

Teacher Guide Mid-Latitude Cyclones and Climate Change

Developed by: David Burch

Activity Focus: Students view background data about mid-latitude storms (blizzards and tornadoes); they analyze historical data concerning the frequency and intensity of these events; they look at IPCC projections for the 21st century.

Major Concepts:

- Tornadoes and blizzards are the most violent and deadly mid-latitude storms
- Current studies on global climate change indicate possible changes in intensity and frequency of mid-latitude storms

Objectives: After completing this activity, students will be able to:

- Describe tornadoes and blizzards
- Locate mid-latitudes on the earth
- Interpret the Fujita Scale
- Project possible mid-latitude storm scenarios for the 21st century

Materials and Preparation: You will need to prepare the following materials before conducting this activity.

- Copy the *Mid-Latitude Cyclones and Climate Change* activity (make 1 copy per student).
- Make a transparency or PowerPoint slide for each data set (appendix) for use in the class discussion. You may want to make a color copy of the data set for groups of students.
- In 2007, scientists developed an Enhanced Fujita Scale; this is not mentioned in student textbooks, but some may be interested in the change. The data table is included at the end of this document.

Procedures: Students may work individually or in small groups (2-4 students) to complete this activity.

1. Introduce the activity by projecting pictures of tornadoes and blizzards (the ones included in the appendix, or others). Ask the class if anyone can relate a personal story about either blizzards or tornadoes. Discuss the danger and damage resulting from each storm.
2. Organize students into small groups of 2-4 or have students work independently on completing the rest of the activity. If students are working in small groups, have them read and discuss each question as a group before recording a consensus response.

Bibliography

The Science of Global Climate Change

<http://www.geocities.com/csango80/gwweb02.htm>

Effects of future climate change on regional air pollution episodes in the United States

<http://www.agu.org/pubs/crossref/2004/2004GL021216.shtml>

Frequency of winter storms in Canada

http://www.colorado.edu/geography/blanken/GEOG%206181%20Fall%202003/noble/pages/Clim_change.html

Effects of future climate change on regional air pollution episodes in the United States

<http://www.as.harvard.edu:16080/chemistry/trop/publications/mickley2004b.abs.html>

Air Quality Degradation due to Greenhouse Warming Decreasing the Frequency of Mid-latitude Cyclones, Eric M. Leibensperger

http://www-as.harvard.edu/chemistry/trop/presentations/powerpoints/eml2007/epa_leibensperger_feb07.ppt

Climate Impacts in New York City: Sea Level Rise and Coastal Floods

<http://icp.giss.nasa.gov/research/ppa/2002/impacts/introduction.html>

Future Weather

http://www.globalchange.umich.edu/globalchange1/current/lectures/samson/weather_patterns/index.html

Tornado Characteristics

<http://www.ux1.eiu.edu/~cfrlw/T2k/Unit4/torend.html>

The Tornado Project

<http://www.tornadoproject.com/toptens/toptens.htm#top>

Trends in Blizzards at Selected Locations in the Canadian Prairies

<http://www.ingentaconnect.com/content/klu/nhaz/2003/00000029/00000002/05095393?crawler=true>

The Effect of Climate Change on Tornado Frequency and Magnitude

<http://jrscience.wcp.muohio.edu/studentresearch/climatechange02/tornado/website/tornado.html>

Storm Events Database

<http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>

Internet Weblinks for storms

http://www.physicalgeography.net/weblinks_ch7.html

Storms and Climate Change

<http://www.realclimate.org/index.php?p=140>

GlobalWarming Awareness

<http://www.aglobalwarmingawareness2007.com/Globalwarmingawareness2007-articles/category/climate-modelling/>

Likelihood of Increased Mid-Latitude Storms

http://grida.no/climate/ipcc_tar/wg2/036.htm

Mid latitude cyclones and weather extremes

www.uib.no/People/gbsag/stormtracks.html

Enhanced Fujita Scale

<http://www.spc.noaa.gov/efscale/ef-scale.html>

<http://www.spc.noaa.gov/efscale/>

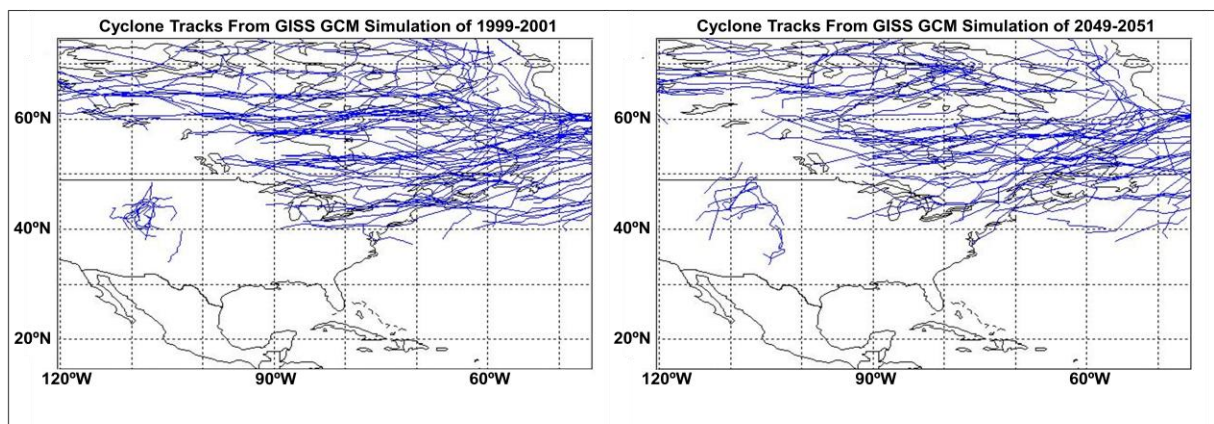
Photos of tornado damage

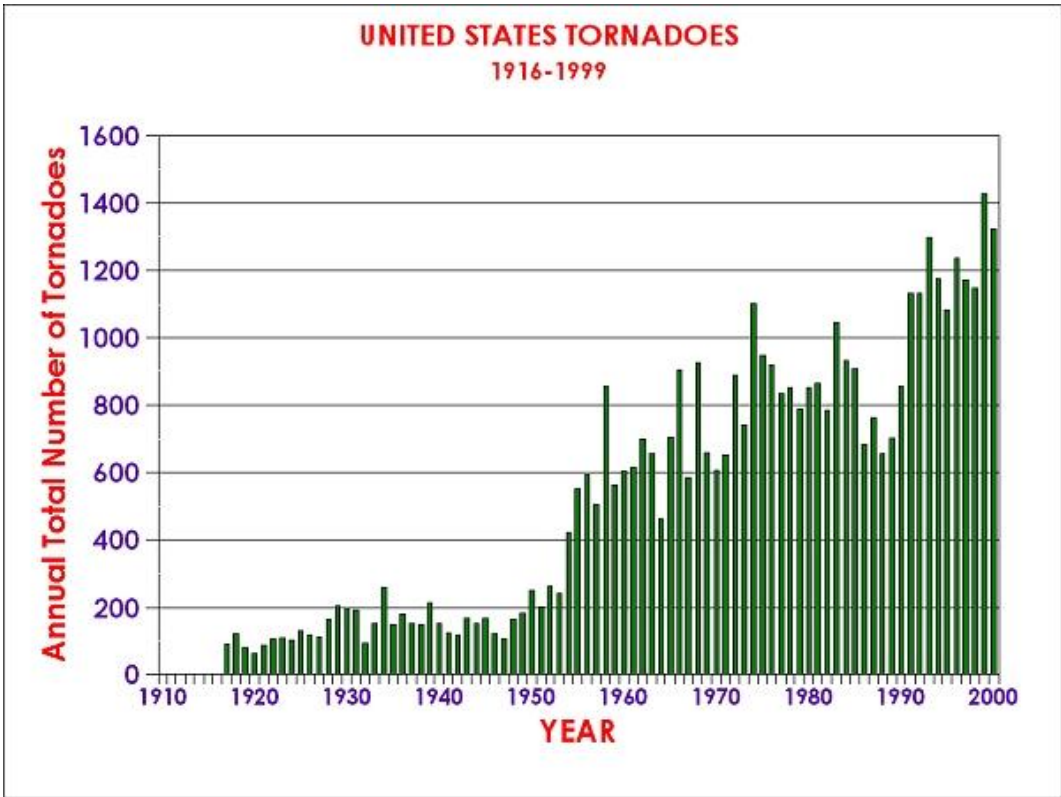
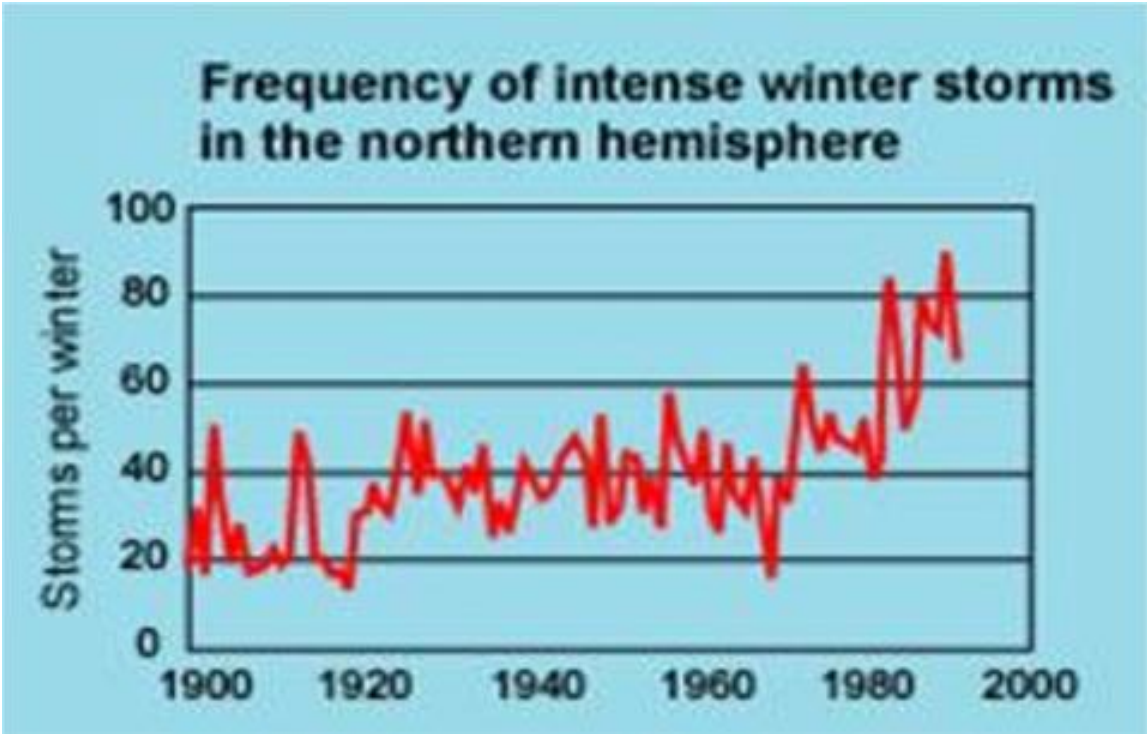
<http://www.spc.noaa.gov/efscale/ef-ttu.pdf>

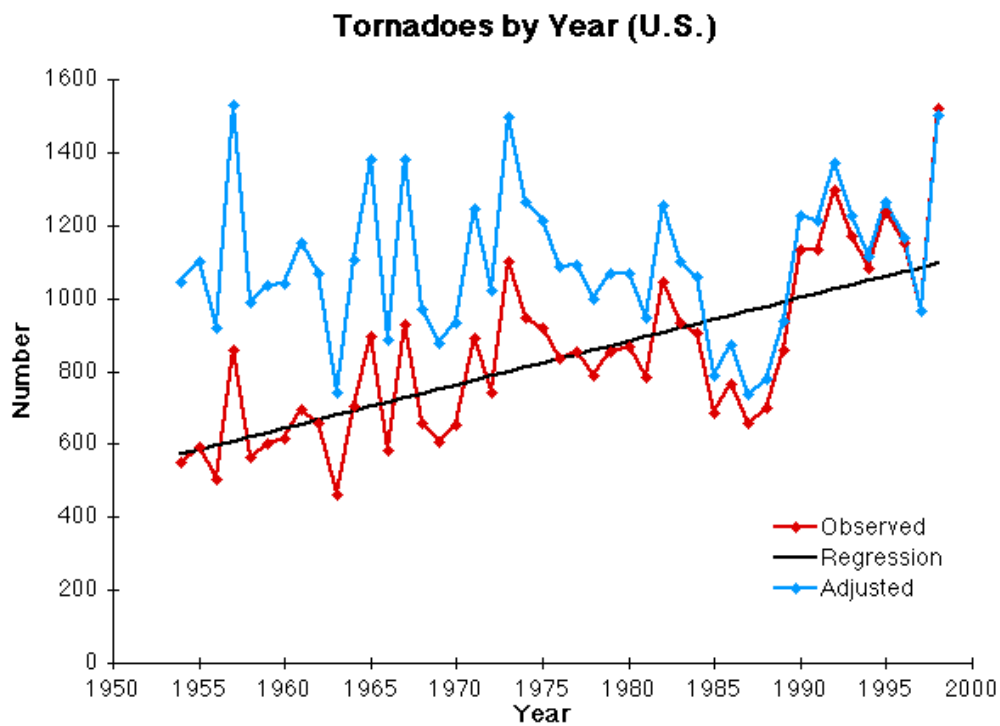
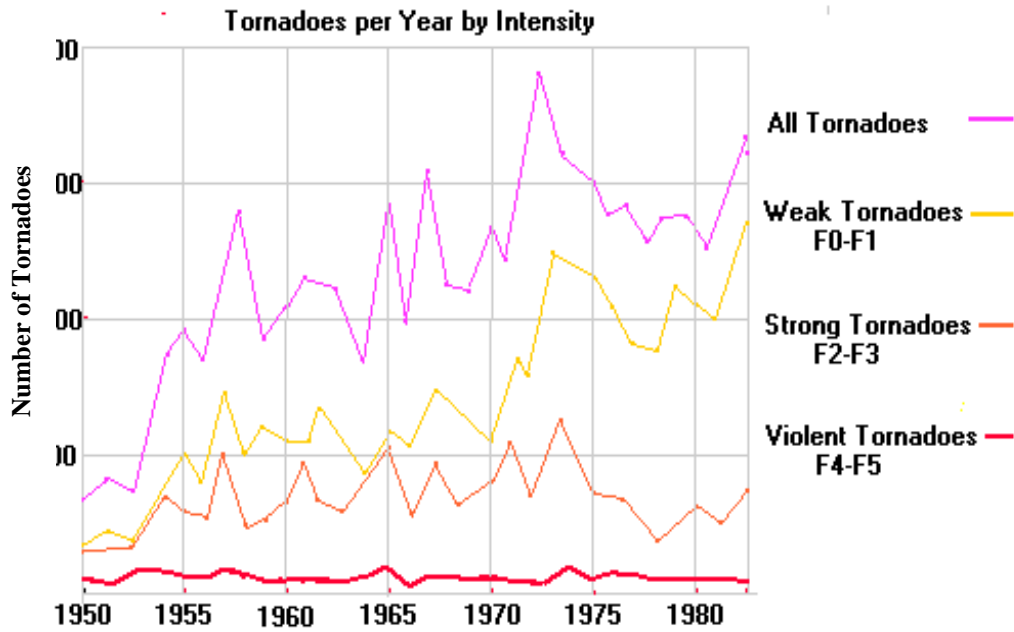
Appendix:

Top 10 Killer Tornadoes in the US (Source: The Tornado Project)

Rank	State(s)	Date	Time	Dead	Injured	F-Scale	Town(s)
1	MO-IL-IN	March 18, 1925	1:01PM	695	2027	F5	Murphysboro, Gorham, DeSoto
2	LA-MS	May 7, 1840	1:45 PM	317	109	F?	Nachez
3	MO-IL	May 27, 1896	6:30PM	255	1000	F4	St. Louis, East St. Louis
4	MS	April 5, 1936	8:55 PM	216	700	F5	Tupelo
5	GA	April 6, 1936	8:27 AM	203	1600	F4	Gainesville
6	TX-OK-KS	April 9, 1947	6:05 PM	181	970	F5	Glazier, Higgins, Woodward
7	LA-MS	April 24, 1908	11:45AM	143	770	F4	Amite, Pine, Purvis
8	WI	June 12, 1899	5:40PM	117	200	F5	New Richmond
9	MI	June 8, 1953	8:30 PM	115	844	F5	Flint
10	TX	May 11, 1953	4:10PM	114	597	F5	Waco







Fujita-Scale Number	Intensity Phrase	Wind Speed
F0	Gale tornado	40-72 mph
F1	Moderate tornado	73-112 mph
F2	Significant tornado	113-157 mph
F3	Severe tornado	158-206 mph
F4	Devastating tornado	207-260 mph
F5	Incredible tornado	261-318 mph
F6	Inconceivable tornado	319-379 mph



www.theinsurancepolicy.com/consumers/tornadoes/



Greg Glaser

http://www.waco-texas.com/city_depts/fire/emtips



www.livejournal.com/.../wichitalife/51336.html



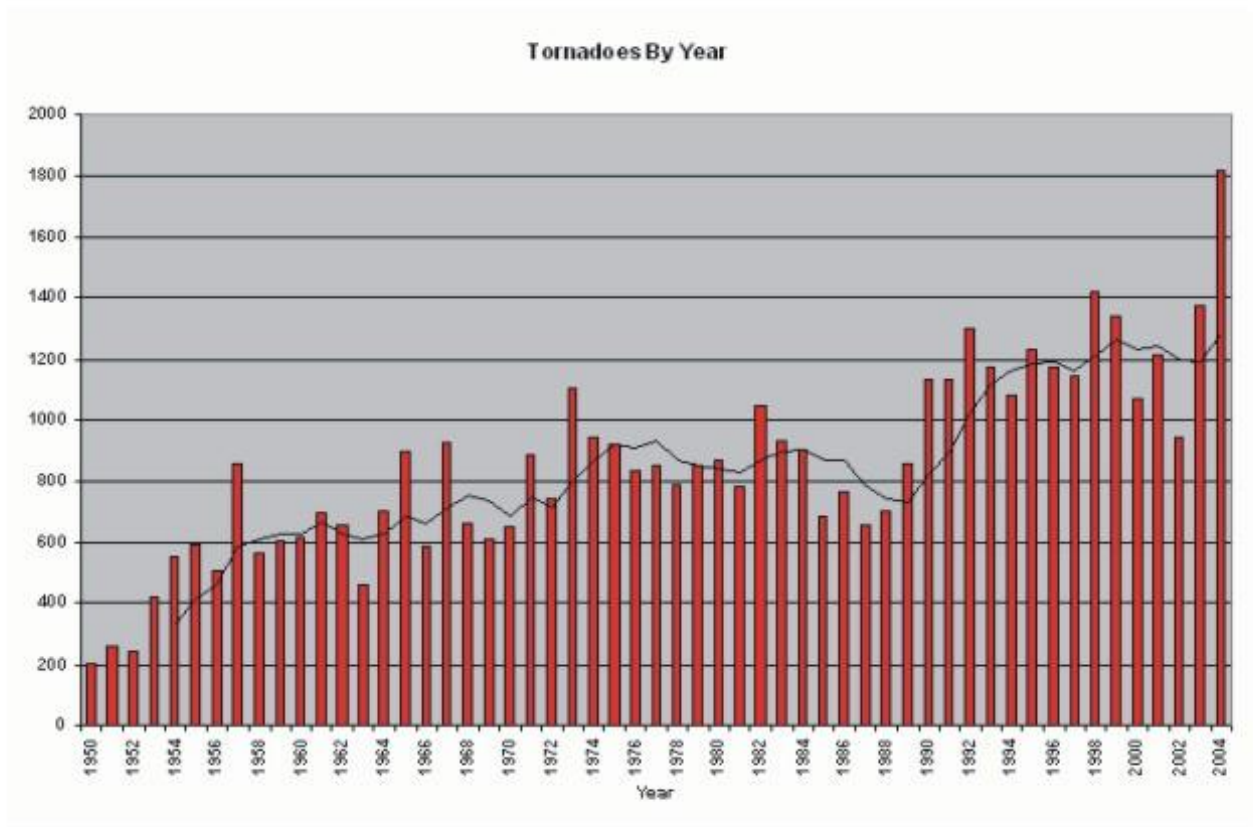
library.thinkquest.org/.../blizzard.htm



www.northshorewx.com



larc.hamgate.net/blizzard_of_1977.htm



<http://www.spc.noaa.gov/efscale/torn5004.jpg>

FUJITA SCALE			DERIVED EF SCALE		OPERATIONAL EF SCALE	
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

<http://www.spc.noaa.gov/efscale/ef-scale.html>

The Enhanced Fujita Tornado Scale

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<http://lwf.ncdc.noaa.gov/oa/satellite/satelliteseye/educational/fujita.html>