





23+

1k

Beijing, 1997 Found by Dr. Ershun Zhong

Partners in 30+ countries

Years for GIS software



Branch offices and subsidiaries



#### 5 Main Key Technologies

BIG DATA GIS AI GIS THREE DIMENSION GIS CROSS PLATFORM GIS CLOUD COMPUTING





### Mapping the Movement of Tornadoes using GIS

Firdausi Zahara Gandes – SuperMap Instructor



## WHAT IS? Geographic Information System (GIS)





Computer based database system designed to spatially analyze and display data

(Debo and Reese, 2002)





# We need to mapping the tornadoes movements

#### SuperMap





Climate conditions needed for tornado formation are complex, so it is difficult to make timely warning, but its occurence is not completely irregular

By mapping the tornado, we can get its migration rule which will be useful as a basis for making policy in the face of a tornado going forward



# Tornado Map





# SuperMap iDesktop 10i



#### Download here

SuperMap iDesktop 64 bit https://bit.ly/SuperMap\_iDesktop64

SuperMap iDesktop 32 bit https://bit.ly/SuperMap\_iDesktop32



Tornadoes

magnitude data

from 2009 - 2018

	1	
TORNADO	HAIL	DAMAGING WIND
2018_torn.csv (0.1 mb) Updated: 30 Sep 2019	2018_hail.csv (0.8 mb) Updated: 30 Sep 2019	2018_wind.csv (1.7 mb) Updated: 30 Sep 2019
2017_torn.csv (0.2 mb)	2017_hail.csv (1.2 mb)	2017_wind.csv (2.0 mb)
2016_torn.csv (0.1 mb)	2016_hail.csv (1.1 mb)	2016_wind.csv (1.9 mb)
2015_torn.csv (0.1 mb)	2015_hail.csv (0.9 mb)	2015_wind.csv (1.5 mb)
2014_torn.csv (0.1 mb)	2014_hail.csv (0.9 mb)	2014_wind.csv (2.8 mb)
2013_torn.csv (0.1 mb)	2013_hail.csv (1.0 mb)	2013_wind.csv (1.5 mb)
2012_torn.csv (0.1 mb)	2012_hail.csv (1.4 mb)	2012_wind.csv (1.7 mb)
2011_torn.csv (0.2 mb)	2011_hail.csv (2.0 mb)	2011_wind.csv (2.5 mb)
2010_torn.csv (0.1 mb)	2010_hail.csv (1.1 mb)	2010_wind.csv (1.6 mb)
2009_torn.csv (0.1 mb)	2009_hail.csv (1.4 mb)	2009_wind.csv (1.5 mb)

# Source : www.spc.noaa.gov/

lyr	m	10	dy	date	time	tz	st	stf	stn	mag	inj	fat	lo	0SS	closs	slat	slon	elat	elon	len	wid	ns	sn	sg	f1
1	2009	1	. 3	3 ########	13.13.00	3	MS		28 0	1		0	0	00.04	00.00	31.875	-89.331	31.888	-89.327	0,064583	175.00.00	1	L	1	1
2	2009	1	. 6	5 ########	16.05.00	3	GA		13 0	0		0	0	00.05	00.00	343.227	-853.844	343.515	-853.727	02.01	100.00.00	1	L	1	1
3	2009	1	. 7	7 ########	02.00.00	3	GA		13 0	0		0	0 0.	025	00.00	329.789	-838.904	329.858	-838.414	0,144444	100.00.00	1	L	1	1
4	2009	1	10	) ########	15.33.00	3	MS		28 0	0		0	0	00.00	0.002	324.983	-885.795	325.089	-885.495	01.09	30.00.00	1	L	1	1
5	2009	1	10	) ########	17.05.00	3	AL		1 0	1		0	0	02.05	00.00	31.269	-88.032	312.751	-880.055	01.06	200.00.00	1	L	1	1
6	2009	1	24	4 <b>#######</b> #	17.00.00	3	CA		6 0	0		0	0	00.01	00.00	393.602	-122.041	393.602	-122.041	00.01	40.00.00	1	L	1	1
	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1         2009           2         2009           3         2009           4         2009           5         2009           6         2009	model         model           1         2009         1           2         2009         1           3         2009         1           4         2009         1           5         2009         1           6         2009         1	Incomposition         Incompos	Incomposition         Incompos	1         2009         1         3         ########         13.13.00           2         2009         1         6         #########         16.05.00           3         2009         1         7         #########         16.05.00           3         2009         1         7         ########         15.33.00           4         2009         1         10         ########         15.33.00           5         2009         1         10         ########         17.05.00           6         2009         1         24         ########         17.00.00	1         2009         1         3         ########         13.13.00         3           2         2009         1         6         ########         16.05.00         3           3         2009         1         7         ########         02.00.00         3           4         2009         1         10         ########         15.33.00         3           5         2009         1         10         ########         17.05.00         3           6         2009         1         24         ########         17.00.00         3	1       2009       1       3       #########       13.13.00       3       MS         2       2009       1       6       #########       16.05.00       3       GA         3       2009       1       7       #########       02.00.00       3       GA         4       2009       1       10       ########       15.33.00       3       MS         5       2009       1       10       #########       17.05.00       3       AL         6       2009       1       24       ########       17.00.00       3       CA	1       2009       1       3       ########       13.13.00       3       MS       3         2       2009       1       6       #########       16.05.00       3       GA       3         3       2009       1       7       #########       16.05.00       3       GA       3         4       2009       1       10       ########       15.33.00       3       MS       3         5       2009       1       10       #########       17.05.00       3       AL         6       2009       1       24       #########       17.00.00       3       CA	1       2009       1       3       ########       13.13.00       3       MS       28       0         2       2009       1       6       ########       16.05.00       3       GA       13       0         3       2009       1       7       ########       16.05.00       3       GA       13       0         4       2009       1       10       ########       15.33.00       3       MS       28       0         5       2009       1       10       ########       17.05.00       3       AL       1       0         6       2009       1       24       ########       17.00.00       3       CA       6       0	mod       oy       osce       on       oy       osce       oy       osce       oy       oy	no       oy       oy <thoy< th="">       oy       oy       <tho< th=""><th>no       over       &lt;</th><th>no       oy       <th< th=""><th>no       op       op&lt;</th>       op       op&lt;</th<></th>       op       op&lt;</tho<></thoy<>	no       over       <	no       oy       oy <th< th=""><th>no       op       op&lt;</th>       op       op&lt;</th<>	no       op       op<	mo       oy       oy <th< th=""><th>no       oy       otce       nine       otc       o</th><th>Ind         oy         <thoy< th="">         oy         oy         oy&lt;</thoy<></th><th>Inc         Inc         Inc</th></th<> <th>Inc         oy         <thoy< th="">         oy         oy         oy&lt;</thoy<></th> <th>Ind         Ind         Ind<th>Inc         Inc         Inc<th>Inc         inc         inc<th>no         of         of&lt;</th>         of&lt;</th>         of&lt;</th>         of&lt;</th> of<	no       oy       otce       nine       otc       o	Ind         oy         oy <thoy< th="">         oy         oy         oy&lt;</thoy<>	Inc         Inc	Inc         oy         oy <thoy< th="">         oy         oy         oy&lt;</thoy<>	Ind         Ind <th>Inc         Inc         Inc<th>Inc         inc         inc<th>no         of         of&lt;</th>         of&lt;</th>         of&lt;</th> of<	Inc         Inc <th>Inc         inc         inc<th>no         of         of&lt;</th>         of&lt;</th> of<	Inc         inc <th>no         of         of&lt;</th> of<	no         of         of<	Inc         inc

Starting point End point

Magnitude

### Data Processing Flow

SuperMap

#### Import and append data

Mean center analysis

Connect Tornado center point

Symbolization

Trajectory visualization

#### Import and append data

Imp	ort Data							×
	🕞 •   🔟 🗹				Import CSV Fil	e		
1	Source File	Type CSV File	<ul> <li>Result Settings —</li> <li>Target Datasource:</li> </ul>	📊 Tornado	✓ Result D	ataset: 2009_to	rn	
2 3 4	2010_torn.csv 2011_torn.csv 2012_torn.csv	CSV File CSV File CSV File	Create Spati Transformation Pa Separator:	rameters	First	Row as Field Info		
5 6 7	2013_torn.csv 2014_torn.csv 2015_torn.csv	CSV File CSV File CSV File	om 1	yr 2009	mo 1	dy 3	date 2009-01-03	
8 9 10	2016_torn.csv 2017_torn.csv 2018_torn.csv	CSV File CSV File CSV File	2	2009	1	6	2009-01-06	· •
	-		Import Spatial D     WKT Field:     Ocordinate Lo     Source File Info:     Source Folder:     Characte	om ong slon D:\2. Work\Supe	✓ Latit S	at Alt	it 09_tori Prope	rties
	Auto close when finish		charset:		•	Im	port	Close

The data were in the csv format, we will import them as spatial data by set the longitude and lattitude coordinate



#### Import and append data

Dataset Append Row	×
Target Data     Datasource:     TornadoMig	ration - Dataset: • TornadoStartPoint -
Source Data	
	↑ ↓ <u>+</u>
Dataset	Datasources ^
1 :: T2009_torn	🗟 Tornado Migration
2 • T2010_torn	Tornado Migration
3 • T2011_torn	TornadoMigration
4 • T2012_torn	TornadoMigration
5 • T2013_torn	Tornado Migration
6 • T2014_torn	Tornado Maration
7 • T2015_torn	TornadoMigration 🗸
Save New Fields	OK Cancel

T\_2009 T\_2010 T\_2011 T\_2012 T\_2013 T\_2014 T\_2015 T\_2016 T\_2017 T\_2018 T\_2019



**Tornado Starting Point** 



#### Import and append data



Tornado Starting Point visualize in the form of points



Output Window Task Management

#### Mean Center Analysis



The Mean Center function can be used to identify the center of density of a set of core elements, namely the geographic average center.

$$\bar{X}_w = \frac{\sum\limits_{i=1}^n w_i x_i}{\sum\limits_{i=1}^n w_i} \quad , \quad \bar{Y}_w = \frac{\sum\limits_{i=1}^n w_i y_i}{\sum\limits_{i=1}^n w_i}$$

X = Longitude Y = Latitude W = weight



#### Mean Center Analysis



2

Magnitude will be act as weight value



#### Mean Center Analysis



F	ResultMear	nCenter@TornadoN	ligration $ imes$ Sta	te_R@TornadoMig	ration Start T	ab	
	No	SmID	SmUserID	SmGeometry	Month_Group	Magnitude_Sum	
Þ	1	1	0	BinaryData	1	319	
	2	2	0	BinaryData	2	435	
	3	3	0	BinaryData	3	515	
	4 4		0	BinaryData	4	1,718	
	5	5 0		BinaryData	5	694	
	6	6	0	BinaryData	6	793	
	7	7 0		BinaryData	7	372	
	8	8 8 0		BinaryData	8	202	
	9	9 9		BinaryData	9	177	
	10	10	0	BinaryData	10	333	
	11	11	0	BinaryData	11	452	
	12	12	0	BinaryData	12	310	



#### **Connect Tornado Center Point**



The point to line feature will allow you to get the connection line between each point, SmUsersID will be act as the connector function

MajpDesign

You need to draw the last line by your own



#### **Symbolization**





#### Different color for each month

4

Use expression = Magnitude\_Sum/60+8



#### **Symbolization**



Add the number of month on each tornado center point





 $\times$ 

#### **Trajectory Visualization**

Imp	port Data									×
	ì ⊑•   ĪŪ   🗹 🗹					Import CSV Fil	e			
	Source File	Туре		Result Settings —						
1	2009_torn.csv	CSV File	Т	larget Datasource:	📊 Tornado	✓ Result D	ataset: 2009	_torn		
2	2010_torn.csv	CSV File		Create Spati						
3	2011_torn.csv	CSV File		Too of compliant De						
4	2012_torn.csv	CSV File	c	eparator	ameters					
5	2013_torn.csv	CSV File		,		✓ First	Row as Field Ir	nto		
6	2014_torn.csv	CSV File		om	yr	mo	dy	d	date	^
7	2015_torn.csv	CSV File			2009	1	3	20	009-01-03	
8	2016_torn.csv	CSV File		2	2009	1	6	20	009-01-06	<b>T</b> .    .
9	2017_torn.csv	CSV File		<						<b>`</b>
10	2018_torn.csv	CSV File		_						-
				Import Spatial D	ata					
			0	🔵 WKT Field:	om	~		_		
			0	Coordinate Lo	ong elon	✓ Latit el	at 🔹	Altit		-
			s	Source File Info: — Source Folder: Charset:	D:\2. Work\Super	rMap\Technical\SM	C Webinar\Data	a\2009_t	Proper	ties
	Auto close when finish							Import	t C	lose

Dataset Append Row Target Data TornadoMigration Dataset: TornadoEndPoint Datasource: -Source Data 🛱 🗹 🖾 🔟 🛧 🕇 🕇 🛨 Datasources Dataset 🔒 TornadoMigration C TornadoStartPoint Save New Fields OK Cancel

Import the tornado csv data with end point information

Append the end point and start point into one dataset => Tornado migration





#### **Trajectory Visualization**

Poin	t->Line						×
C7		Durified Setting	15				
	Source Dataset	Datasource	Result Datasou	Result Dat	Connection F	Sort Field	Sort Type
1	TornadoEnd	TomadoMigr	TornadoMigr	TornadoEn	SmUserID	SmID	Sort Ascending
	uto dose when fini	sh				Conve	rt Close

Convert the Tornado Migration point into line with SmUserID as the connector









Tornado Mapping – Tutorial Video



https://youtu.be/YkfN-LepKn8

**Download material** bit.ly/SMCweb\_material

If you succesfully got the result, kindly share yours to this link

bit.ly/SMCweb\_submission1

Participant who send their submission will get certificate from us!

#### SuperMap

#### SuperMap SuperMap

☆ Discover your GIS Skills.
☆ Opportunities for Prizes, Bonus & Internship.

Category:

•Mapping •Development •Application Analysis •Paper

Register Now! www.giscontest.com/en ↔



For students :

- Undergraduates
- Postgraduates
- PhDs students

Category :

- Mapping
- Development
- Aplication Analysis
- Paper

Further information please visit



http://www.giscontest.com/en/



## Thank you!

Further information you can reach us by email at global@supermap.com

Or visit supermap.com/en