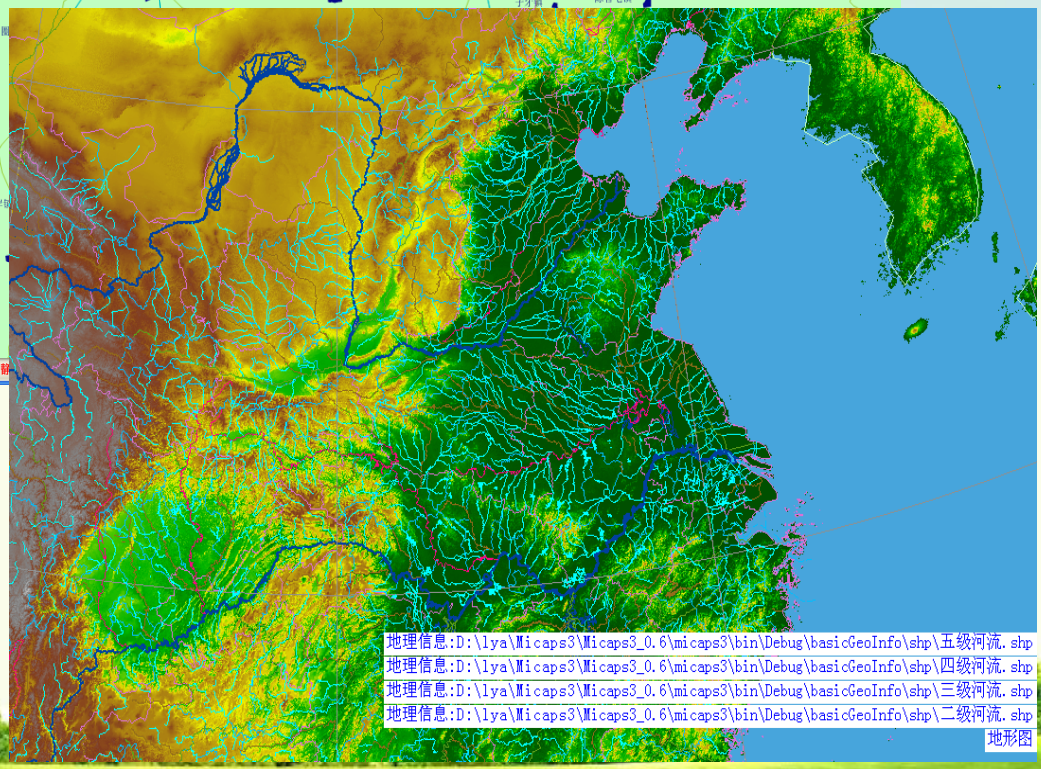
MICAPS3.0

Interactive Workstation for Forecaster

Open Source SDK

- GeoLayer
- SHP/MIF
- DEM
- Sharmap
- ProJ4





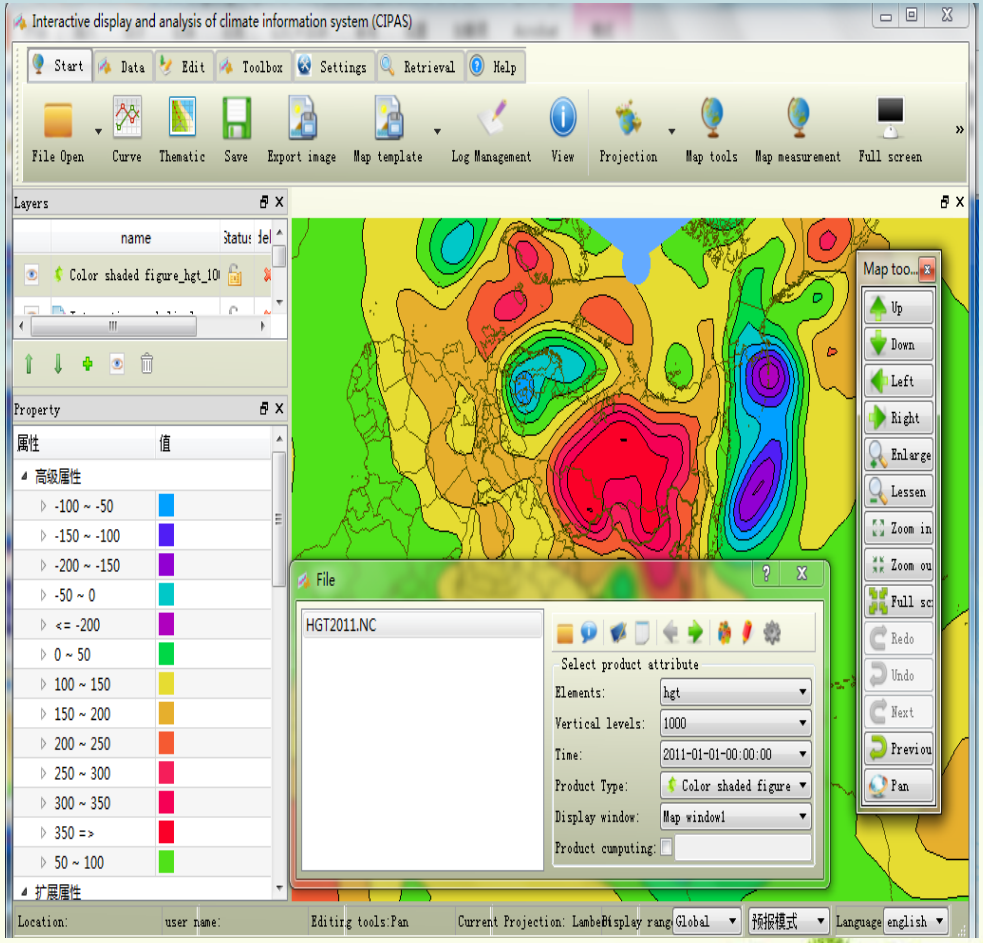
SharpMap

Geospatial Application Framework for the CLR

CIPAS1.0 Climate Interactive Plotting and Analysis System towards basic operations of monitoring, diagnose , prediction

- **Netcdf/GRIB/shp files**
- **GeoLayer**
- **Layout**

- **Graphic clip,**
- **Line smooth**
- **Region fill**
- **Project transformation**
- **Spatial interpolation**
- **TIN creation**
- **… …**

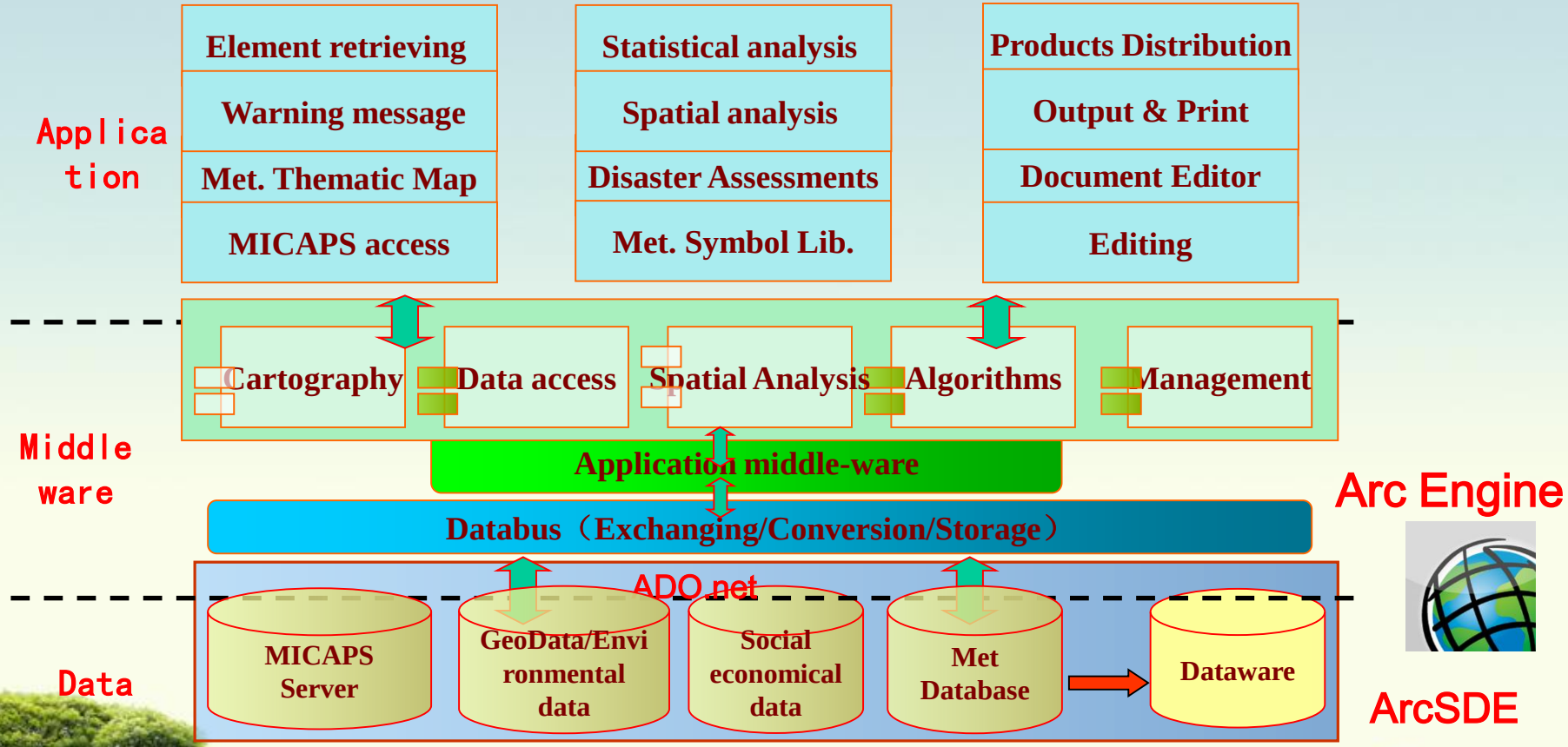


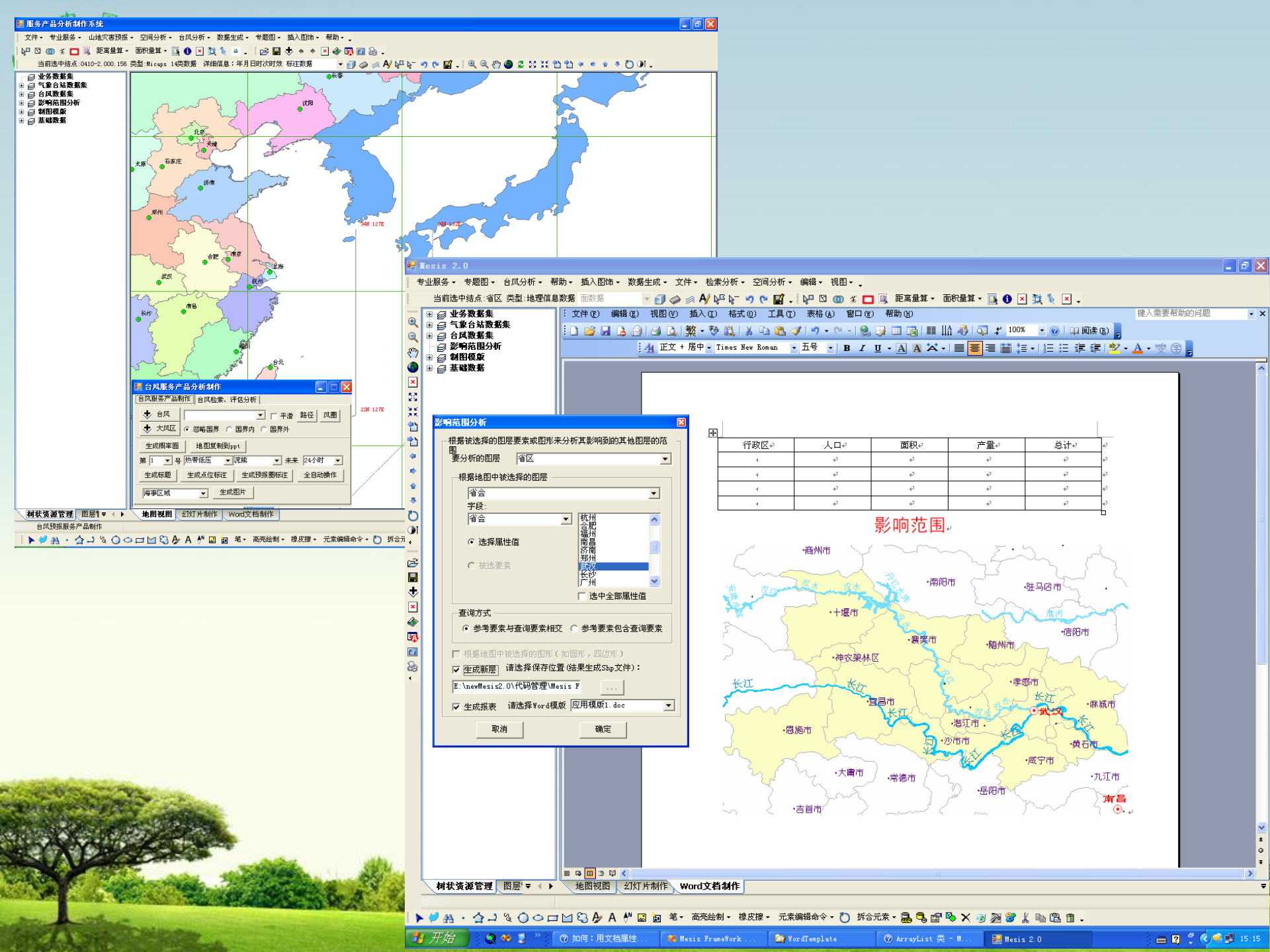
QGIS Trademark

SAGA System for Automated Geoscientific Analyses

MESIS (MEteorological Service Information System)

Interactively generating specialized meteorological service products




服务产品分析制作系统
Mesis 2.0
台风服务产品分析制作
影响范围分析
影响范围
开始

MSPGS Meteo. Service Products Generation

•By model designing, template customizing, generate kinds of met. thematic maps, curve , histogram

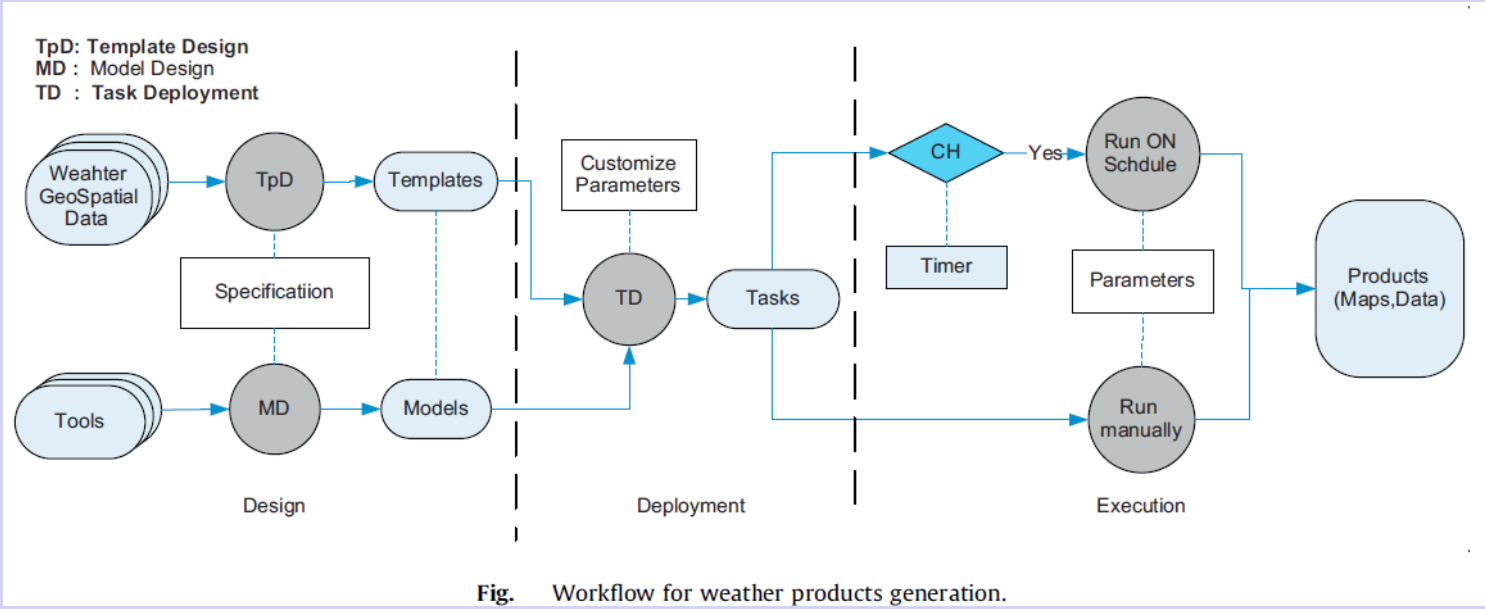


Fig. Workflow for weather products generation.

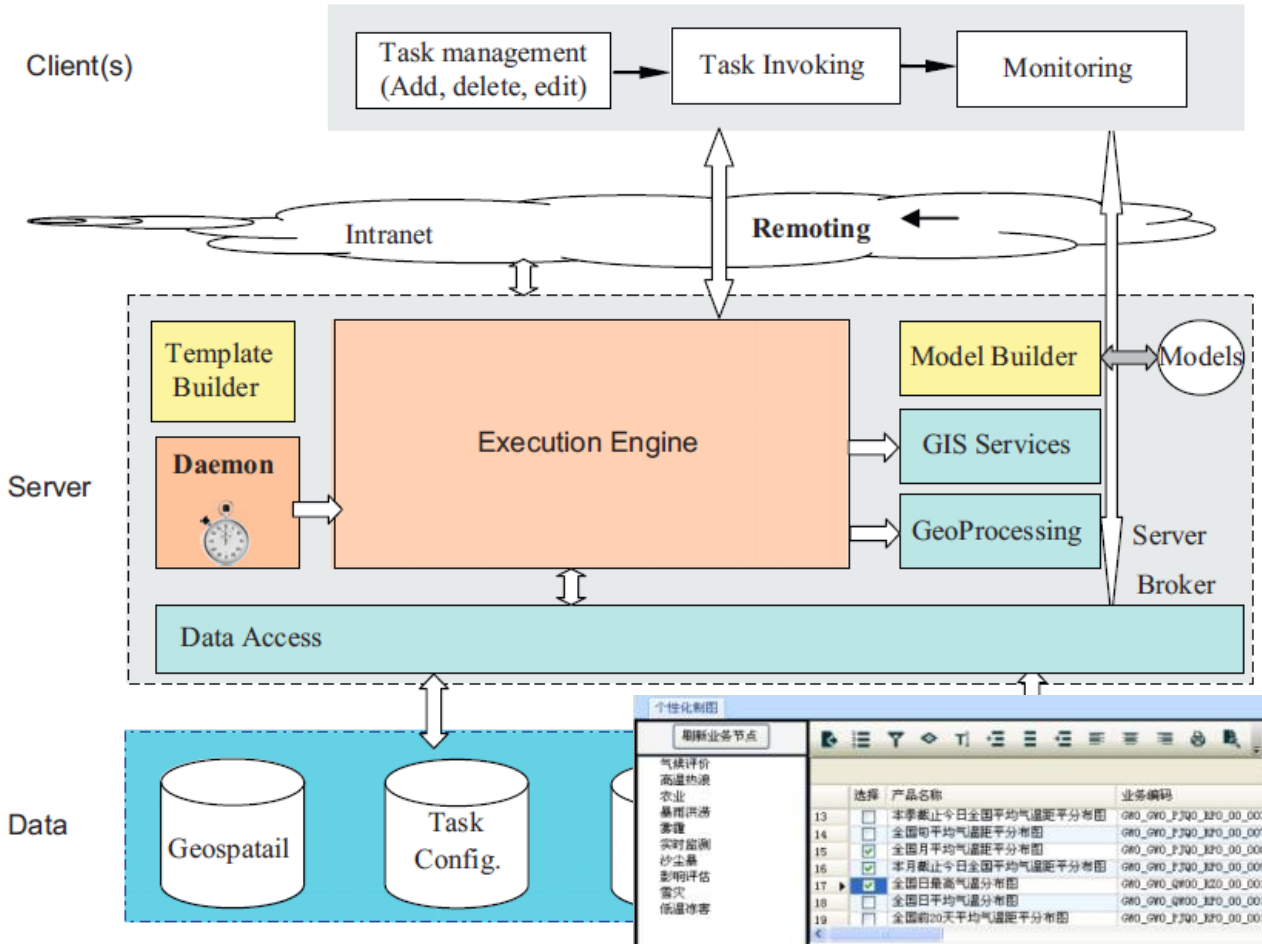
•Data sources: MICAPS file, GIS files, Oracle、SQLServer, Spatial databse)

•Monitoring and management of the tasks

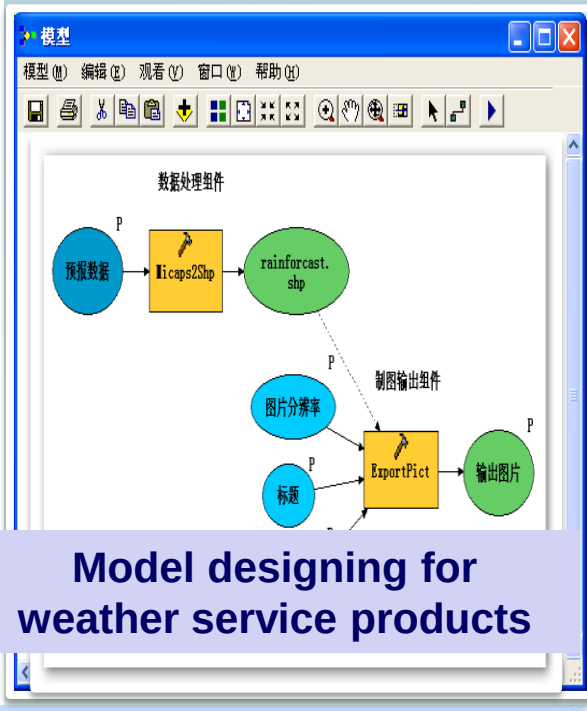
•C/S distributed architecture

•A Damon for automatically running on time

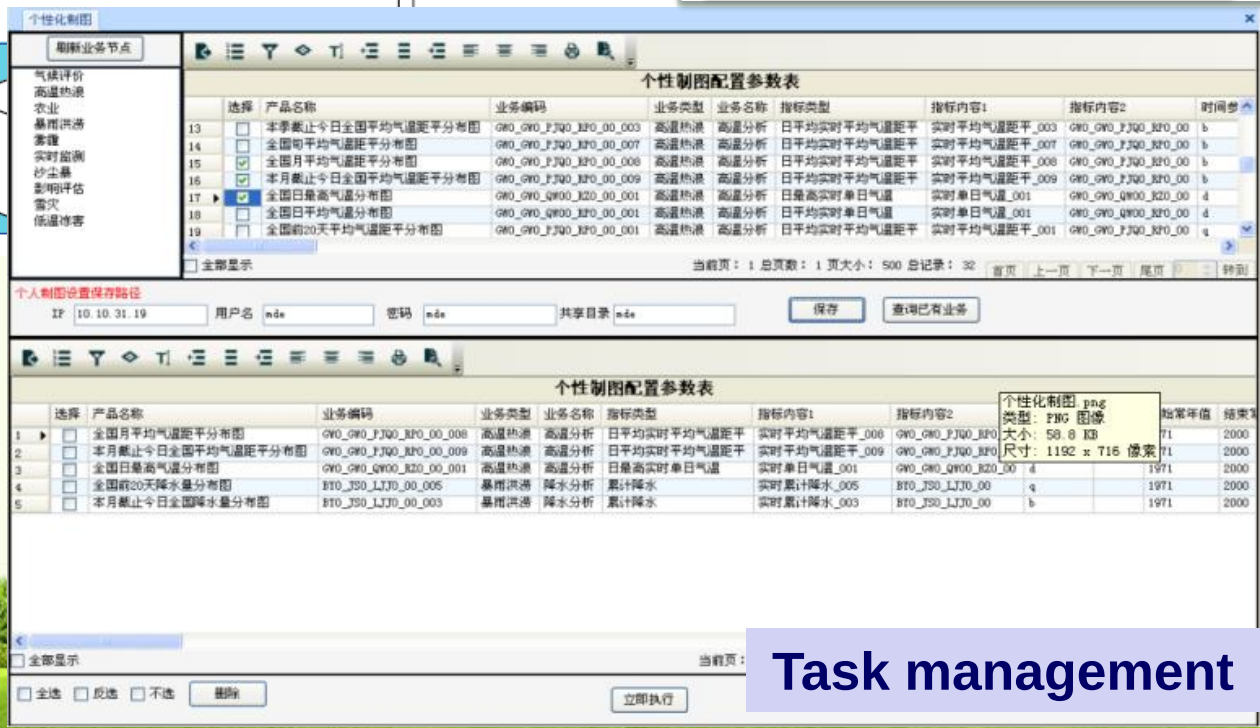
ArcGIS Geoprocessing(Modelbuilder) + Desktop(Map template)



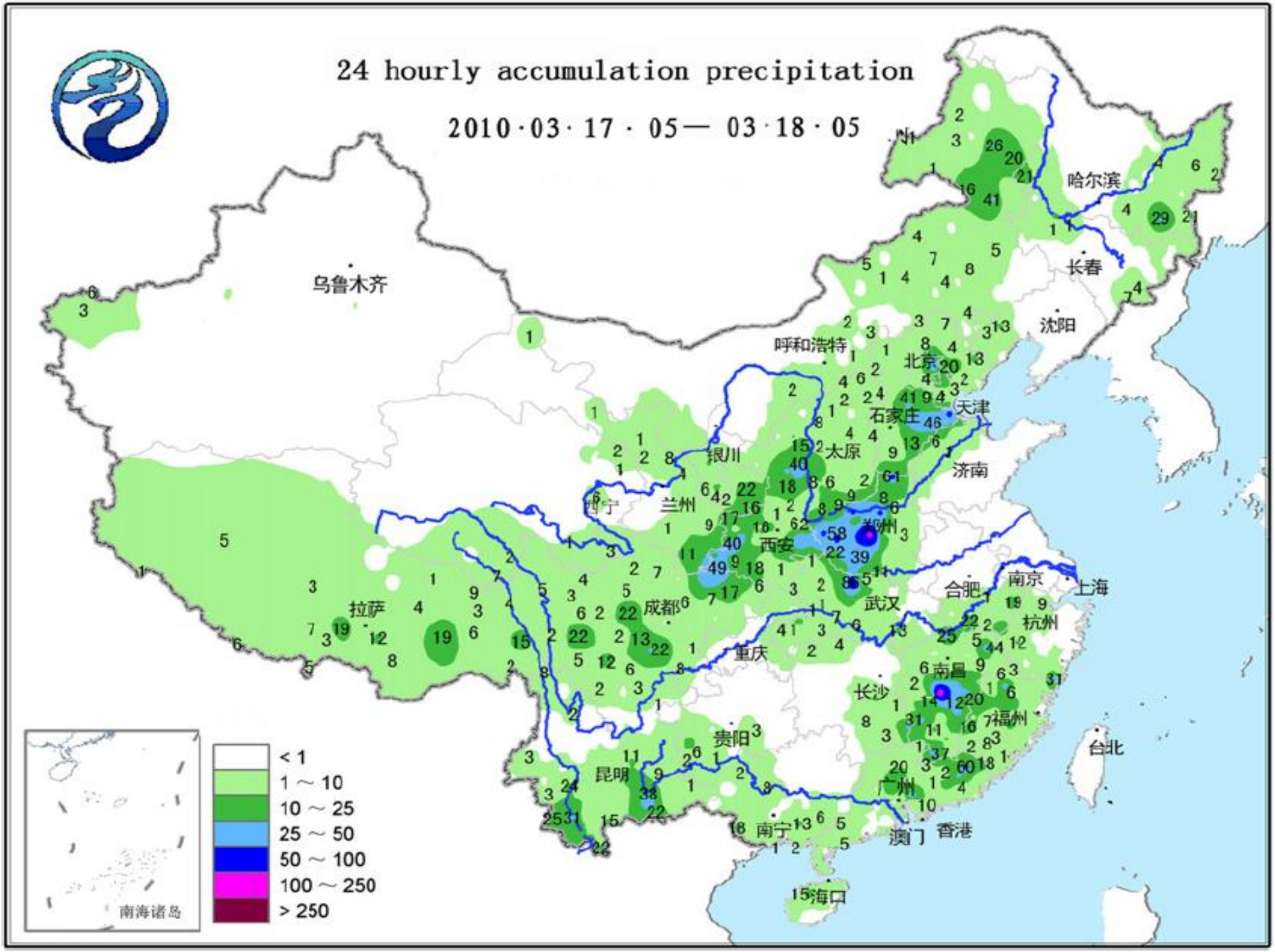
Task Execution



Model designing for weather service products



Task management


24 hourly accumulation precipitation
2010·03·17·05— 03·18·05
乌鲁木齐
哈尔滨
长春
沈阳
呼和浩特
北京
天津
石家庄
太原
济南
银川
西宁
兰州
西安
郑州
拉萨
成都
重庆
武汉
合肥
南京
上海
杭州
南昌
长沙
福州
台北
贵阳
昆明
广州
南宁
澳门
香港
海口
南海诸岛
< 1
1 ～ 10
10 ～ 25
25 ～ 50
50 ～ 100
100 ～ 250
> 250

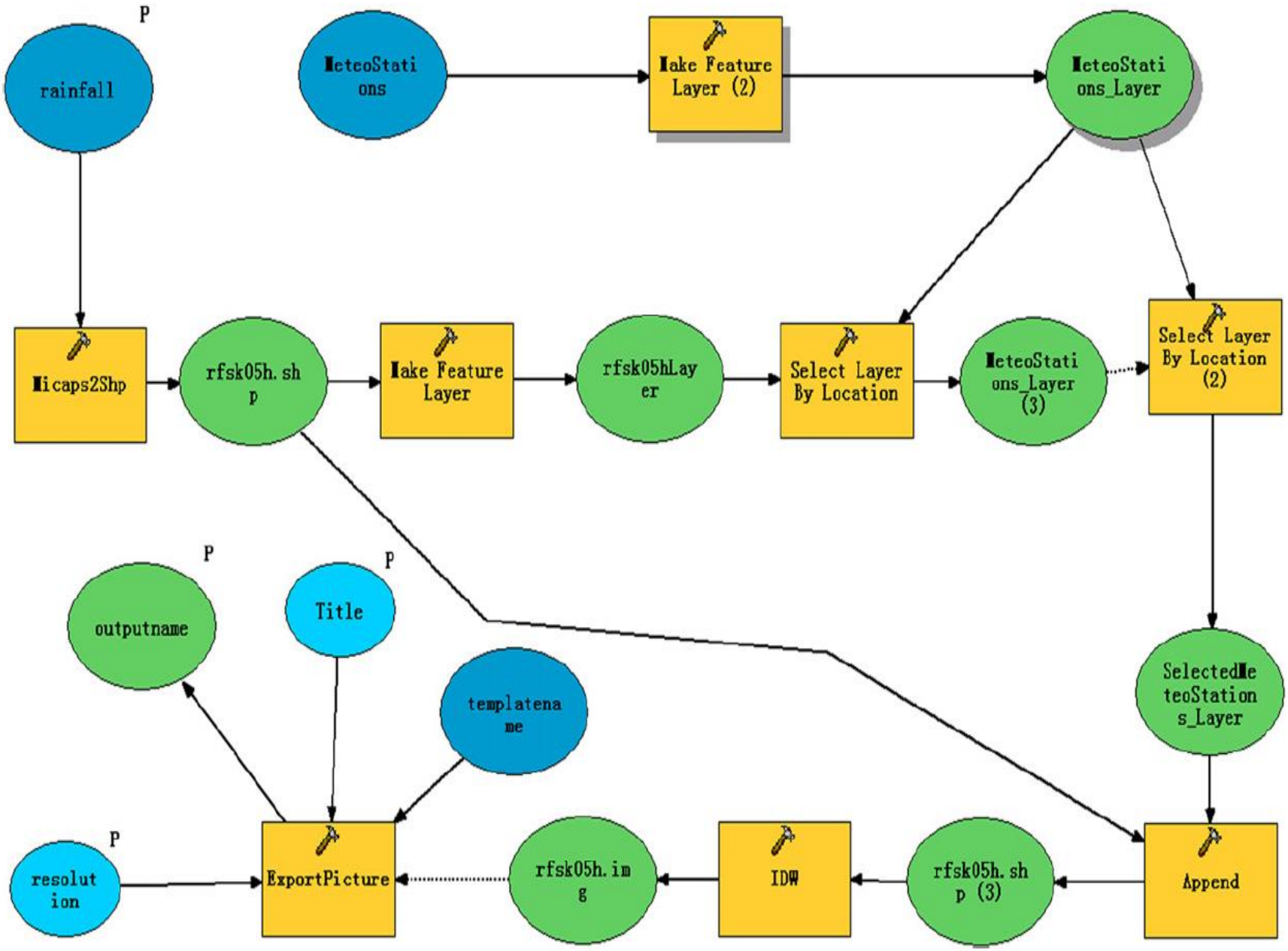
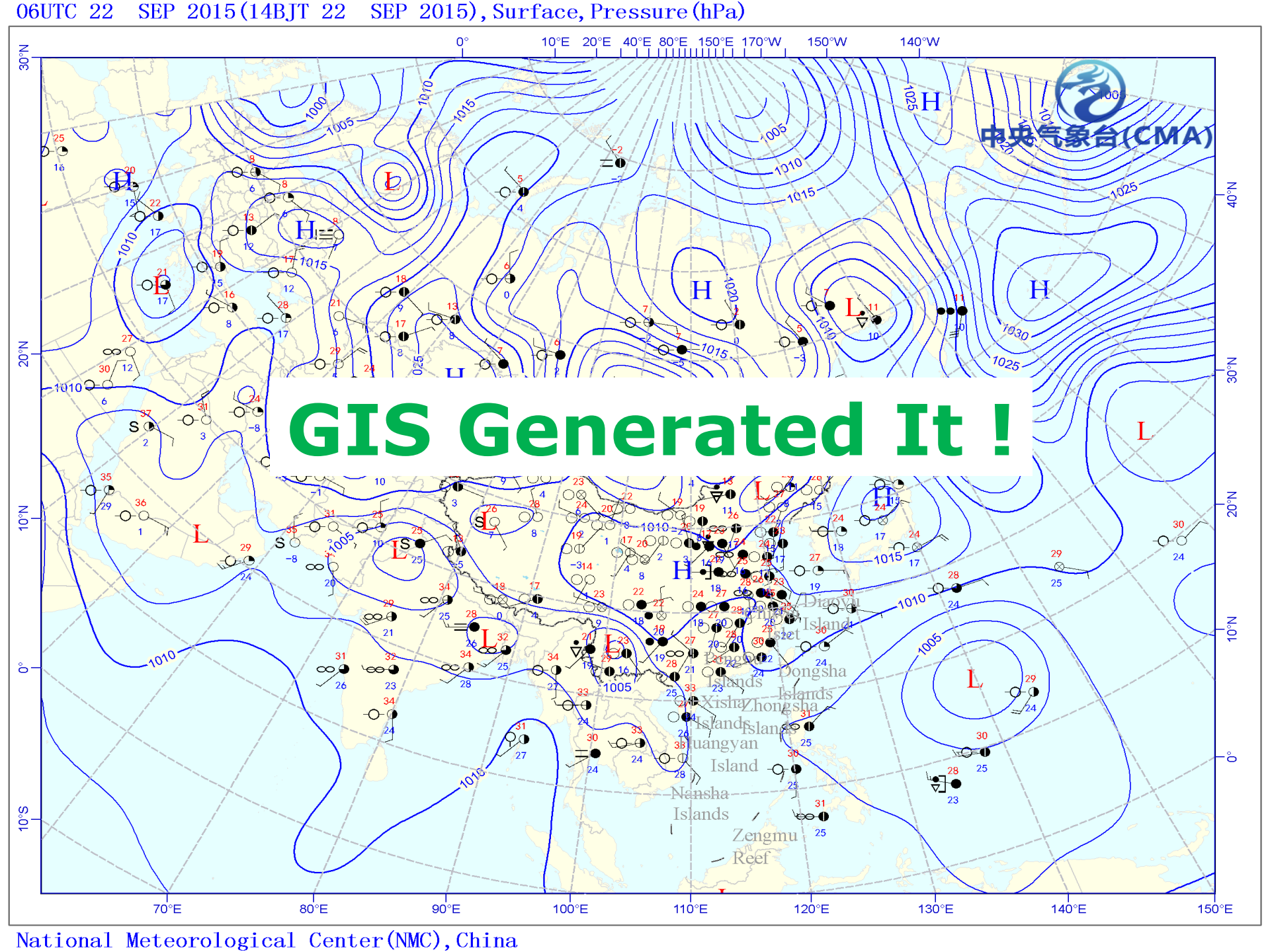


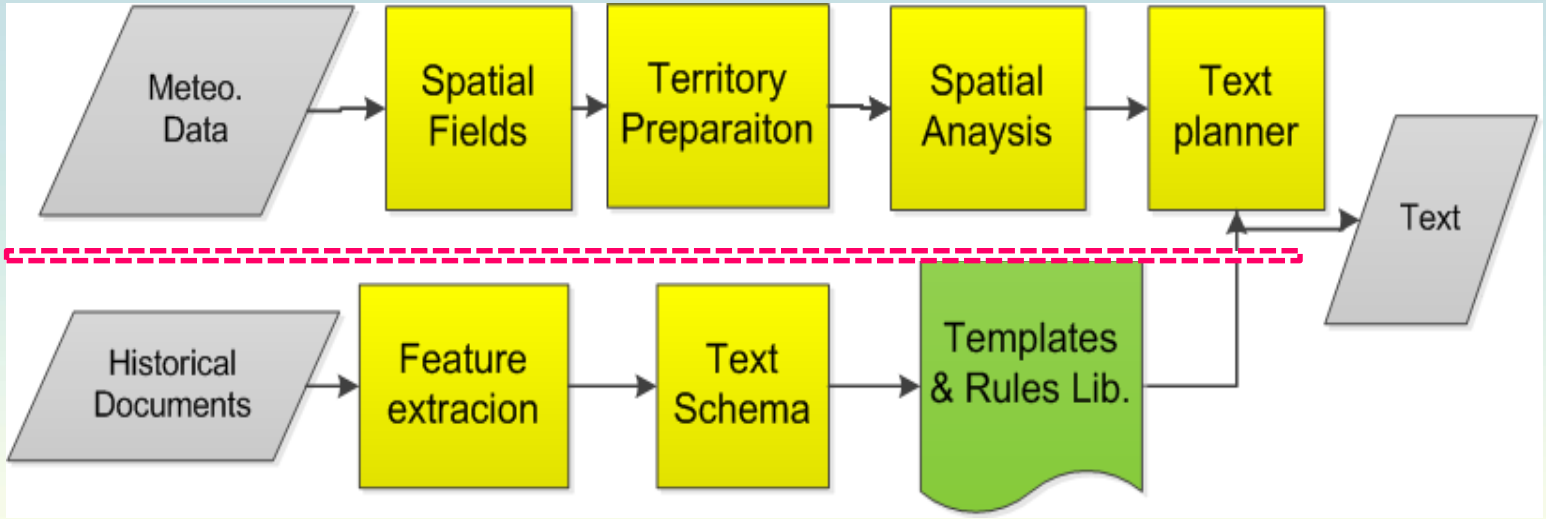
Fig. Processing model for precipitation map generation. Here P represents parameters, rectangle represents a process, and ellipse represents an input or an output variable of a tool.


06UTC 22 SEP 2015(14BJT 22 SEP 2015), Surface, Pressure(hPa)
GIS Generated It !
中央气象台(CMA)
National Meteorological Center(NMC),China

• Text generation

- **GIS（Meteo info Overlay thematic info)**

GEOS Geometry Engine Open Source



- **Nutral Language Processing（NLP)**

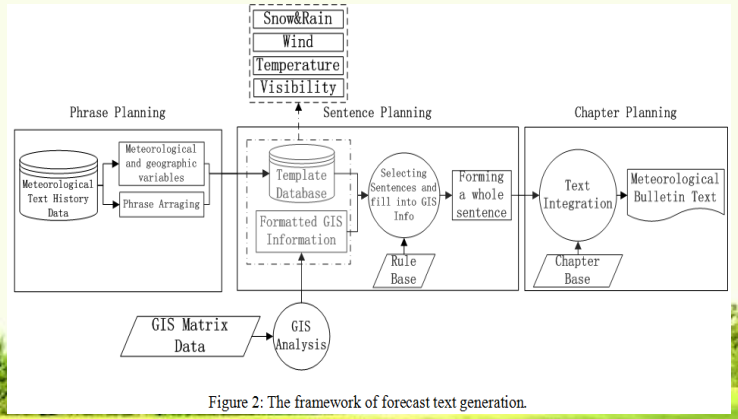
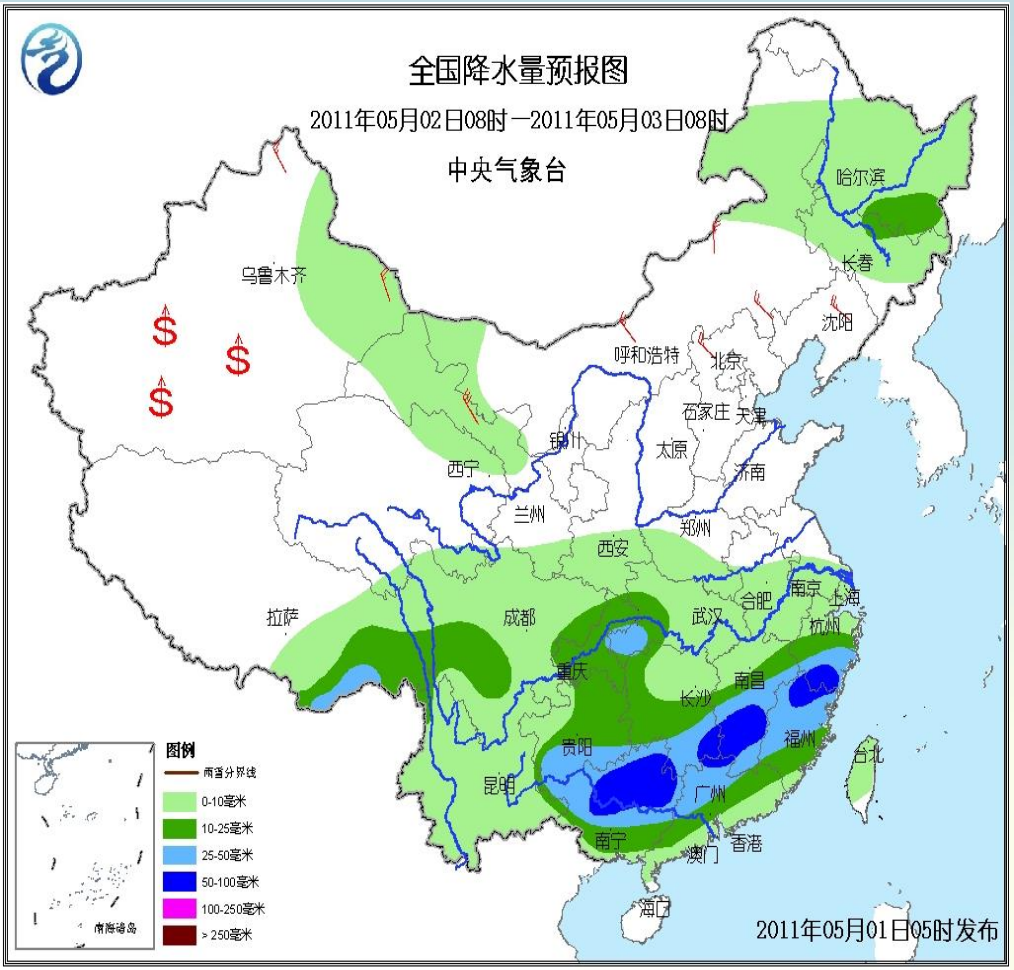


Figure 2: The framework of forecast text generation.

China Daily Weather Bulletin(NMC)



2日08时至3日08时，新疆东部、青藏高原东部偏南地区和东北部、内蒙古东部和西部、东北地区中北部、甘肃中西部和东南部、陕西南部、黄淮西部、江汉、西南地区、江淮大部及其以南大部地区有小到中雨或阵雨，其中，江汉西南部、贵州南部、江南南部、华南北部、西藏东南部等地的部分地区有大雨，局地有暴雨。

Forecaster

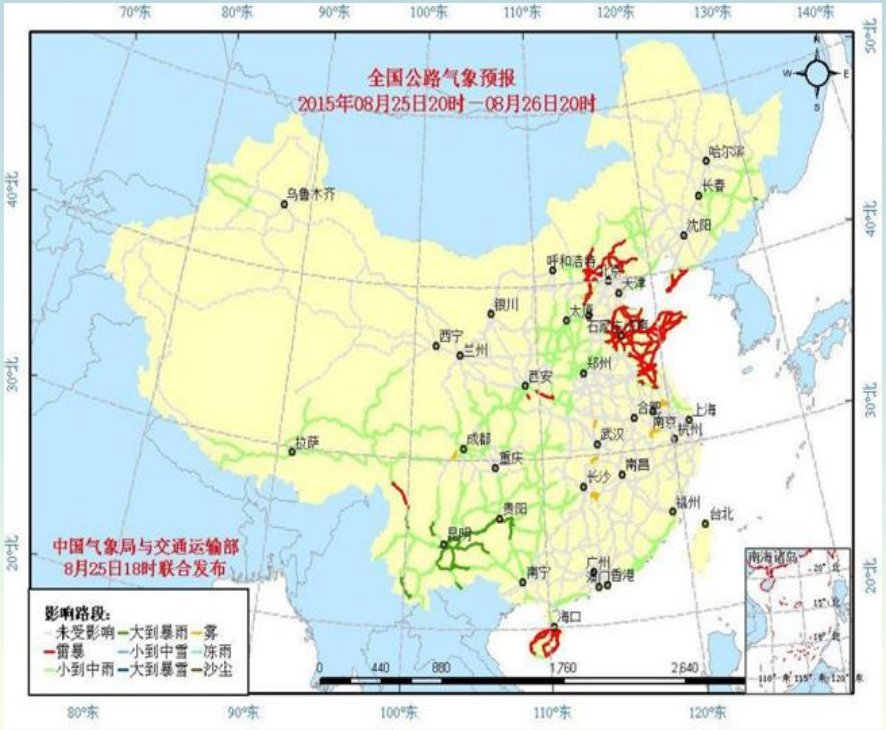
2日08时至3日08时，西北中东部、新疆东部和北部、西藏东部和南部、内蒙古局部、东北中北部、黄淮西部、江淮大部、江汉、江南、华南和西南等地有小到中雨，其中，西藏东部、湖北南部和西部、湖南局部、江西中南部、浙江中南部、福建部分地区、广东局部、广西大部、重庆局部、贵州局部和云南东南部和东北部等地有大雨，其中，湖南南部、江西中南部、浙江南部、福建西北部和东北部、广东西北部和广西部分地区等地有暴雨。

Computer

- Describe weather falling area more precisely

Traffic Weather monitoring & conditions forecast over China

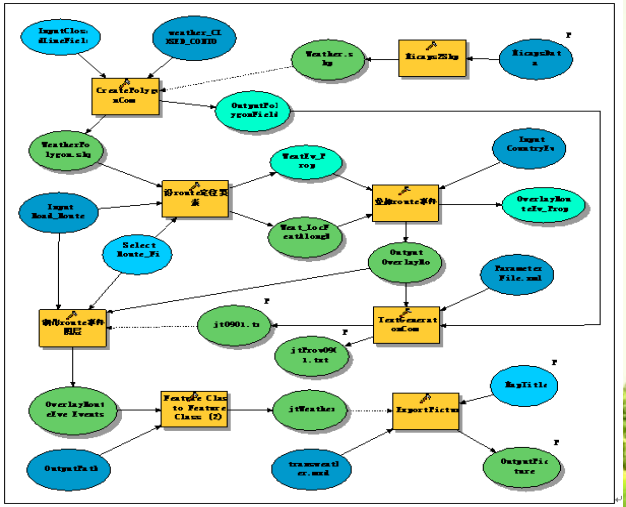
-----Graphics & Text Generation



受大到暴雨影响的主要路段有：

京昆高速(G5)川滇省界—云南元谋段
杭瑞高速(G56)云南曲靖—昆明段
沪昆高速(G60)贵州凯里—麻江—贵阳—安顺—普安段、云南曲靖—昆明段
兰海高速(G75)贵州龙里—麻江—都匀段
汕昆高速(G78)云南石林—宜良—昆明段
广昆高速(G80)云南开远境内路段
开河高速(G8011)云南屏边—河口段
渝昆高速(G85)云南崇明—昆明段
昆磨高速(G8511)昆明—云南玉溪—峨山段
108国道云南永仁—元谋段
210国道贵阳—贵州都匀—独山段
213国道昆明—云南玉溪—峨山段

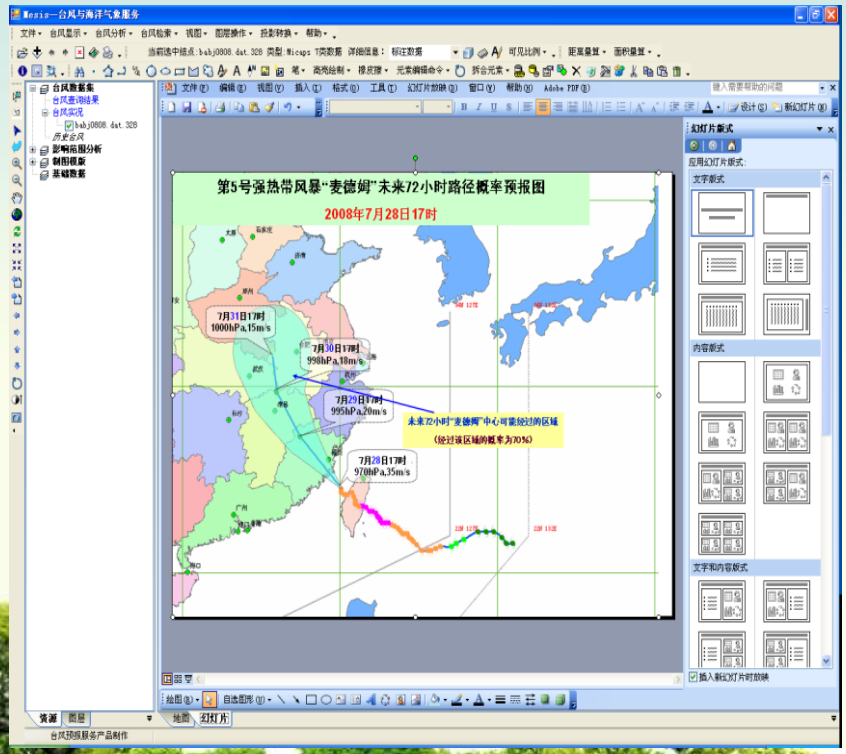
- Main Road Chosen
- Map Template design
- Language Planner
- GIS spatial analysis and Linear Referencing

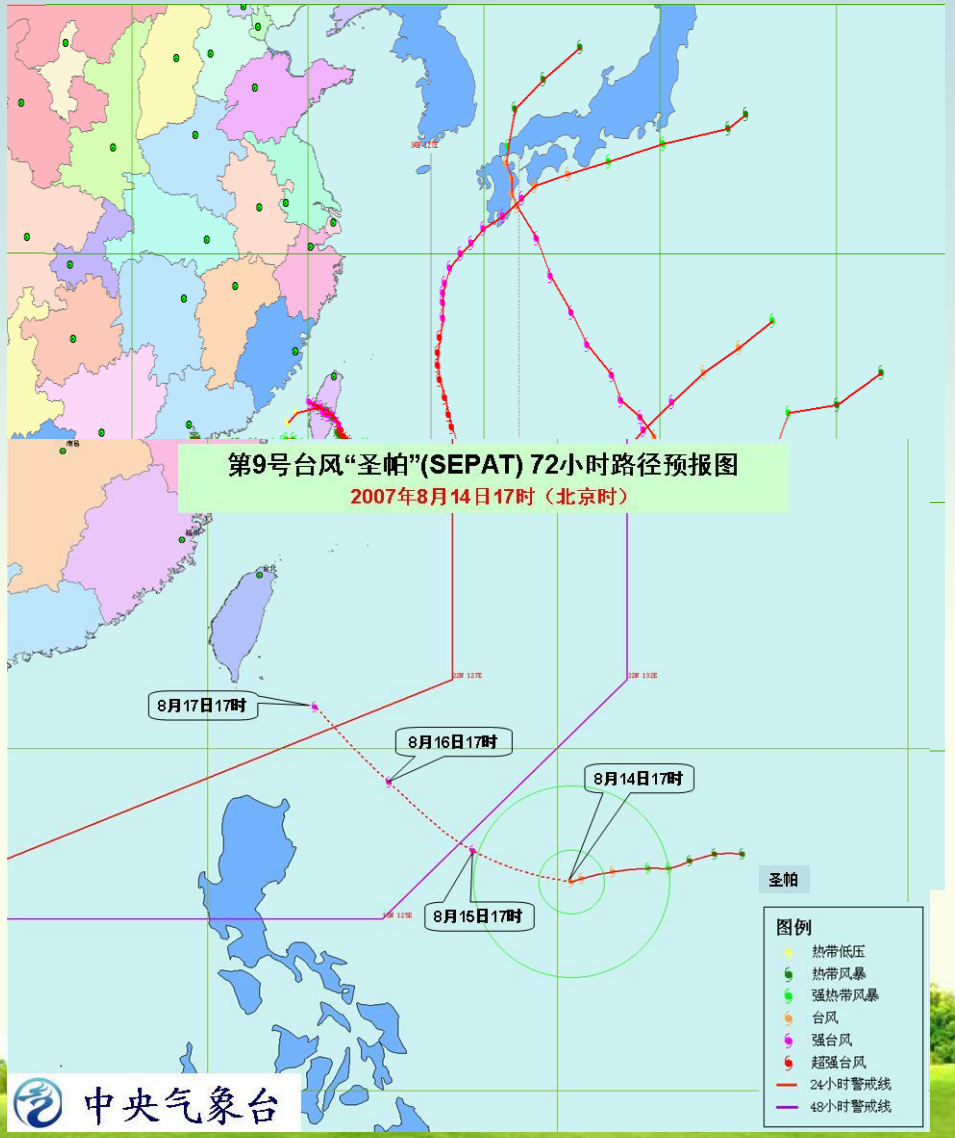


地理处理模型示意图（图中带“P”的椭圆形表示模型参数，运行时动态更新）

Interactive Tropical Cyclone Warning Service

- TC forecast tracks and points symbolization
- History TC tracks retrieval
- Warning area generation
- TC affected area assessment
- Graphic Animation product output

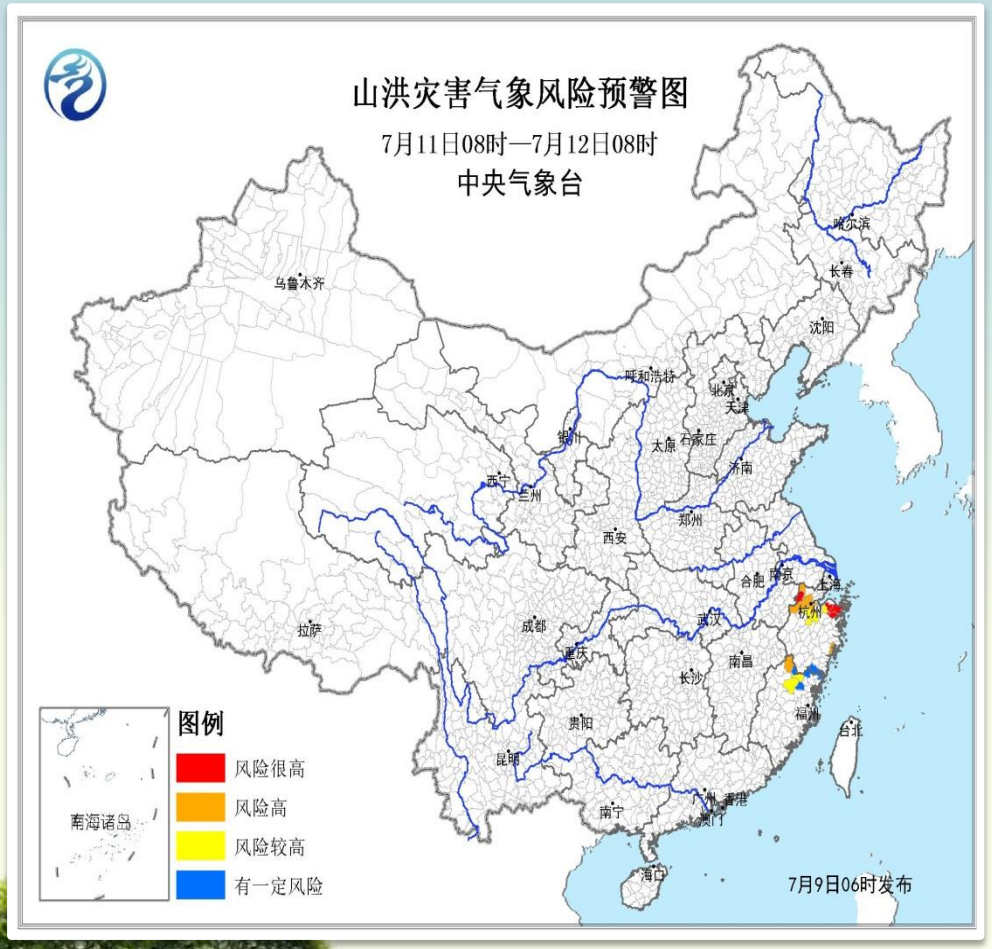


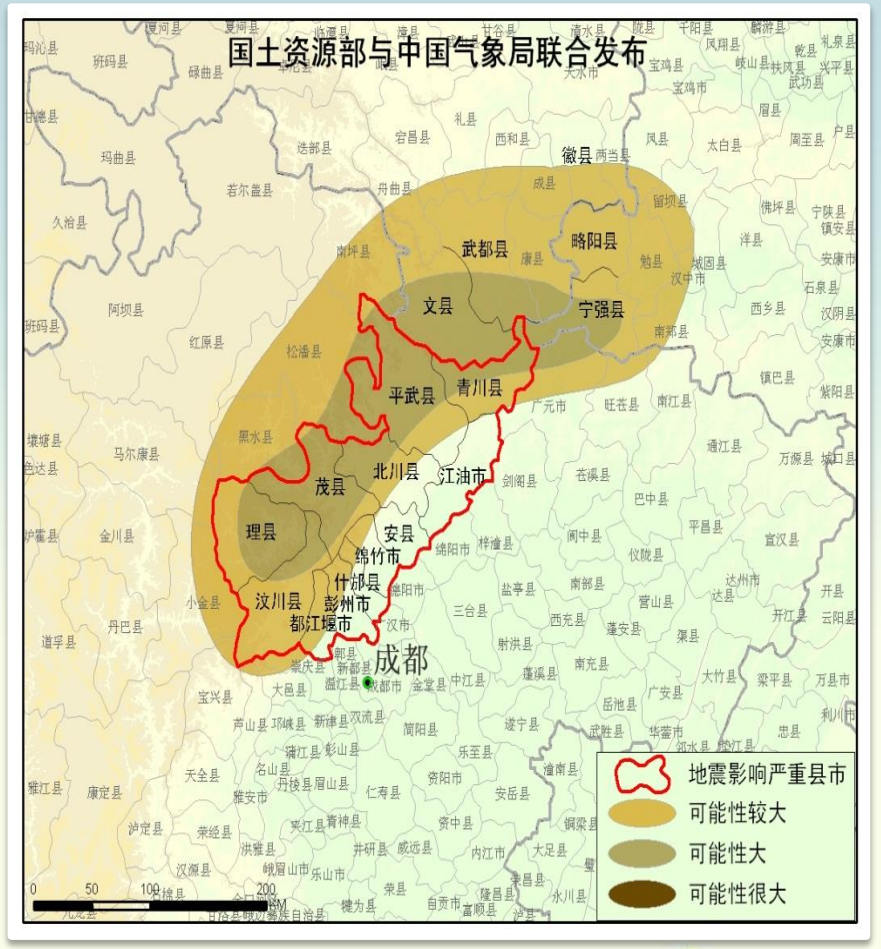


Arc Engine (GIS)

Landslide warning

in cooperation with Ministry of Land and Resources

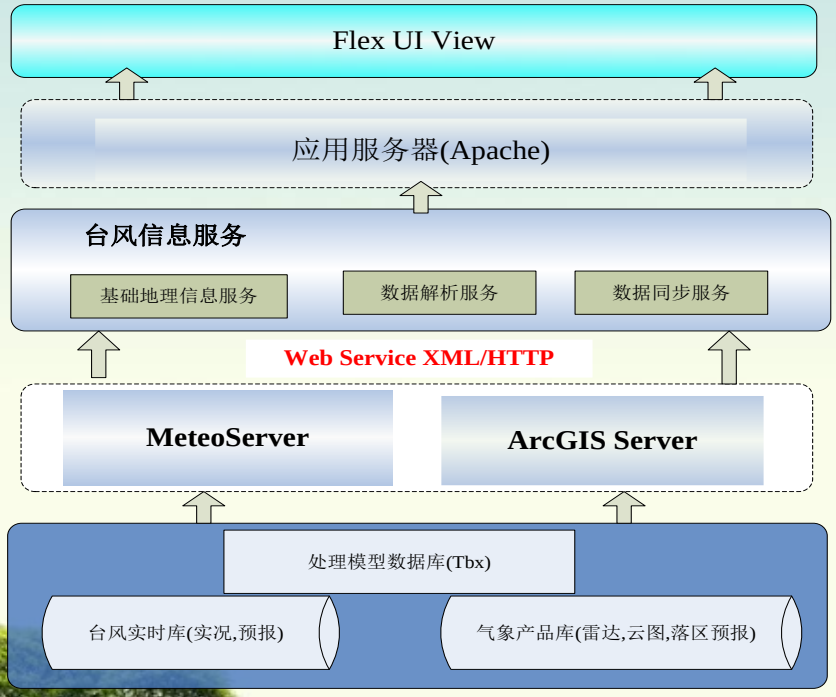


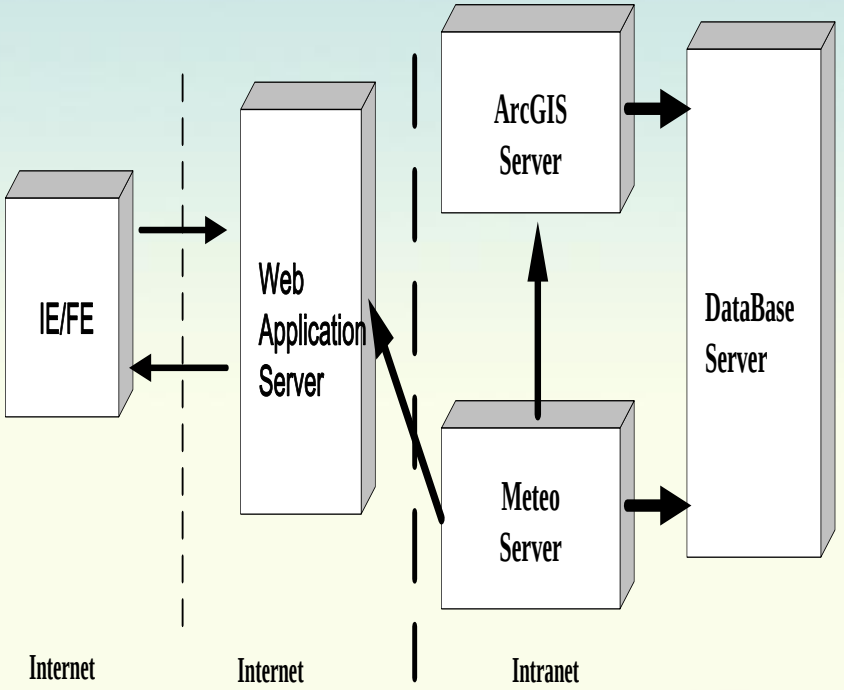


Arc Engine (GIS)

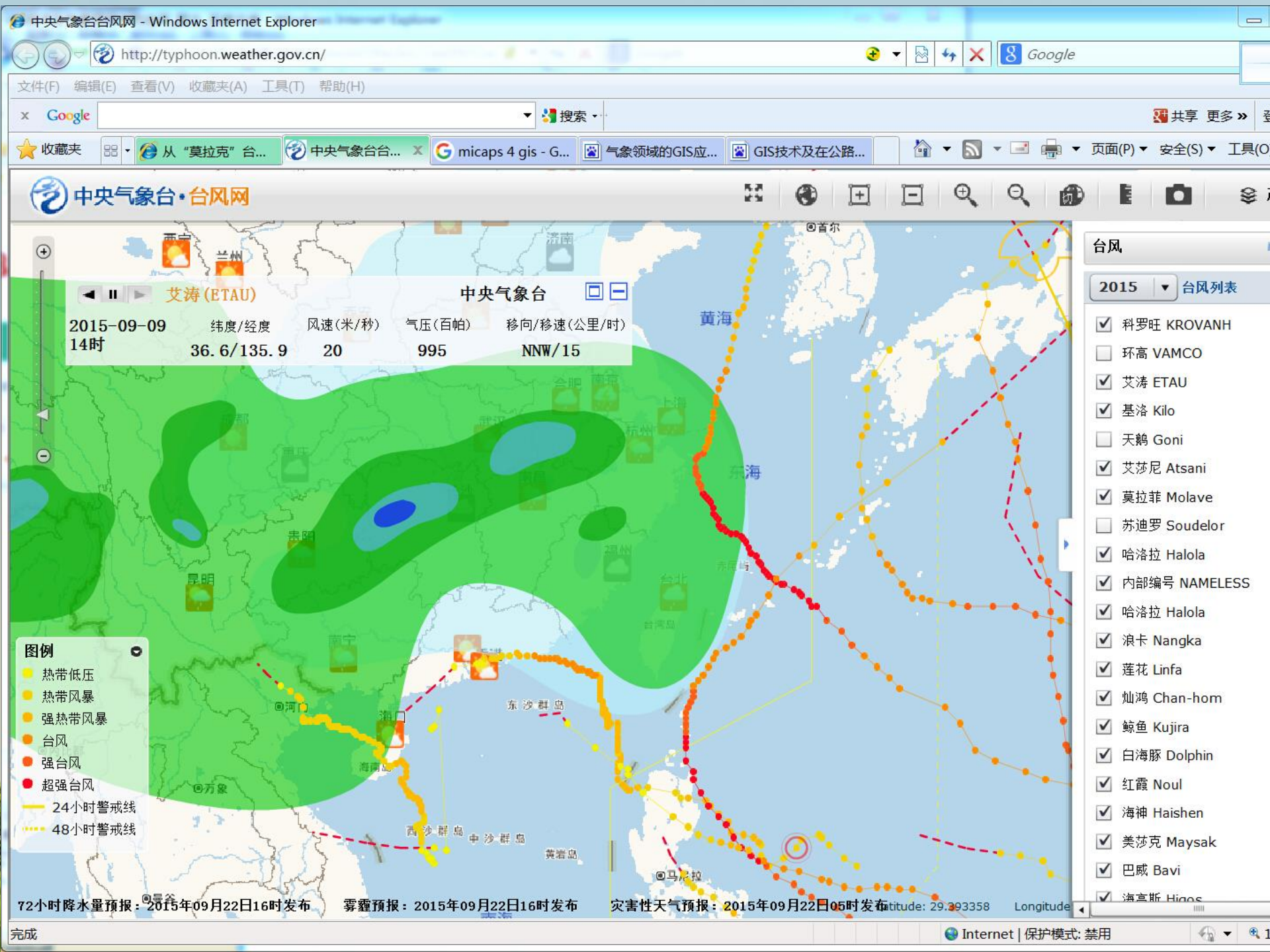
• Weather Information Web Portal

- Map operation
- Data querying
- Analysis tools
- Web Output
- OGC Web Services (WMS,WFS,WCS,KML)



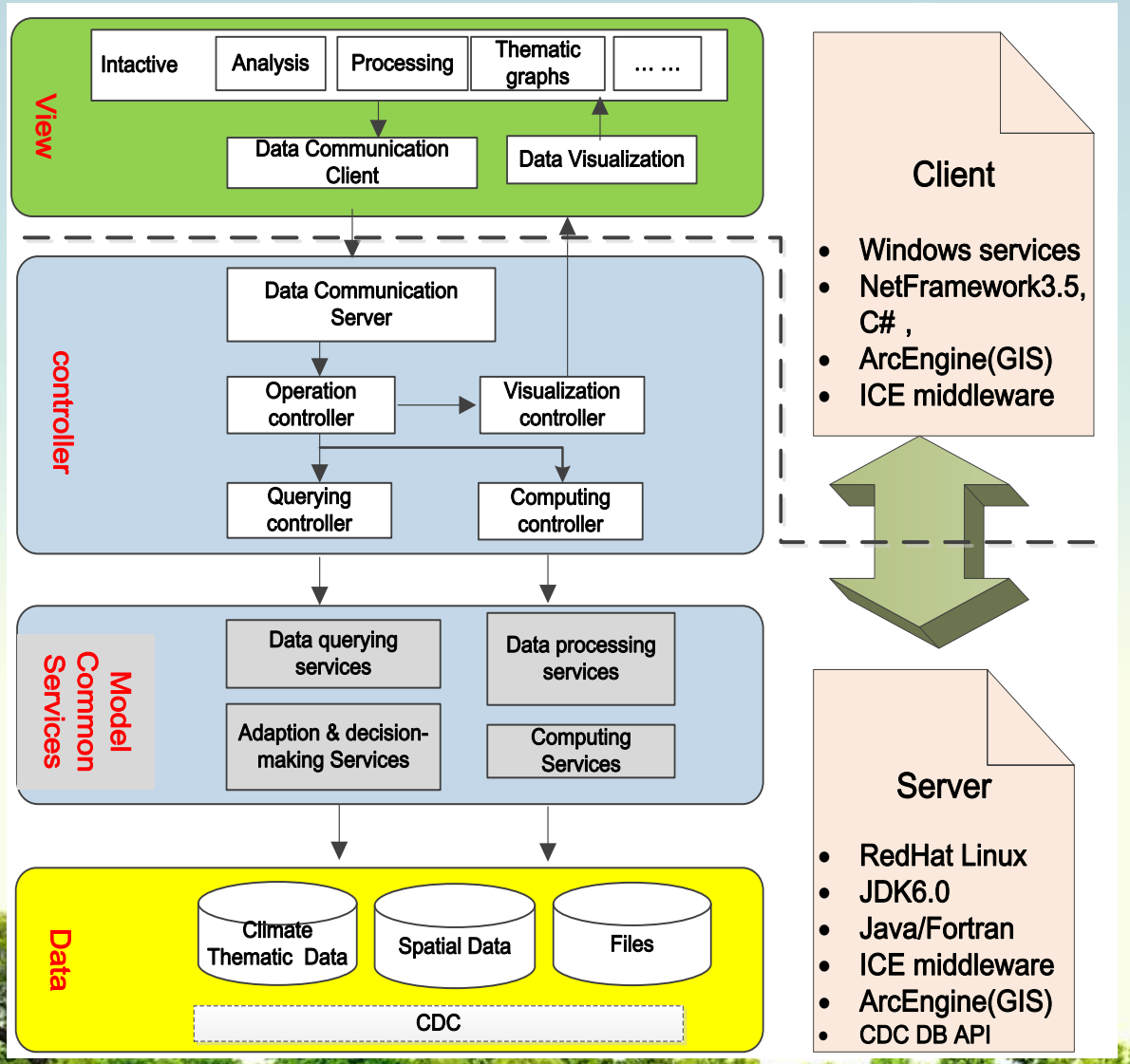


ArcGIS Server(WebGIS), Rich Flex(Flash) , Ajax, J2EE


中央气象台台风网 - Windows Internet Explorer
http://typhoon.weather.gov.cn/
中央气象台·台风网
艾涛(ETAU)
中央气象台
2015-09-09 14时
纬度/经度 36.6/135.9
风速(米/秒) 20
气压(百帕) 995
移向/移速(公里/时) NNW/15
图例
热带低压
热带风暴
强热带风暴
台风
强台风
超强台风
24小时警戒线
48小时警戒线
台风
2015
台风列表
科罗旺 KROVANH
环高 VAMCO
艾涛 ETAU
基洛 Kilo
天鹅 Goni
艾莎尼 Atsani
莫拉菲 Molave
苏迪罗 Soudelor
哈洛拉 Halola
内部编号 NAMELESS
哈洛拉 Halola
浪卡 Nangka
莲花 Linfa
灿鸿 Chan-hom
鲸鱼 Kujira
白海豚 Dolphin
红霞 Noul
海神 Haishen
美莎克 Maysak
巴威 Bavi
72小时降水量预报：2015年09月22日16时发布
雾霾预报：2015年09月22日16时发布
灾害性天气预报：2015年09月22日05时发布
Latitude: 29.393358
Longitude
完成
Internet | 保护模式: 禁用

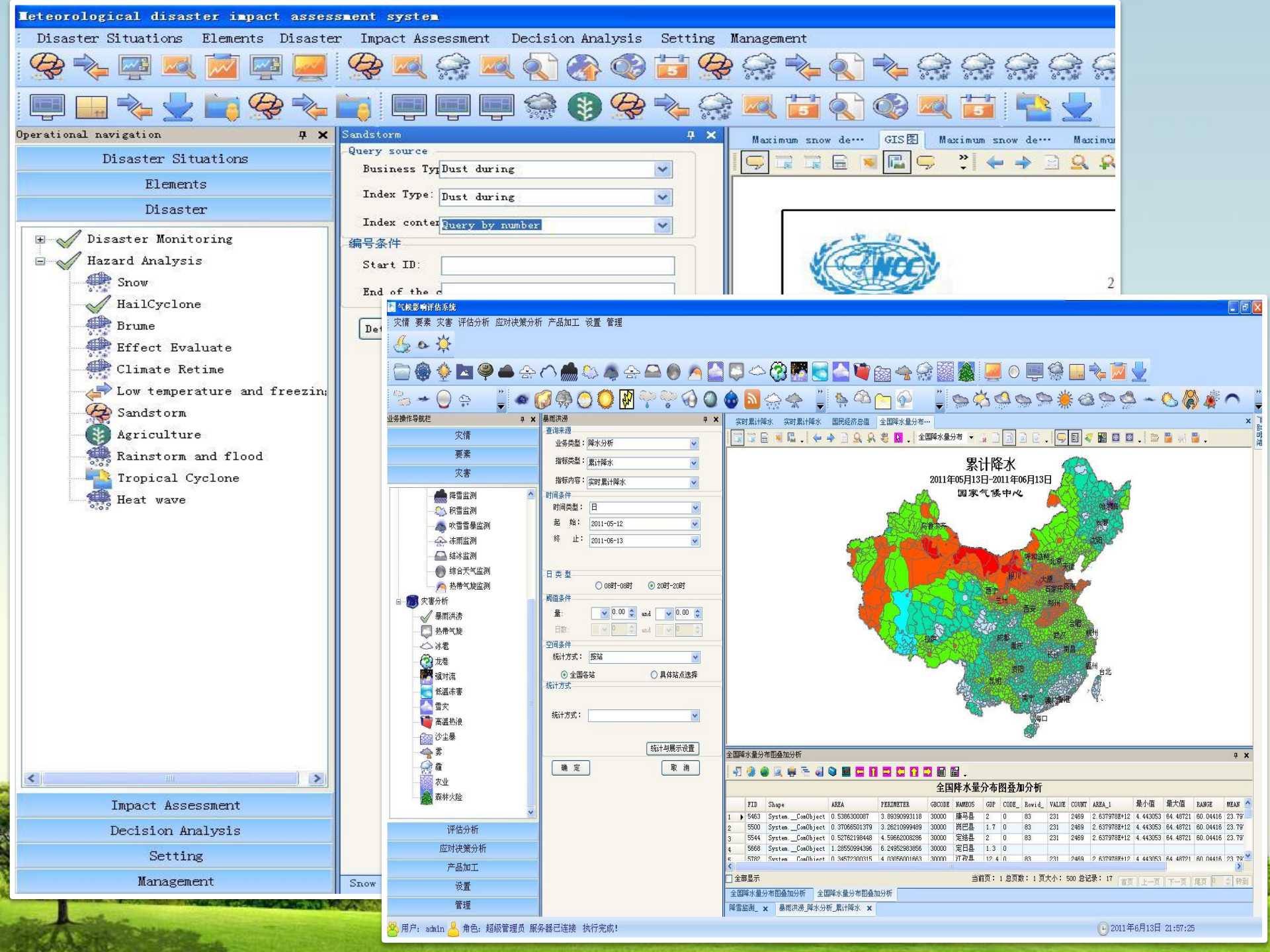
MEDIAS

Interactive Climate Service system toward Climate Assessment & impaction

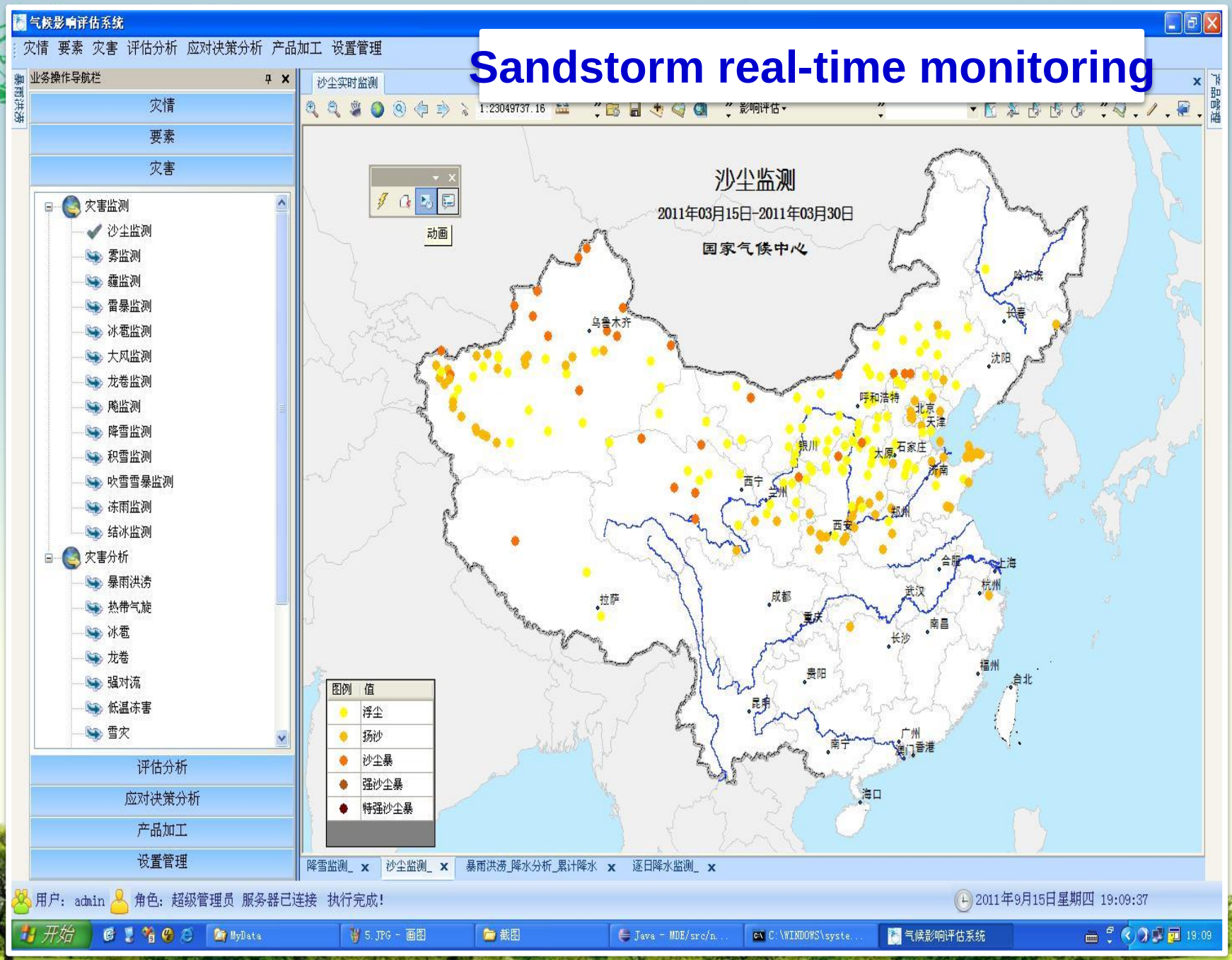


- Meteo-disaster info real-time analysis tools
- General Spatial statistic analysis, Mathematical statistics tools
- Meteo-disaster indicator monitoring and statistical analysis tools (270 type or so)
- Extreme climate event
- assessment of disaster using indicators, model, causing factors
- Climate impact assessment on agriculture, environment, etc.
- Disaster response strategy knowledge database
- Thematic database management
- Products visualization & generation

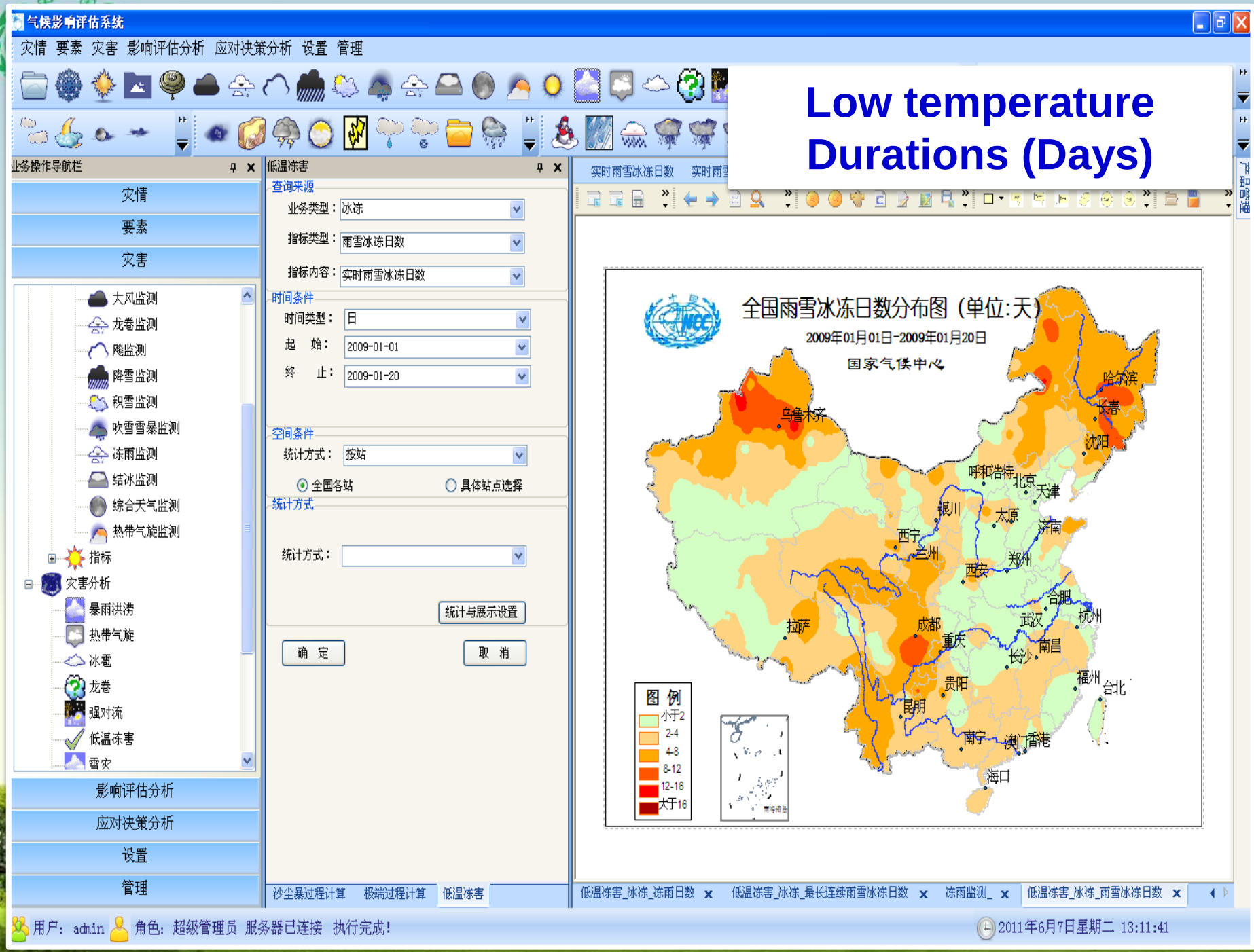
Arc Engine (GIS)


Meteorological disaster impact assessment system
Disaster Situations
Elements
Disaster
Impact Assessment
Decision Analysis
Setting
Management
Operational navigation
Disaster Situations
Elements
Disaster
Disaster Monitoring
Hazard Analysis
Snow
HailCyclone
Brume
Effect Evaluate
Climate Retime
Low temperature and freezin
Sandstorm
Agriculture
Rainstorm and flood
Tropical Cyclone
Heat wave
Impact Assessment
Decision Analysis
Setting
Management
Sandstorm
Query source
Business Typ
Dust during
Index Type:
Dust during
Index conter
Query by number
编号条件
Start ID:
End of the c
Maximum snow de···
GIS图
Maximum snow de···
气候影响评估系统
灾情 要素 灾害 评估分析 应对决策分析 产品加工 设置 管理
业务操作导航栏
灾情
要素
灾害
降雪监测
积雪监测
吹雪雪暴监测
冻雨监测
结冰监测
综合天气监测
热带气旋监测
灾害分析
暴雨洪涝
热带气旋
冰雹
龙卷
强对流
低温冻害
雪灾
高温热浪
沙尘暴
雾
霜
农业
森林火险
评估分析
应对决策分析
产品加工
设置
管理
暴雨洪涝
查询来源
业务类型：降水分析
指标类型：累计降水
指标内容：实时累计降水
时间条件
时间类型：日
起 始：2011-05-12
终 止：2011-06-13
日 类 型
08时-08时
20时-20时
阈值条件
量：
空间条件
统计方式：按站
全国各站
具体站点选择
统计方式
统计方式：
统计与展示设置
确 定
取 消
实时累计降水
实时累计降水
国民经济总值
全国降水量分布···
全国降水量分布
累计降水
2011年05月13日-2011年06月13日
国家气候中心
全国降水量分布图叠加分析
全国降水量分布图叠加分析
FID Shape AREA PERIMETER GBCODE NAME05 GDP CODE_ Rowid_ VALUE COUNT AREA_1 最小值 最大值 RANGE MEAN
1 5463 System._ComObject 0.5386300087 3.89390993118 30000 康马县 2 0 83 231 2469 2.637978E+12 4.443053 64.48721 60.04416 23.79
2 5500 System._ComObject 0.37066501379 3.26210999489 30000 岗巴县 1.7 0 83 231 2469 2.637978E+12 4.443053 64.48721 60.04416 23.79
3 5544 System._ComObject 0.52762198448 4.59662008286 30000 定结县 2 0 83 231 2469 2.637978E+12 4.443053 64.48721 60.04416 23.79
4 5668 System._ComObject 1.28550994396 6.24952983856 30000 定日县 1.3 0
全部显示
全国降水量分布图叠加分析
全国降水量分布图叠加分析
降雪监测_
暴雨洪涝_降水分析_累计降水
用户：admin 角色：超级管理员 服务器已连接 执行完成！
2011年6月13日 21:57:25

Sandstorm real-time monitoring



Low temperature Durations (Days)



Precipitation statistics report & Charts by provinces (Area, Volume, level, region)

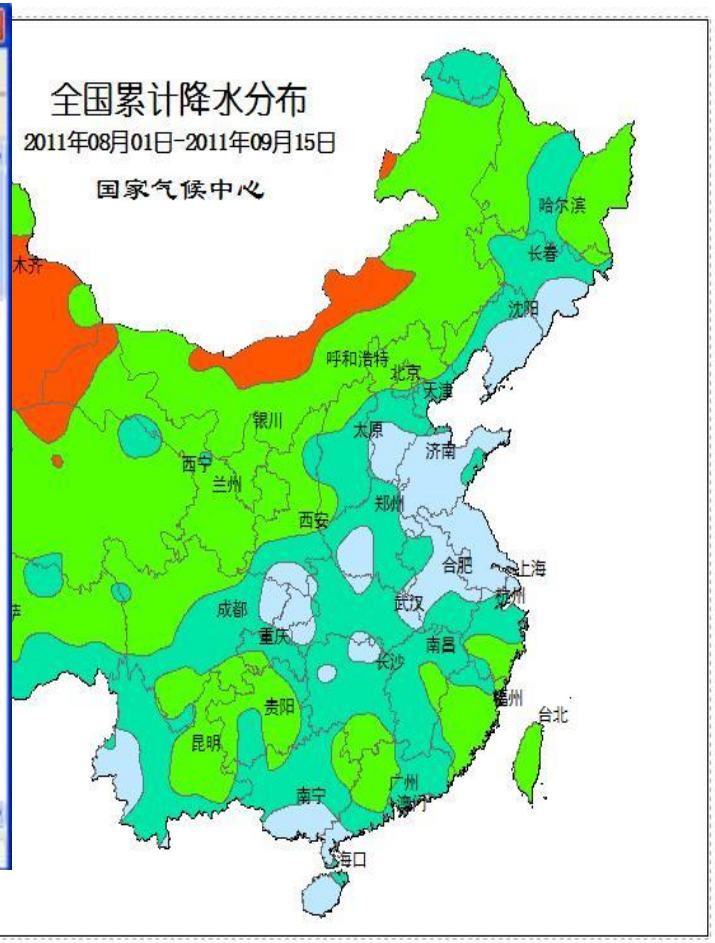
气候影响评估系统

按省名统计

全国降水量分布图按省名统计

	ID	等级	面积()	体积()	人口()	社会经济()	耕地面积()	省名
1	3	50-100	0.41	3.74	171.2	302.1	0	海南省
2	4	100-200	2.97	37.8	621.5	512.88	0	海南省
3	2	10-50	6.16	27.95	2077.2	6033.1	0	广东省
4	3	50-100	9.49	62.31	4416.3	12091.23	0	广东省
5	4	100-200	1.91	21.99	1118.2	1077.15	0	广东省
6	2	10-50	12.35	48.41	2219.3	2367.9	0	云南省
7	3	50-100	19.41	140.56	1427.6	837.92	0	云南省
8	4	100-200	6.56	73.99	603.1	271.66	0	云南省
9	3	50-100	0.11	0.68	0.6	7.25	0	香港特别行政区
10	2	10-50	3.83	17.13	552.6	413.65	0	广西壮族自治区
11	3	50-100	14.41	100.91	2656.5	1985.41	0	广西壮族自治区
12	4	100-200	5.23	67.99	1570.5	1383.45	0	广西壮族自治区
13	2	10-50	3.59	10.64	0	0	0	台湾省
14	2	10-50	3.82	16.65	1046.2	843.93	0	湖南省
15	3	50-100	15.04	118.17	4778.1	4403.04	0.01	湖南省
16	4	100-200	2.28	23.93	775	735.07	0	湖南省
17	2	10-50	11.56	45.73	2534	1333.16	0	贵州省
18	3	50-100	5.98	35.88	1267.5	621.58	0	贵州省
19	2	10-50	1.1	4.6	558.1	586.09	0	重庆市
20	3	50-100	4.36	33.63	1656.7	1590.06	0	重庆市
21	4	100-200	2.66	32.07	957.1	934.6	0	重庆市
22	2	10-50	26.73	103.34	1633.5	1113.57	0	四川省
23	3	50-100	18.86	123.84	6145.9	6064.33	0.01	四川省

全部显示　当前页：1 总页数：1 页大小：500 总记录：79



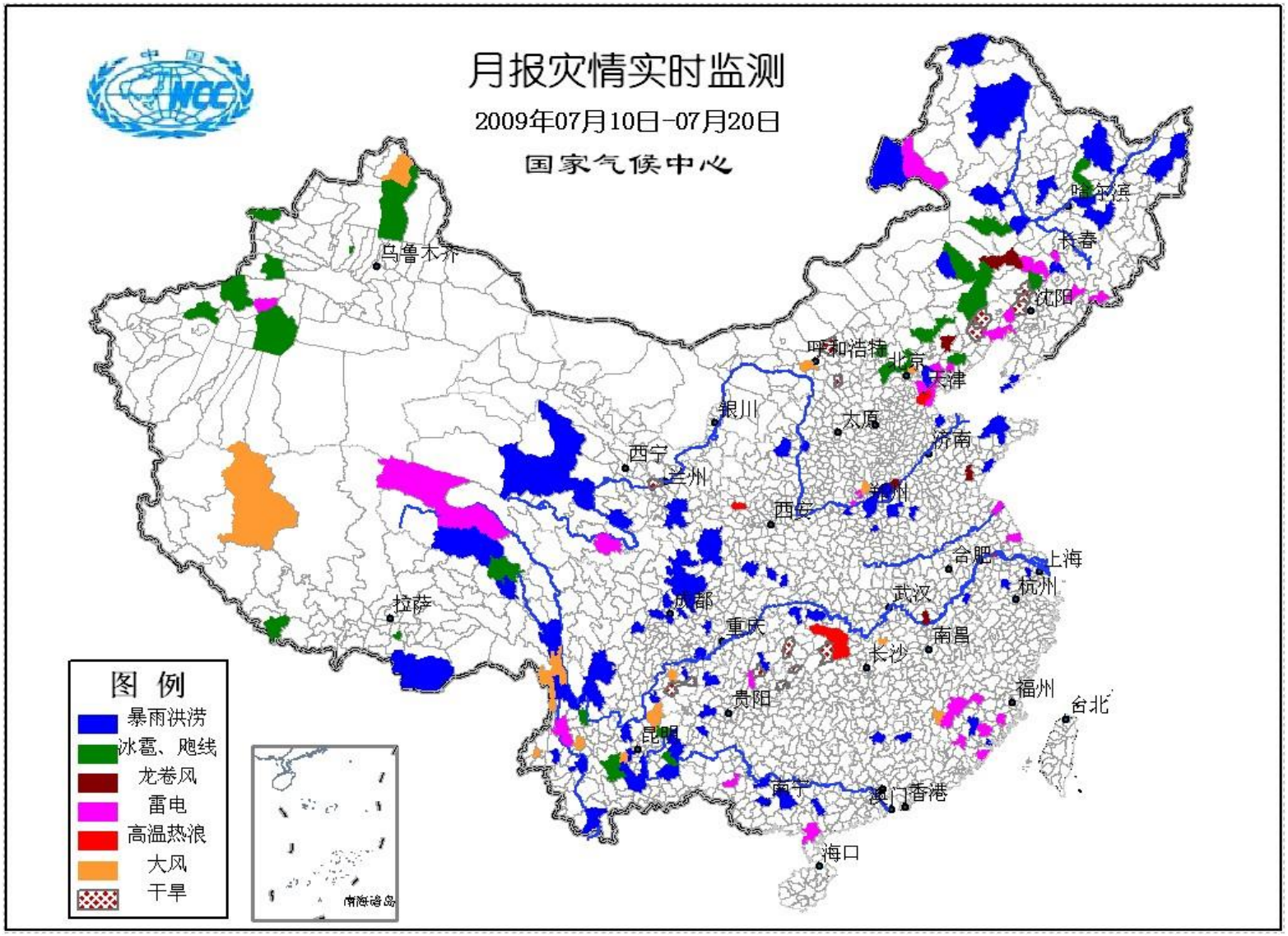
灾害
应对决策分析
产品加工
设置管理

降雪监测_ 沙尘监测_ 暴雨洪涝_降水分析_累计降水 逐日降水监测_ 暴雨洪涝_降水分析_降水日数 热带气旋_热带气旋过程_热带气旋过程

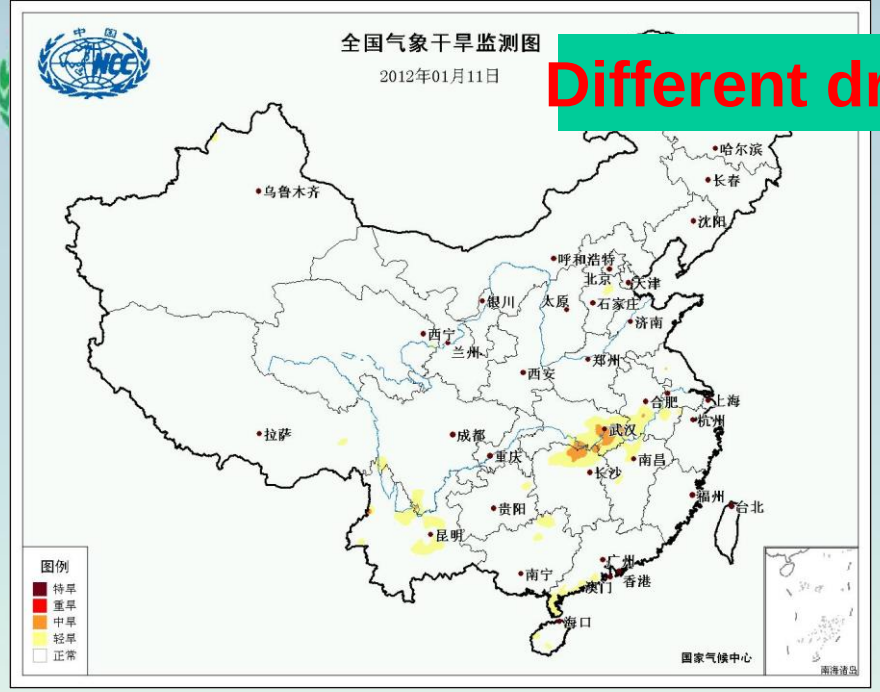
用户：admin 角色：超级管理员 服务器已连接 执行完成！ 2011年9月15日星期四 19:39:07

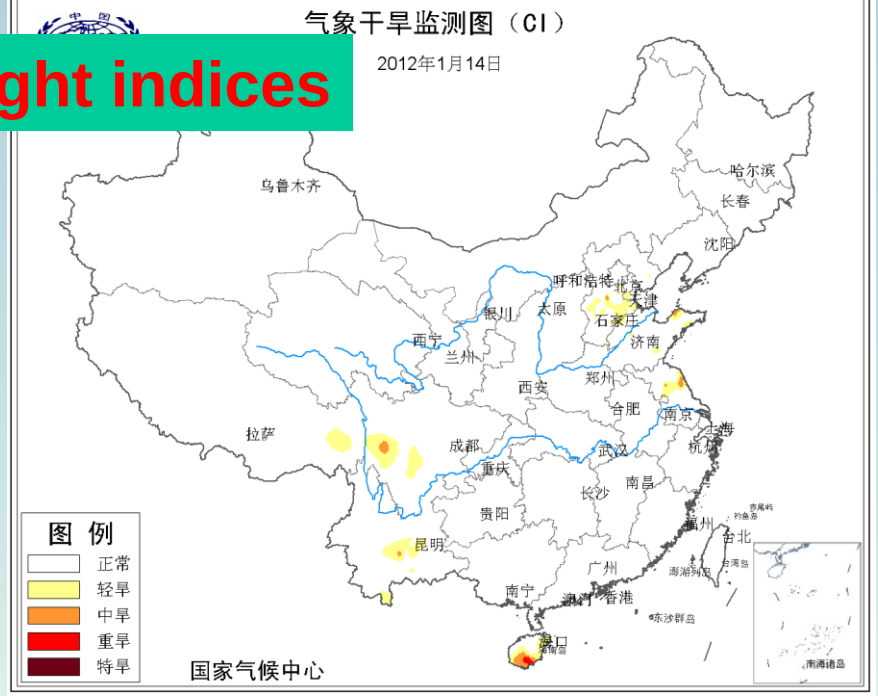
开始 MyData 14.JPG - 画图 截图 Java - MDE/src... C:\WINDOWS\sys... 气候影响评估系统 按省名统计 19:39

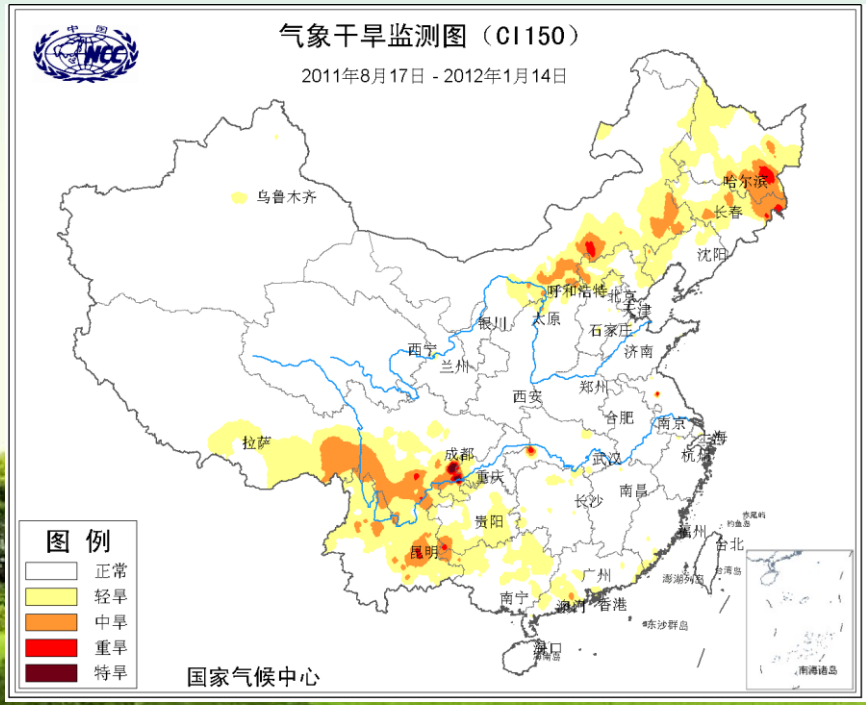
Disaster statistics by national county over a period of time

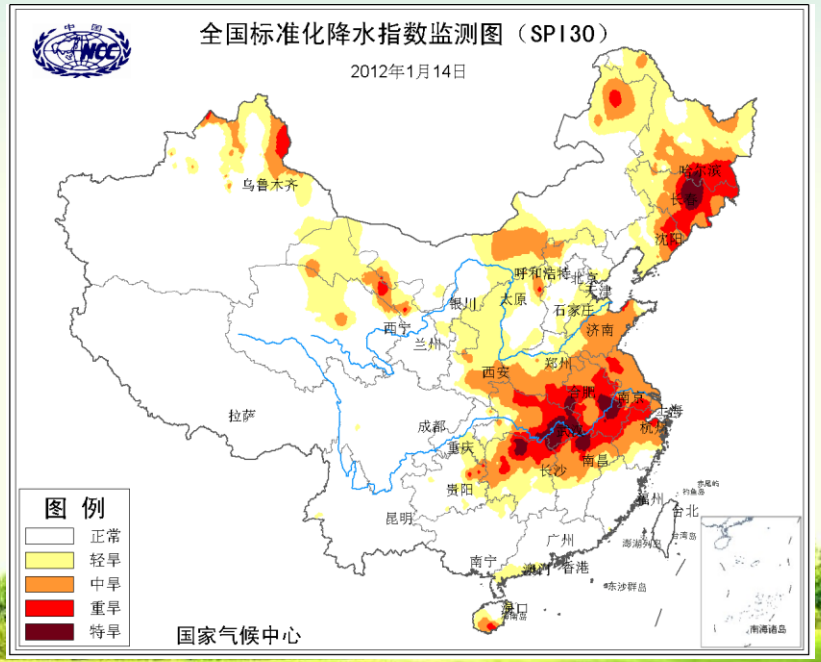


Different drought indices





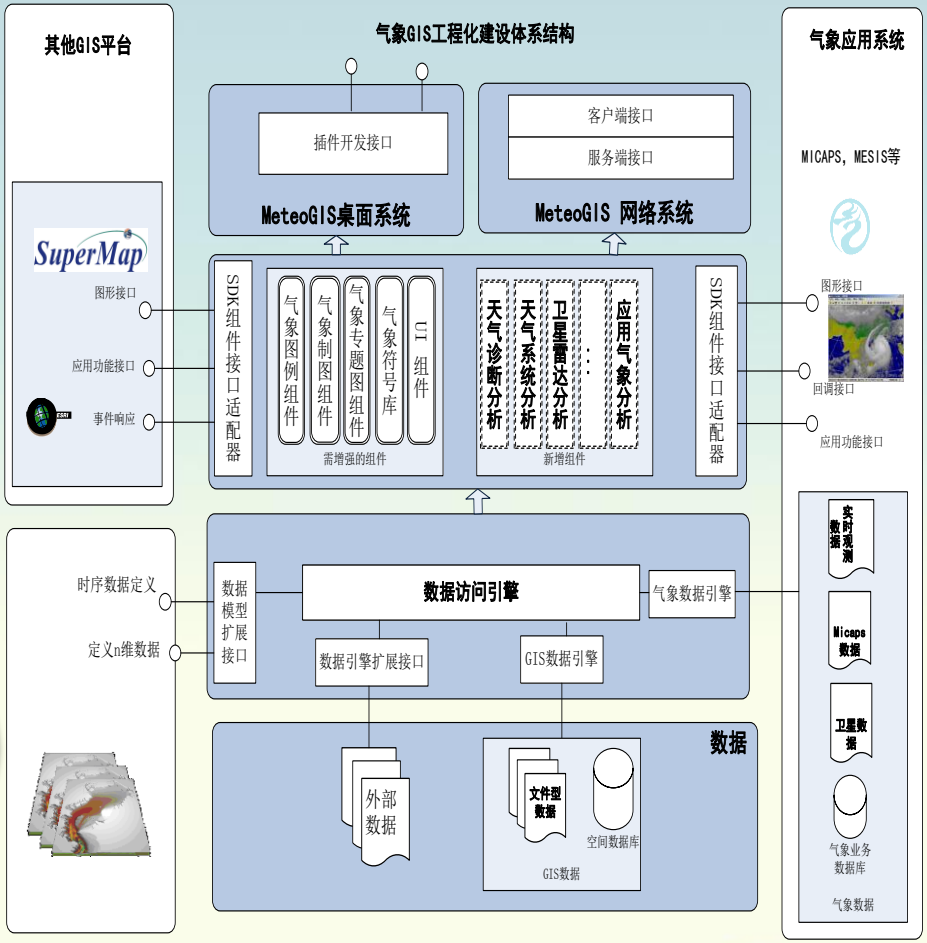




CMA MeteoGIS Based on SuperMap GIS

SuperMap

Extensions



Thank you!

Some figures, slides come from NASA,NCAR,COST,CPC,NMC websites and related slides, thanks the authors!