Explorations in geo-visualizing health data

By

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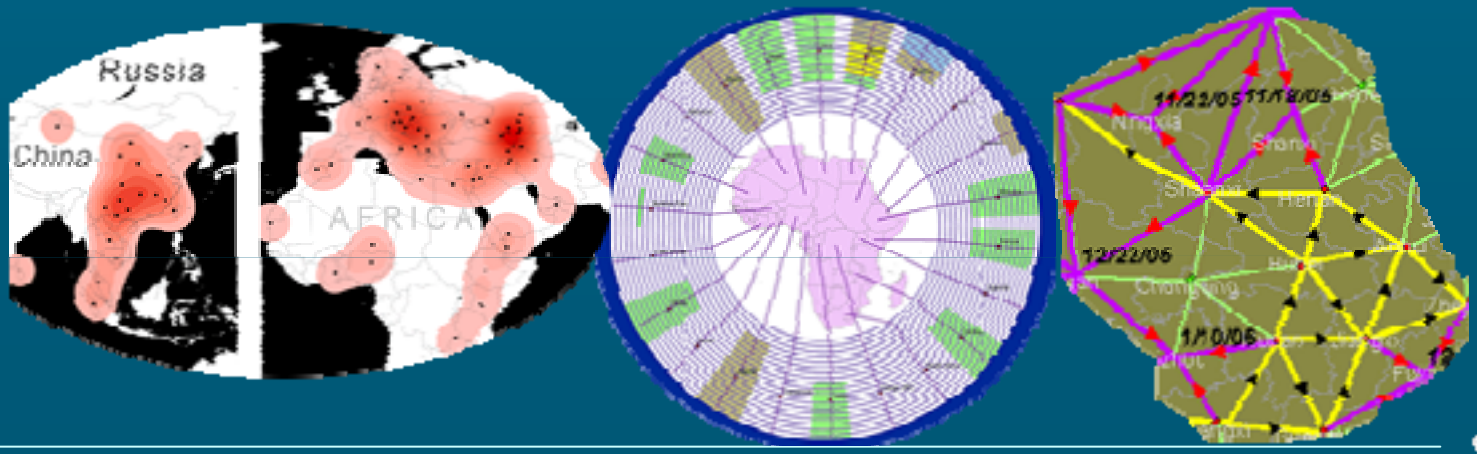
Division of Integrated Biodefense

Today's Presentation

- Purpose of the exploration
- Exploration 1: risk-map
- Exploration 2: ring-map
- Exploration 3: link-map
- Summary



Purpose of Exploration

- *Public health data:* tables, charts, texts…….
- *Gap? People need a convenient and effective means of communicating complex information.*
- *Solution: visualize data in graphic form; interpret data in an innovative way!*
- Why GIS?
  - Public health deals with information that can often be geo-referenced;
  - GIS is an enabling technology for representing data into understandable forms.

Risk Map

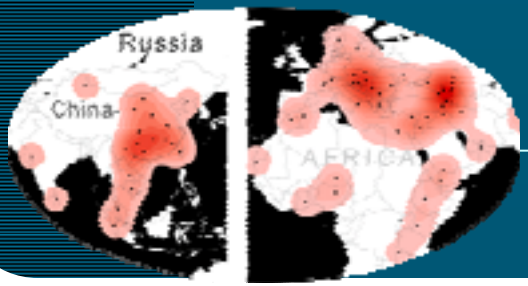
- ***What's a risk-map?*** A map that uses different colors to smoothly geo-visualize risk level.
- **Use:** to geo-visualize surface of risk from infectious diseases.
- **Goal:**

  delineating spatial clusters of infectious disease;

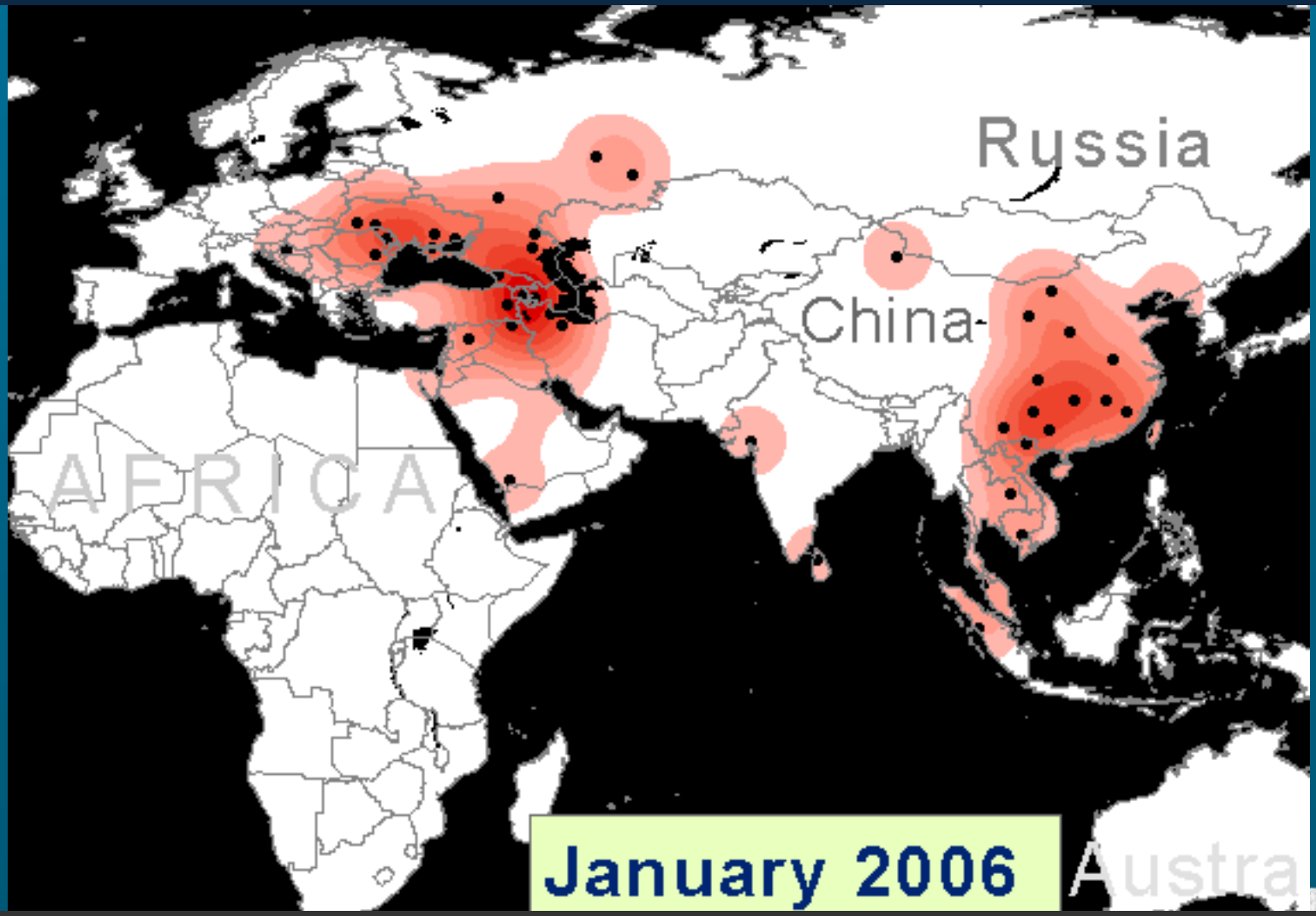
  helping public health agencies to respond more effectively;

  helping epidemiologists to reveal area pattern, track the sources of diseases and movements of contagions.
- **Method:** uses spatial density estimation to transform health data into a surface of disease risk.
- **Requirements:**

  Data; ArcMap with spatial analyst extension.



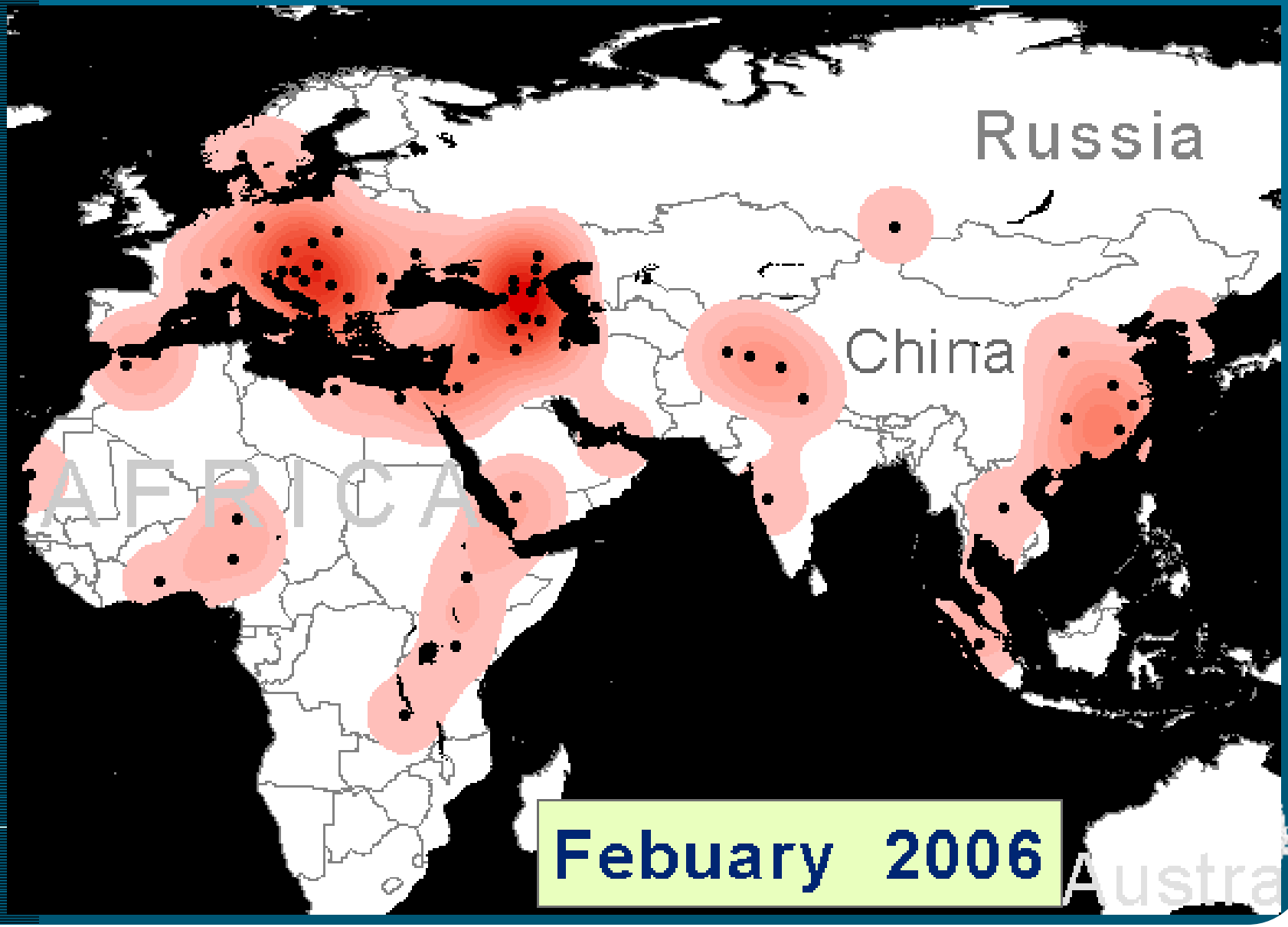
Infectious Disease Risk Map (1)



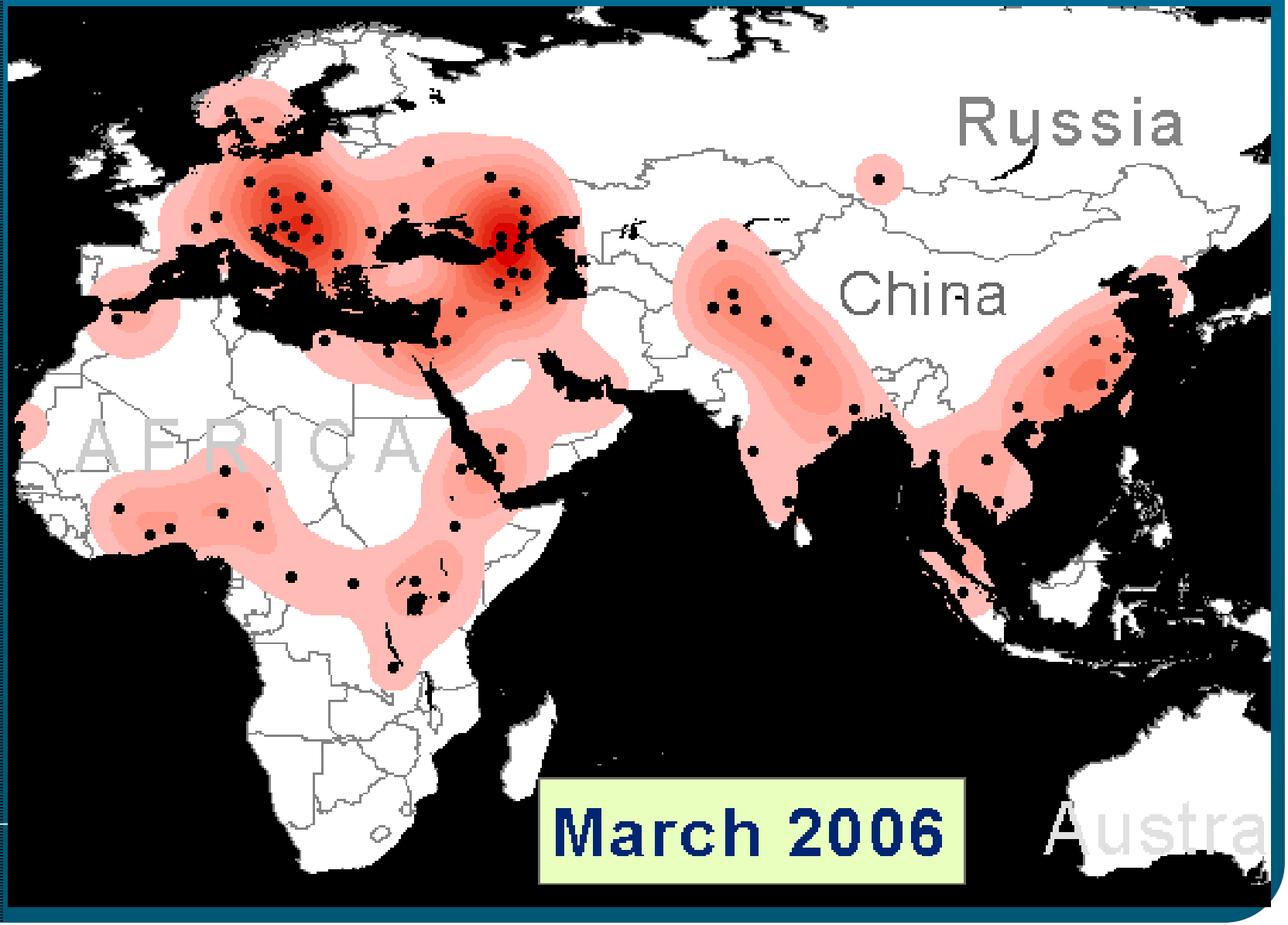
The raw data is from Watch Board 1.0.

The information is obtained through publicly available local media based upon socio-economic factors associated with a local or regional biological event. The assessment of each event is based upon identified social, economic, and geographic indicators contained in local media sources and additional analysis by Argus regional experts. This overview consists of the most serious biological events identified over the past 7 days throughout the world and is meant to provide a summary of these occurrences.

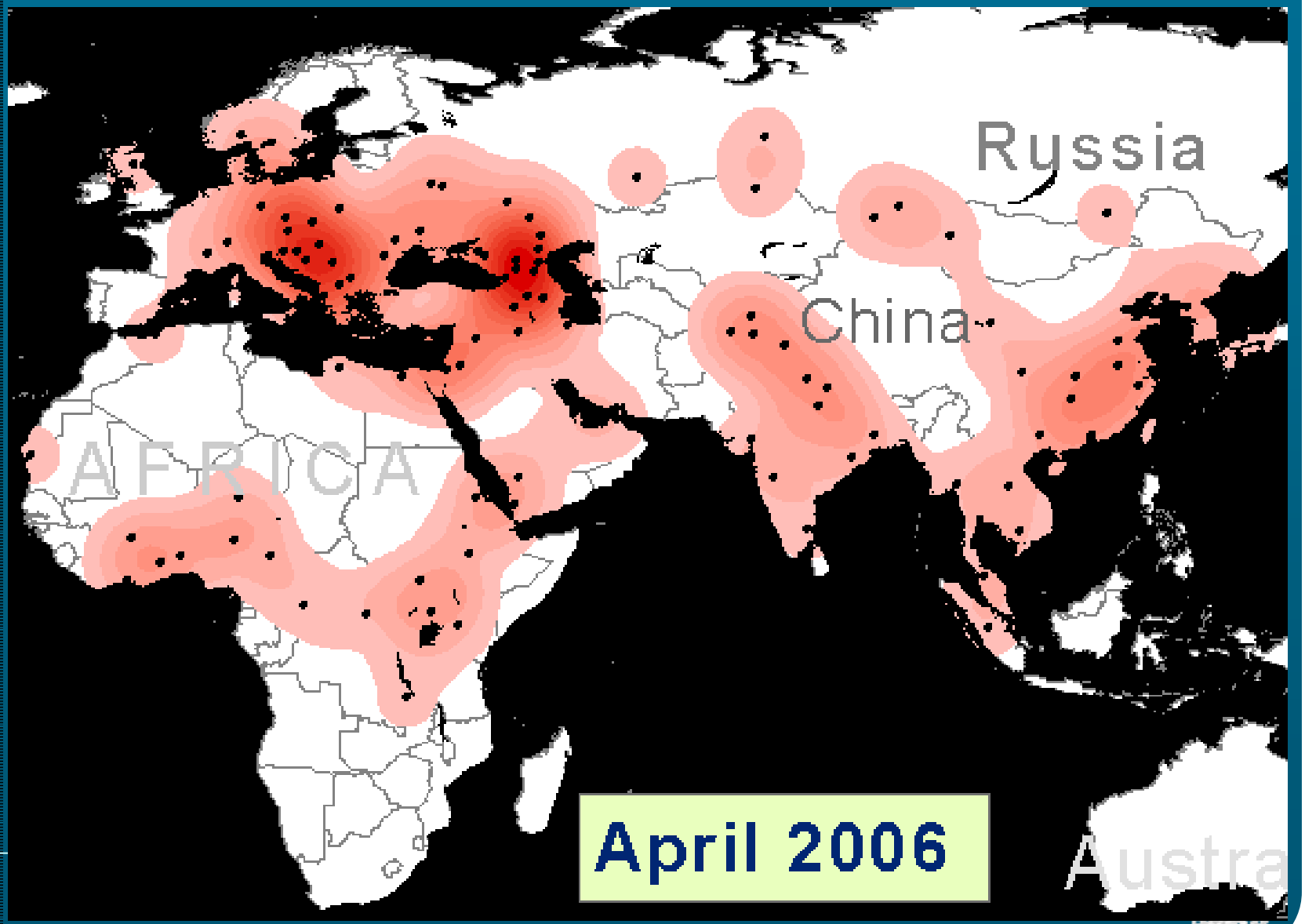
Infectious Disease Risk Map (2)



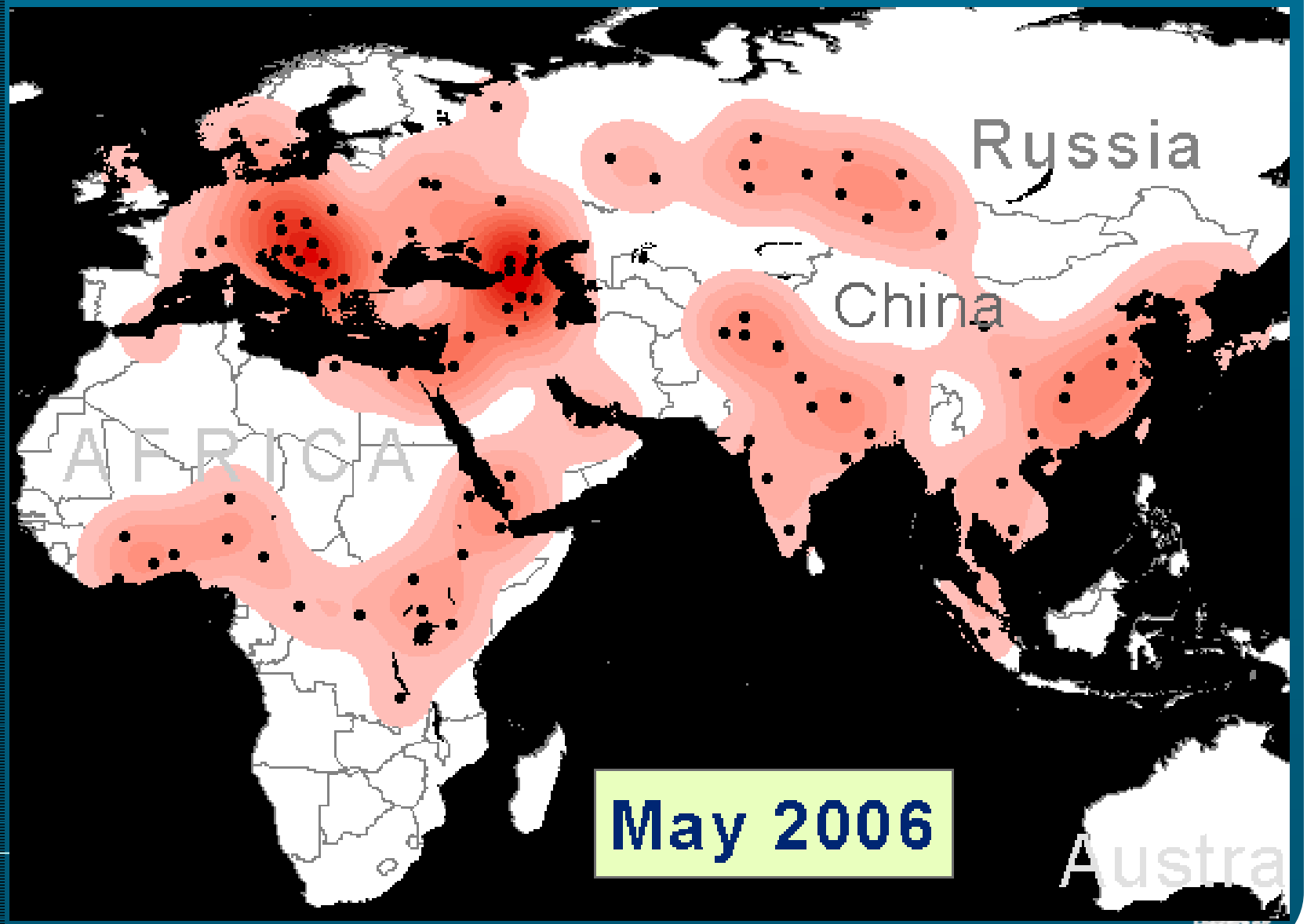
Infectious Disease Risk Map (3)



Infectious Disease Risk Map (4)



Infectious Disease Risk Map (5)



Ring Map

- ***What's a ring-map?*** A set of ring shaped maps, where each ring displays temporal dimension of data.
- **Use:** to geo-visualize health related data for public in an active way.
- **Goal:**

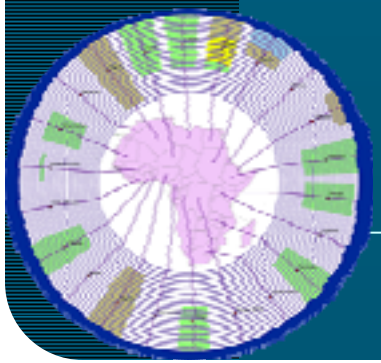
  helping people understand public health data far better than with tables of numbers;

  displaying spatial and temporal information of health data in an effective way.
- **Requirements:**

  Data

  ArcMap

  GeoBrowser



Data: Table of weekly public health status (Alert level)

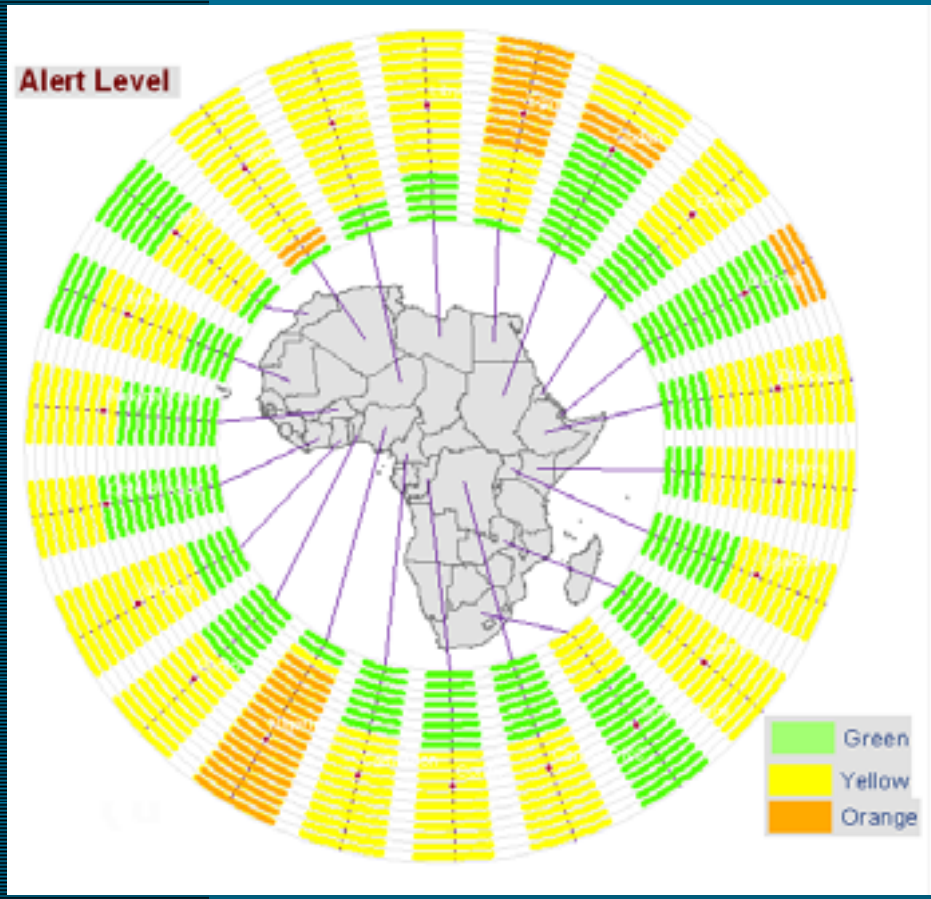
Alert code :
Green (low risk);
Yellow (limited case);
Orange (multifocal);
Red (significant and sustained human cases).

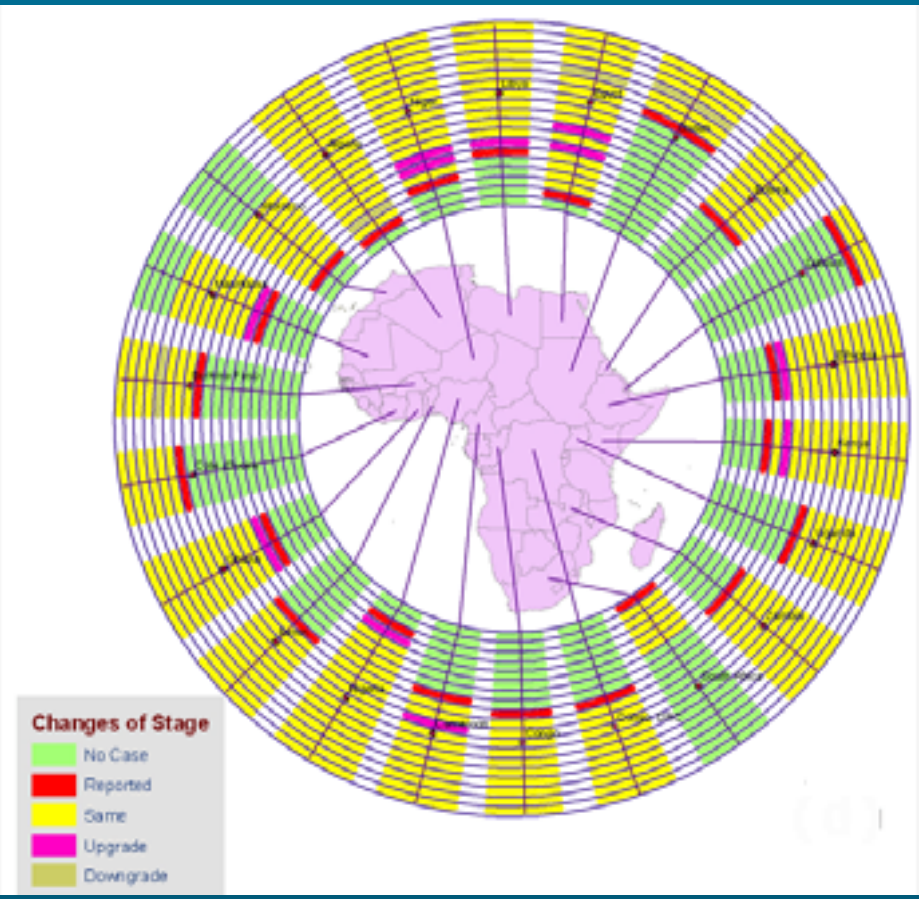
Location Name	Week 1	Week 2	Week 3	……	Week 17	Week 18
Algeria	Green	Orange	Orange	……	Yellow	Yellow
Benin	Green	Green	Green	……	Yellow	Yellow
Burkina Faso	Green	Green	Green	……	Yellow	Yellow
Cameroon	Green	Green	Green	……	Yellow	Yellow
Congo	Green	Green	Green	……	Yellow	Yellow
Congo, DRC	Green	Green	Green	……	Yellow	Yellow
Cote d'Ivoire	Green	Green	Green	……	Yellow	Yellow
Egypt	Green	Yellow	Yellow	……	Orange	Orange
Eritrea	Green	Green	Green	……	Yellow	Yellow
Ethiopia	Green	Green	Green	……	Yellow	Yellow
Ghana	Green	Green	Green	……	Yellow	Yellow
Kenya	Green	Green	Green	……	Yellow	Yellow
Libya	Green	Green	Green	……	Yellow	Yellow
Mauritania	Green	Green	Green	……	Green	Green
Morocco	Green	Green	Yellow	……	Green	Green
Niger	Green	Green	Green	……	Yellow	Yellow
Nigeria	Green	Green	Yellow	……	Orange	Orange
Sudan	Green	Green	Green	……	Yellow	Yellow
Uganda	Green	Green	Green	……	Yellow	Yellow
Zambia	Green	Green	Green	……	Yellow	Yellow

The raw data is from Watch Board 1.0.

The information is obtained through publicly available local media based upon socio-economic factors associated with a local or regional biological event. The assessment of each event is based upon identified social, economic, and geographic indicators contained in local media sources and additional analysis by Argus regional experts. This overview consists of the most serious biological events identified over the past 7 days throughout the world and is meant to provide a summary of these occurrences.

Examples of Ring Maps



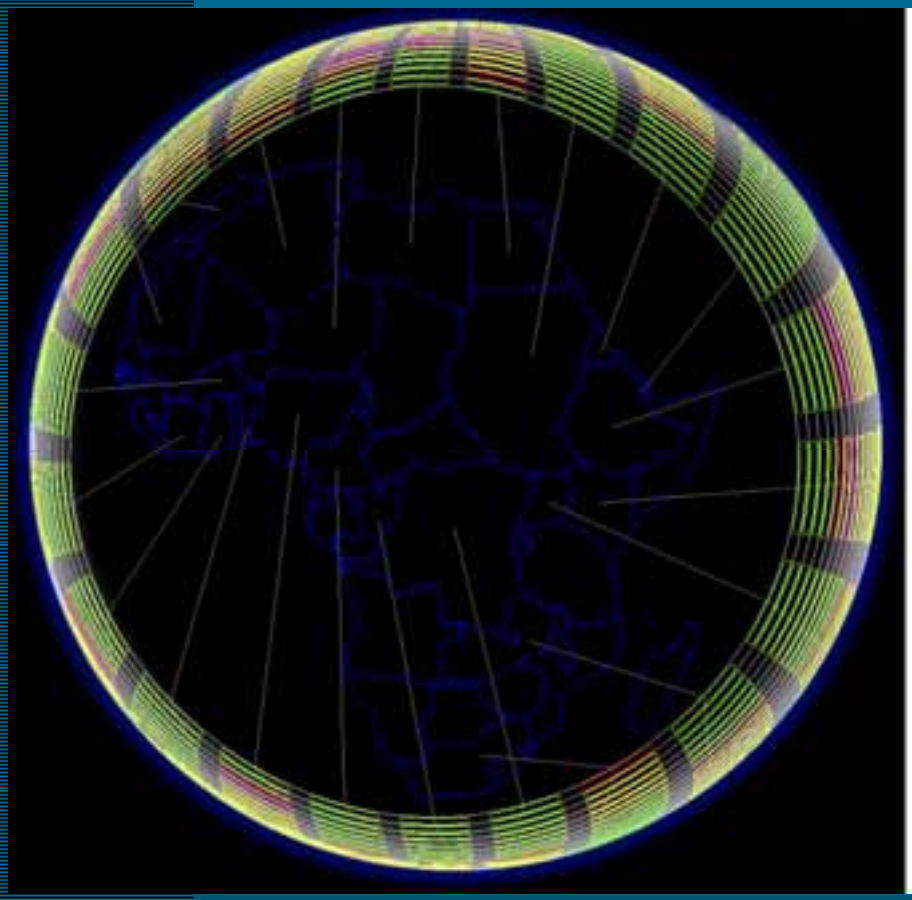


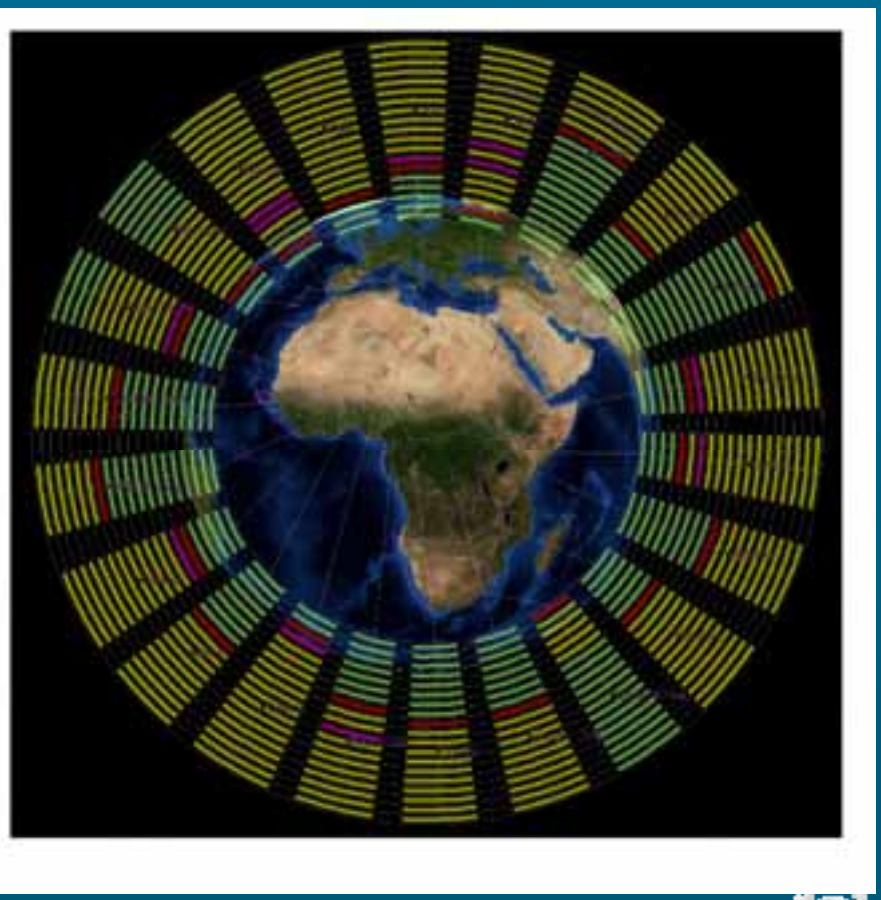
Weekly alert

Changes

Disseminating Ring Maps

Geo-referenced map and data can be accessed through geo-browsers





NASA World Wind only showing our data

Also showing background image

Link Map

- ***What's a link-map?*** *A map that uses lines to connect geographic neighbors.*
- **Use:** to explore crucial relationships and associations between locations with the outbreak of infectious disease.
- **Goal:**

  representing health data with geographic associations;

  helping health workers to investigate the pattern of diseases trans-boundary transmission.
- **Requirements:**

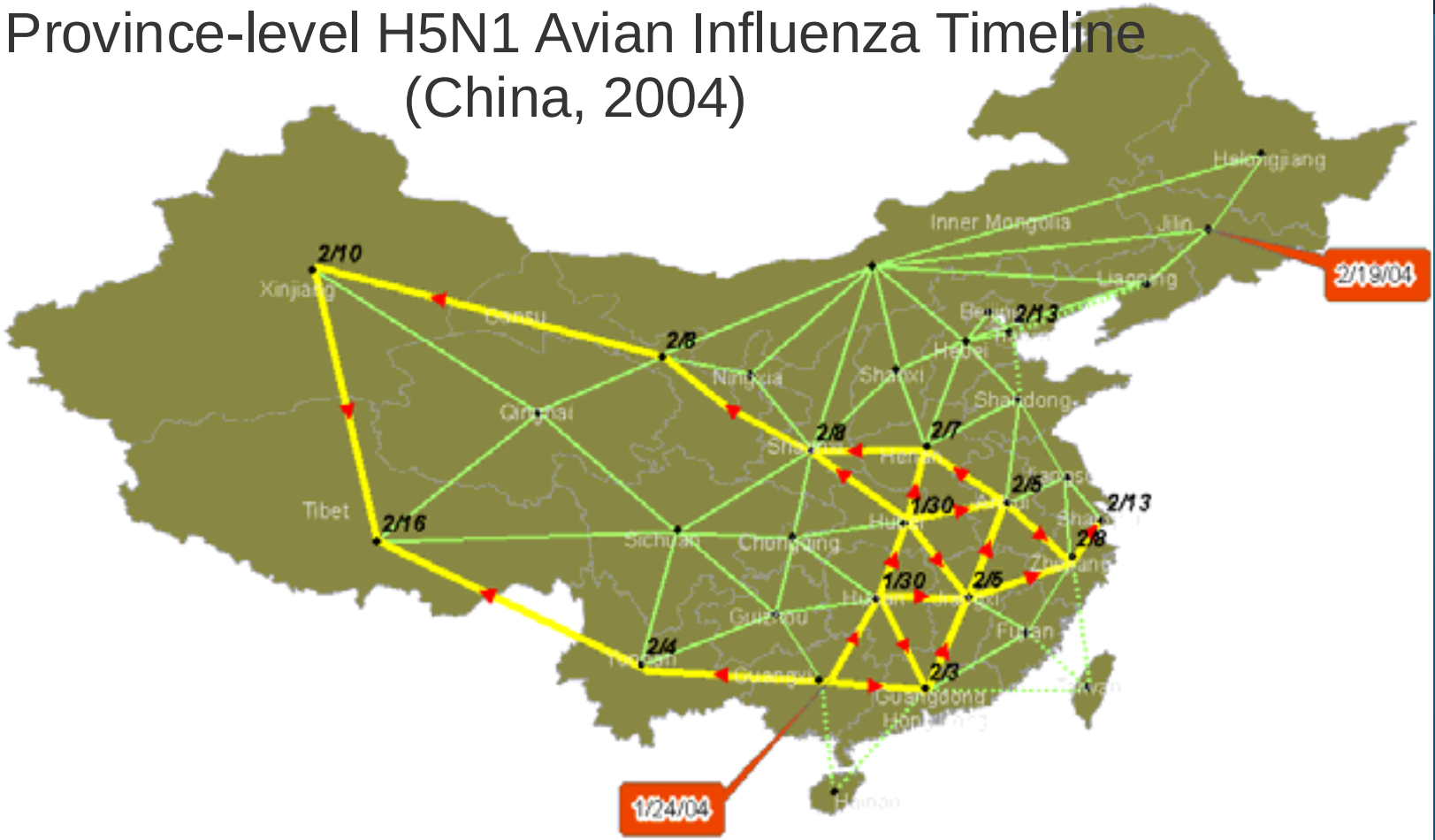
  Data

  ArcMap

  GeoBrowser

Link Map (1)

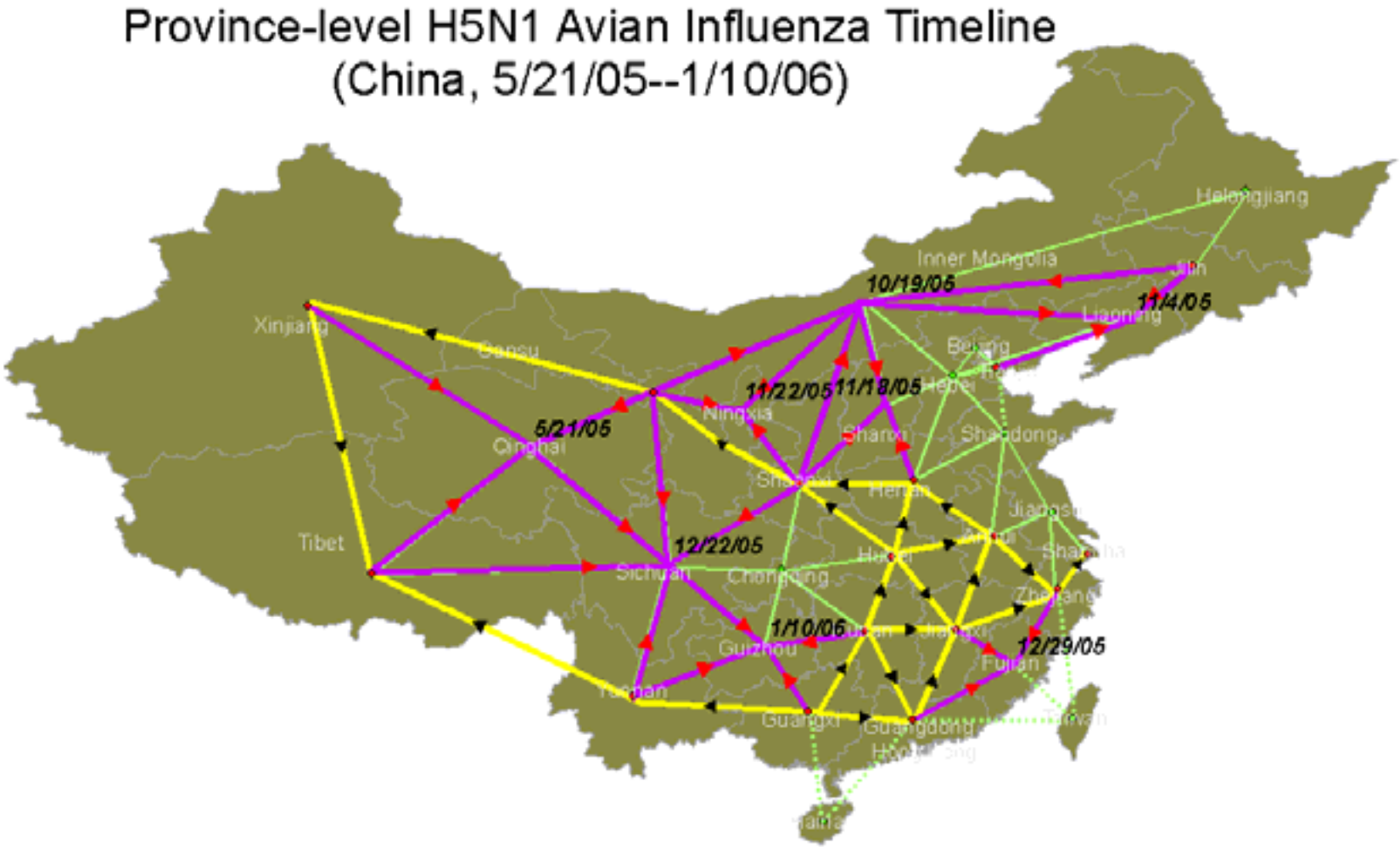
Province-level H5N1 Avian Influenza Timeline (China, 2004)



Province	Guangxi	Hunan	Hubei	Guangdon	Yunnan	Jiangxi	Anhui	Henan
Confirm	1/24/2004	1/30/2004	1/30/2004	2/3/2004	2/4/2004	2/5/2004	2/5/2004	2/7/2004
Province	Zhejiang	Shaanxi	Gansu	Xinjiang	Shanghai	Tianjin	Xizang	Jilin
Confirm	2/8/2004	2/8/2004	2/8/2004	2/10/2004	2/13/2004	2/13/2004	2/16/2004	2/19/2004

Data Source:http://www.china.org.cn/chinese/zhuanti/qlg/490393.htm

Link Map (2)



Province	Qinghai	Inner Mongolia	Liaoning	Shanxi	Ningxia	Sichuan	Fujian	Guizhou
Confirm Date	5/21/2005	10/19/2005	11/4/2005	11/18/2005	11/22/2005	12/22/2005	12/29/2005	1/10/2006

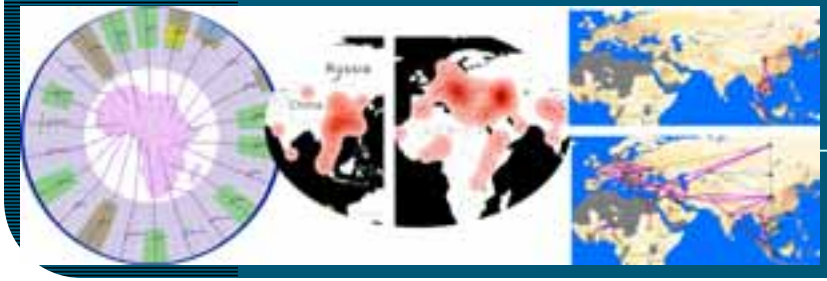
Summary

Using the resource integration capabilities of GIS, we have explored spatiotemporal visualization of health data in 3 innovative ways:

- Risk-map;
- Ring-map;
- Link-map.

This has important practical value for interpreting complicated data into more understandable maps, and improving management, policy decisions and research.

Our users would be public health officials and health researchers.



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- The raw data of ring-map and risk-map are from database of Watch Board 1.0.
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Questions/Comments?

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Thank You!