April 27, 1976

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL WEATHER SERVICE
National Severe Storms Forecast Center
Room 1728 Federal Building
601 E. 12th Street
Kansas City, MO 64106

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Mr. Robert Abbey, Jr.
Site Safety Research Branch
Office of Nuclear Regulatory Research
Nuclear Regulatory Commission
Washington, DC 20555

Subject: Background Information on NSSFC Data Tapes for Tornadoes

Dear Bob:

The SELS Unit of NSSFC has been archiving the date, year, time, latitude/longitude of tornadoes since 1952. This log, hereafter referred to as the rough log, also contains all available data on wind gusts exceeding 50 knots and hail 3/4 inch or larger. The rough log has always been prepared in real time as events are reported to NSSFC via teletype circuits.

Until 1968 the rough log was never filtered for duplicate or erroneous reports, and each tornado event was treated as a point phenomena rather than a swath. Thus, the same tornado might have been reported ten different times along a 100 mile path and treated as if it were 10 tornadoes rather than just one long tracked storm. Also, before 1968 no effort was made to achieve consistency with the annual totals published in STORM DATA. As a result, when the Pautz paper came out, the rough log showed approximately 30% higher frequency of tornadoes than the official United States frequencies as tabulated by EDS.

About that same time, it became apparent that the hail reporting procedures were heavily biased towards metropolitan areas, especially when there was an active NWS office in the area. The Pautz study showed the highest hail frequency for the country in the Kansas City area, only because every off-duty forecaster would telephone in his report to the SELS Unit. The wind damage category, while less biased than the hail, was still very much dependent upon the population density and proximity to a nearby NWS office. As a result, the decision was made to withhold the hail and wind damage data from research groups because of the intense noisiness, and to make every effort to insure that the tornado data was "clean"-before distribution.

Beginning in 1968, and working both forwards and backwards in time, each tornado report was compared with the EDS publication STORM DATA, and with the surface and radar reports available at the time. A copy of the input information was sent to the State Climatologist for verification, and if he unilaterally dropped it from his listing, it was dropped from the smooth SELS Log. At the same time, we went on an intensive effort to improve the

reported location so that beginning and end points of the tornado could be specified to the nearest degree and minute, rather than merely the initial touchdown point to the nearest degree and tenths of degree as it had been. We solicited the help of the State Climatologist as to the type of path, physical characteristics, death, injury and damage breakdowns by county, and beginning in 1971, the FPP scale estimates. The format is computer compatable.

Thus, at the end of each month there is a discussion with the responsible officials at the National Climatic Center in Asheville as to how many tornadoes, how many fatalities, how many crossed state lines, etc. There is 100 percent agreement between NCC and NSSFC, and we have worked backwards to 1949.

There are a few qualifying remarks about the history tapes. In many of the midwestern states west of 95 degrees longitude, the population density is low. The land is fairly flat and mainly in crops such as wheat, corn, beets or in grazing land. It has been very difficult to obtain quality data from many parts of the Dakotas, Nebraska, Western Kansas, Eastern Wyoming and Colorado, and parts of Texas. It is quite possible that there are many more small tornadoes in this area, but if there is nothing to destroy, the odds are against hearing about them are slight. Our efforts to obtain reasonable FPP estimates have been marginal there for many of the same reasons.

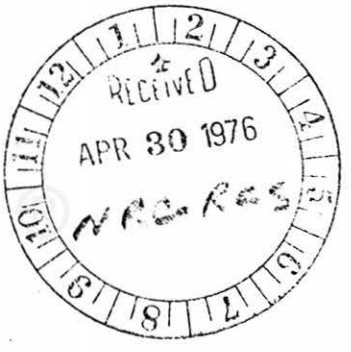
But what is archived is the best collection available anywhere. It is at least in order of magnitude better than STORM DATA.

There are scores of errors there that are never corrected since it is an unedited publication. The data for older years continues to be improved each year through the help of WSFO's, Universities, and in-house programs which utilize news clippings.

From this has come the smooth log, which has been filtered at least three times for errors. This is the only log that NSSFC will distribute. However, much of the historical record is not completed. The purpose of this proposal is to fill in these gaps and to make the smooth log as comprehensive as is possible.

Sincerely yours,

Allen Pearson
Director, NSSFC



· FOURIER ANALYSIS FOR 45 YEAR PERIOD (Units are in statute miles)

FOR THE X POINTS:

	BEGINNING POINT (AVE)	END POINT (AVE)	MEAN	AMP.	PHASE ANGLE (rec X)	B COEF (SIN)	A COEF (COSINE)
1	1916-1925	1960-1969	-13.606	40.529	10.997	39.911	7.053
2	1917-1926	1961-1970	-13.482	40.573	10.954	38.506	12.785
3	1918-1927	1962-1971	-13.195	40.758	10.858	36.272	18.588
4	1919-1928	1963-1972	-12.486	41.423	10.640	33.135	24.859
5	1920-1929	1964-1973	-11.973	42.047	10.500	29.210	30.244
	1921-1930	1965-1974	-10.864	43.671	10.248	24.408	36.213

0.93

90°10' − 11.6' = 89°48.4'

FOR THE Y POINTS:

1916-1925	1960-1969	23.591	94.363	40.324	-67.200	66.247
1917-1926	1961-1970	24.069	95.037	40.375	-75.899	57.196
1918-1927	1962-1971	23.845	94.768	40.348	-83.058	45.633
1919-1928	1963-1972	24.403	95.311	40.422	-88.756	34.735
1920-1929	1964-1973	25.030	95.774	40.509	-92.901	23.286
1921-1930	1965-1974	25.744	96.132	40.612	-95.436	11.544

1.15 +22.3' 36°22.3'

NOTE (*) These are units reckoned from point #1 which is designated as the period 1916-1925, point #2 then designates the period 1917-1926; point #3 designates the period 1918-1927, etc.

VARIANCE & STD DEVIATION FOR FOURIER COMPUTED

BEGINNING POINT (AVE)	END POINT (AVE)	X-VALUES VARIANCE	X-VALUES STD. DEV.	Y-VALUES VARIANCE	Y-VALUES STD. DEV.
1916-1925	1960-1969	821.48 sq. mls	28.65 mls	4452.29 sq. mls	66.7 mls
1917-1926	1961-1970	829.03 "	28.79 "	4515.95 sq mls	67.2 mls
1918-1927	1962-1971	830.73 "	28.83 "	4488.03 sq mls	67.0 mls
1919-1928	1963-1972	857.85 "	29.31 "	4542.45 sq. mls	67.4 mls
1920-1929	1964-1973	884.05 "	29.73 "	4587.37 sq. mls	67.7 mls
1921-1930	1965-1974	952.12 "	30.85 "	4620.88 sq. mls	68.0 mls

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36
54

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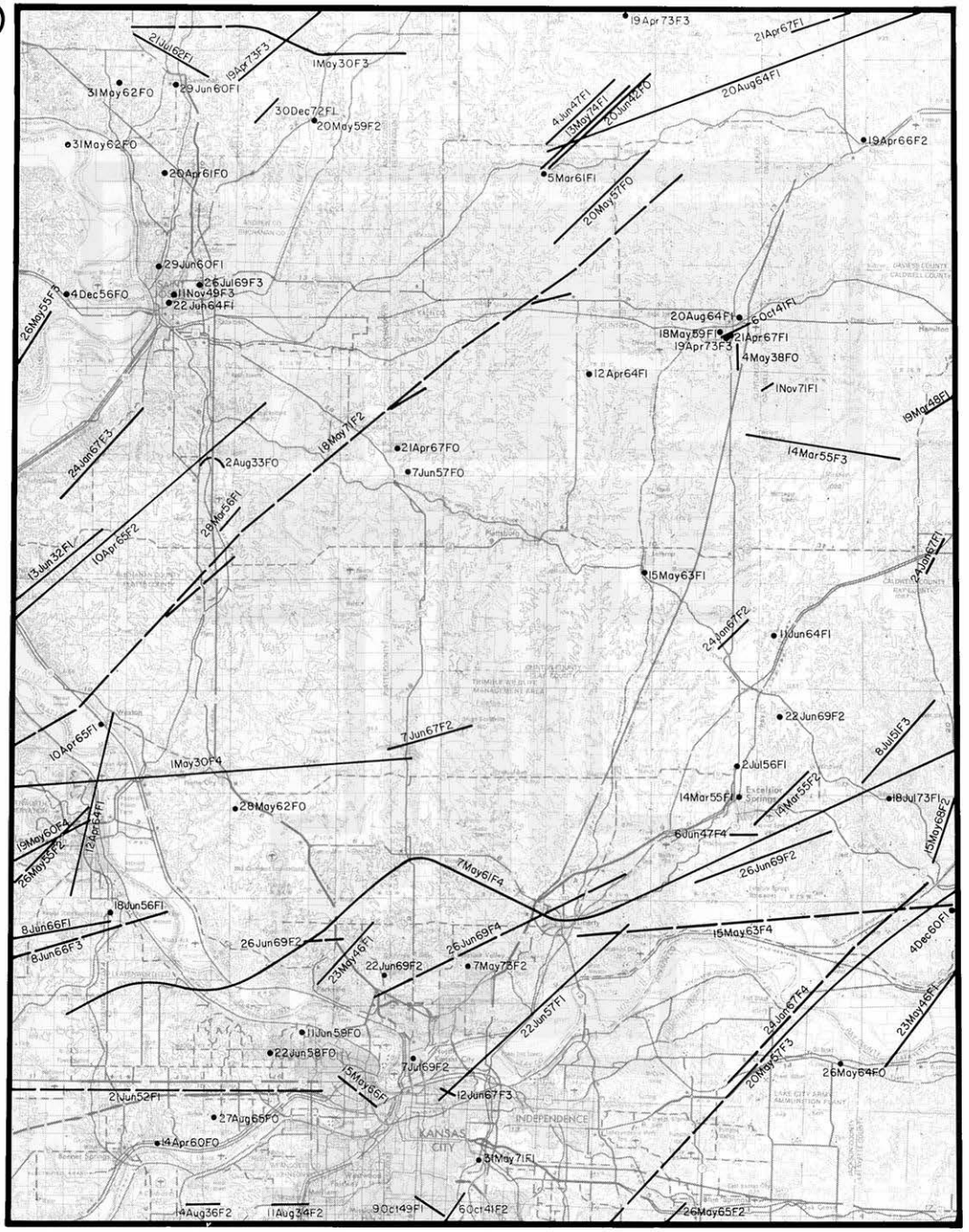
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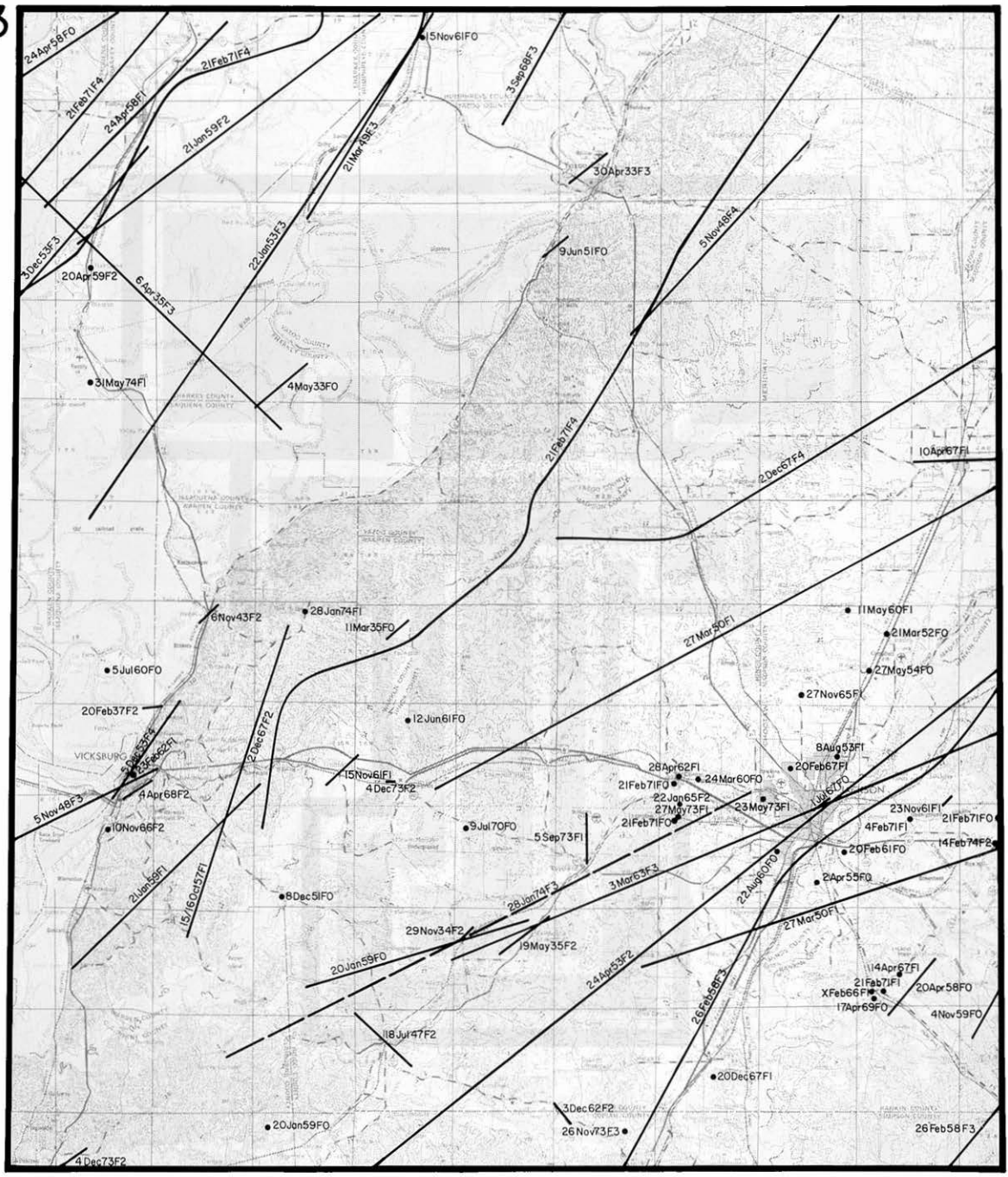
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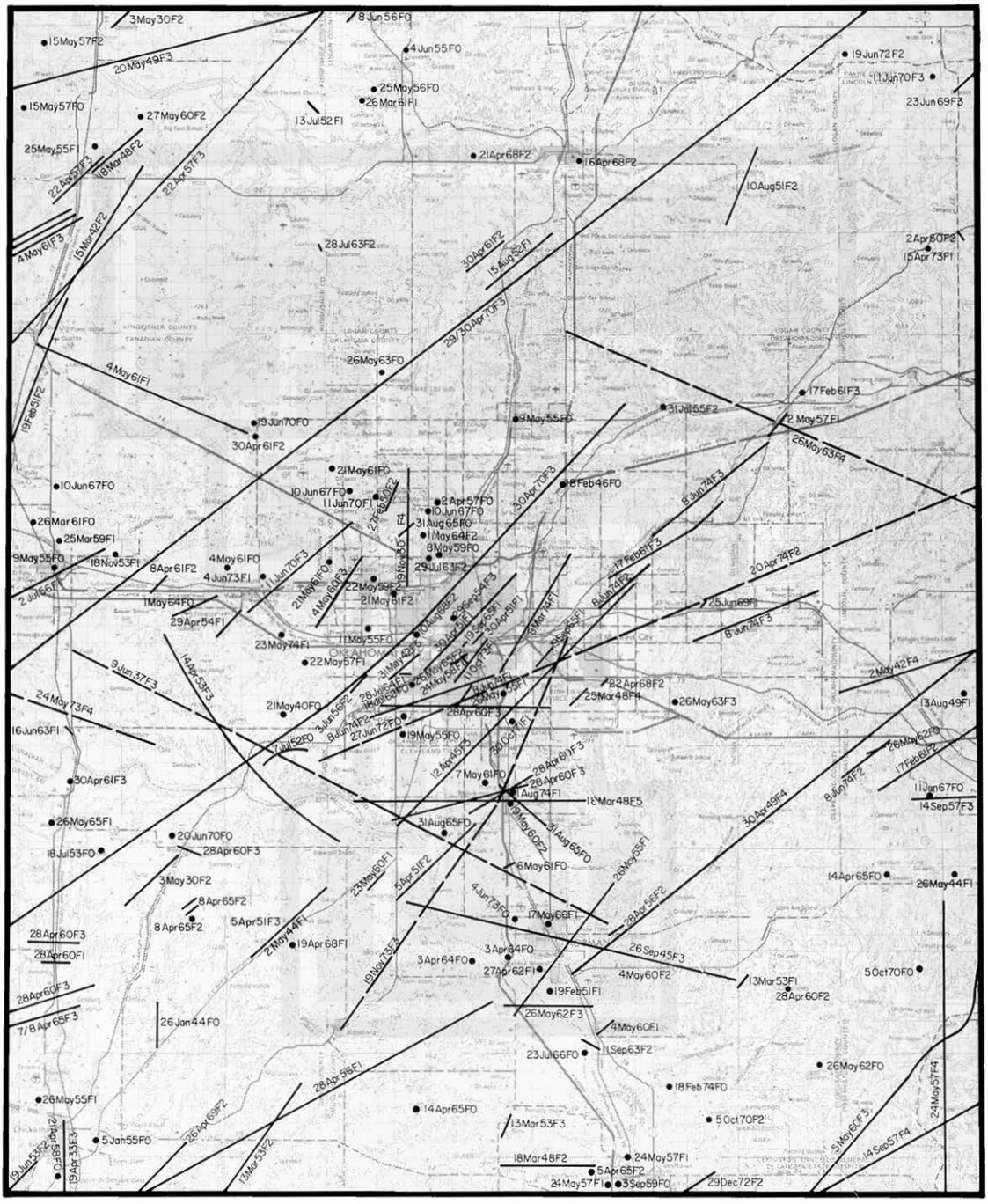
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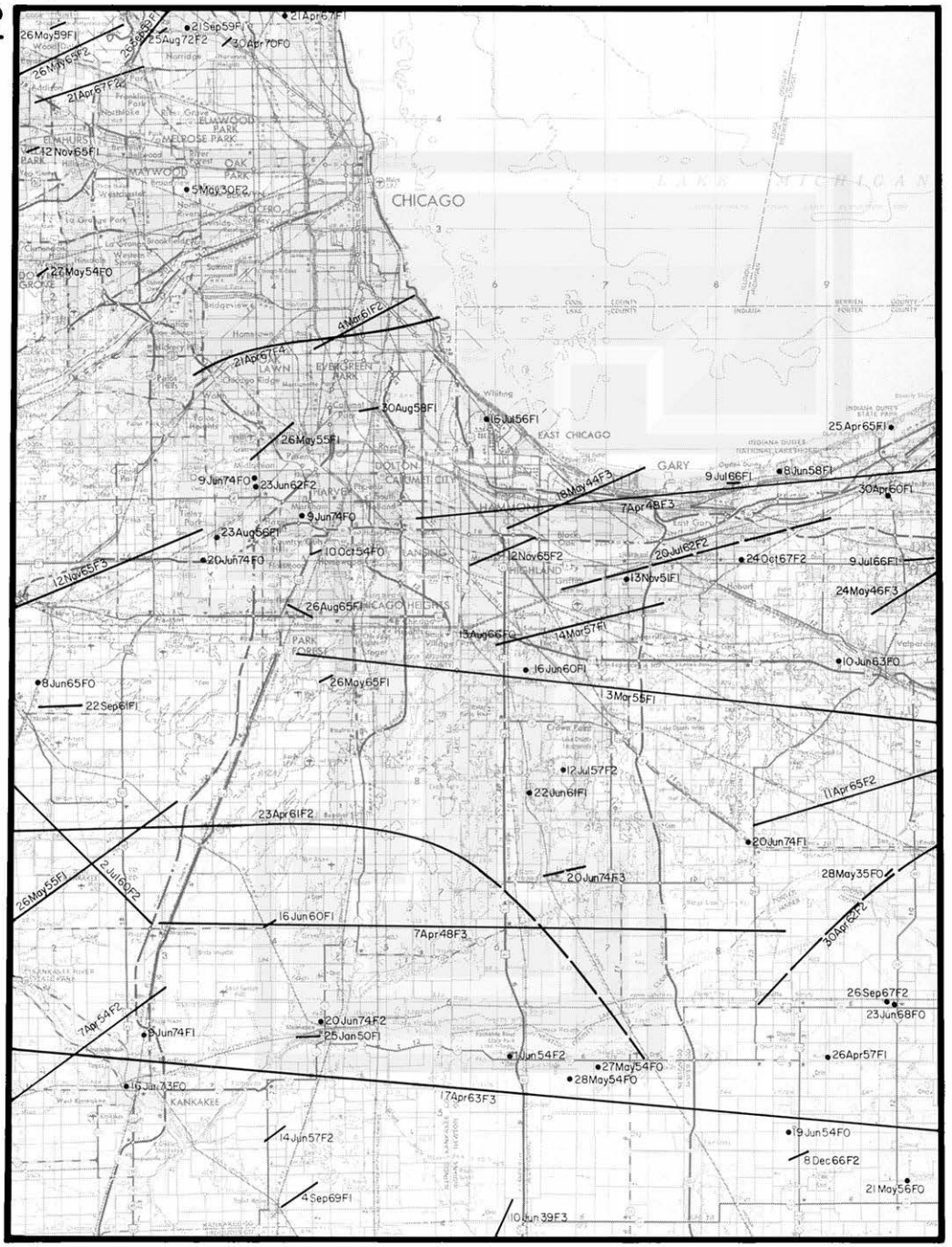
26May65F1
31Aug65F0
20Jun70F0
18Jul53F0
28Apr60F3
6May61F0
14Apr65F0
26May44F1
3May30F2
8Apr65F2
5Apr51F3
8Apr65F2
2May44F1
19Apr68F1
28Apr60F3
28Apr60F1
3Apr64F0
27Apr62F1
26Sep45F3
4May60F2
13Mar53F1
28Apr60F2
50ct70F0
19Feb51F1
28Apr60F3
7/8Apr65F3
26Jan44F0
26May62F3
4May60F1
23Jul66F0
11Sep63F2
26May62F0
18Feb74F0
26May55F1
26Apr56F1
14Apr65F0
13Mar53F3
50ct70F2
5Jan55F0
18Mar48F2
24May57F1
5Apr65F2
24May57F1
3Sep59F0
29Dec72F2

88

42

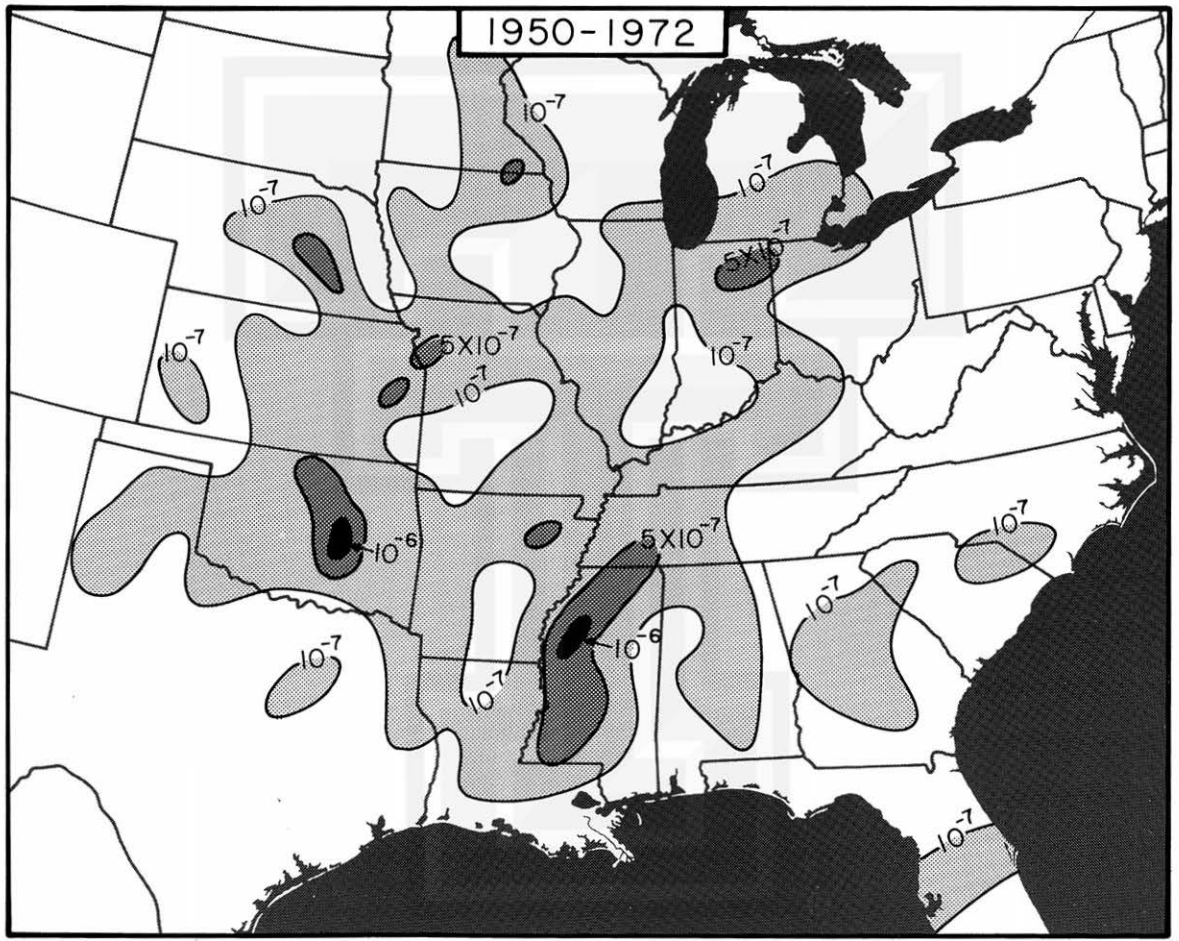

CHICAGO
GARY
EAST CHICAGO
26May59F1
21Sep59F1
25Aug72F2
30Apr70F0
21Apr67F2
12Nov65F1
5May30F2
27May54F0
4Mar61F2
21Apr61F4
30Aug58F1
16Jul56F1
26May55F1
9Jun74F0
23Jun62F2
9Jun74F0
23Aug56F1
20Jun74F0
10Oct54F0
12Nov65F3
26Aug65F1
8Jun65F0
22Sep61F1
26May65F1
16May44F3
7Apr48F3
12Nov65F2
13Nov51F1
20Jul62F2
24Oct67F2
9Jul66F1
8Jun58F1
9Jul66F1
30Apr60F1
25Apr65F1
24May46F3
10Jun63F0
13Aug66F0
14Mar57F1
16Jun60F1
3Mar55F1
12Jul57F2
22Jun61F1
11Apr65F2
20Jun74F1
28May35F0
30Apr62F2
26Sep67F2
23Jun68F0
26Apr57F1
23Apr61F2
26May55F1
2Jul60F2
16Jun60F1
7Apr48F3
7Apr54F2
9Jun74F1
20Jun74F2
25Jan50F1
20Jun74F3
11Jun54F2
27May54F0
28May54F0
16Jun73F0
17Apr63F3
19Jun54F0
8Dec66F2
21May56F0
14Jun57F2
4Sep69F1
10Jun39F3

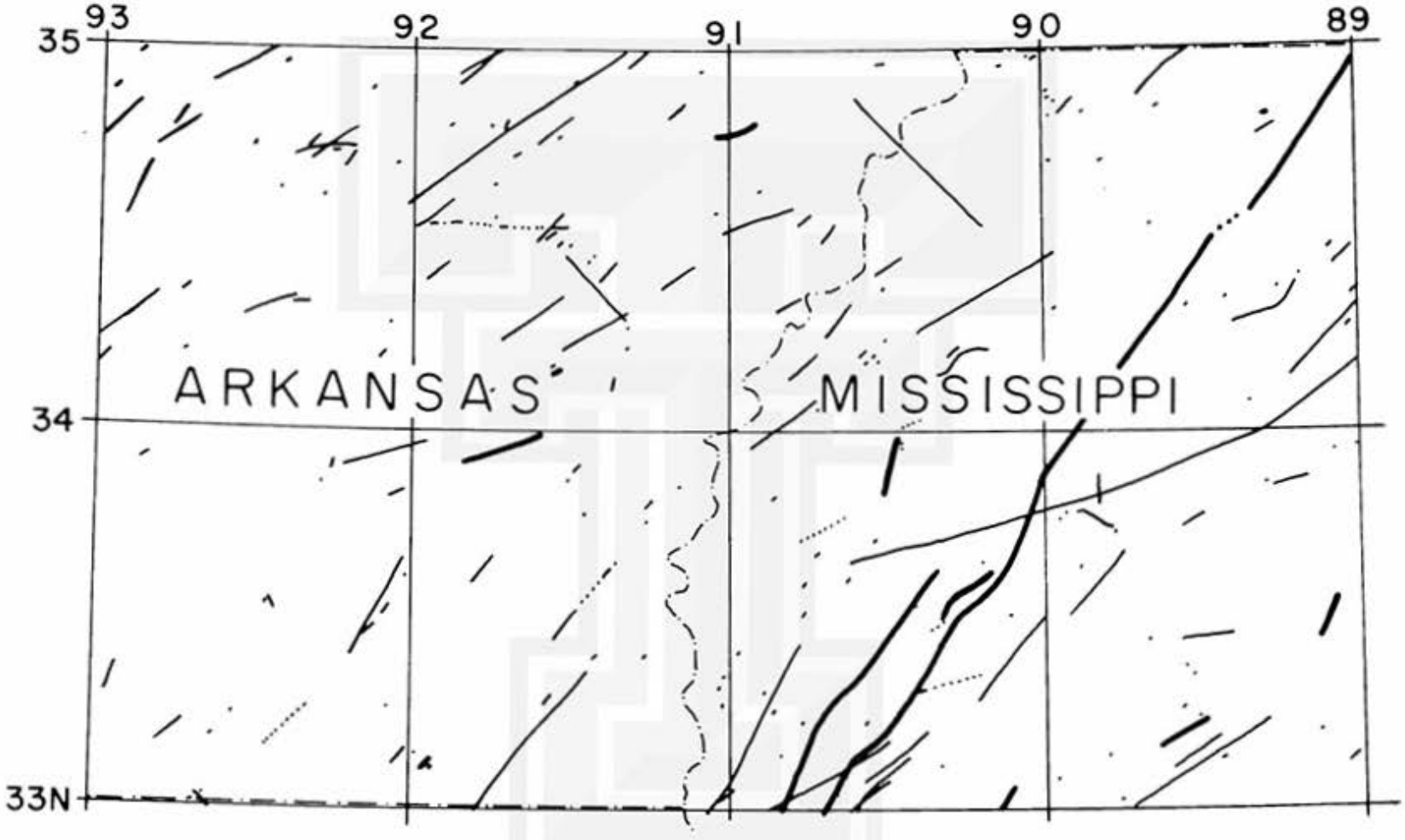
Number of tornadoes per F-scale rating per 1° square, 1950-1972

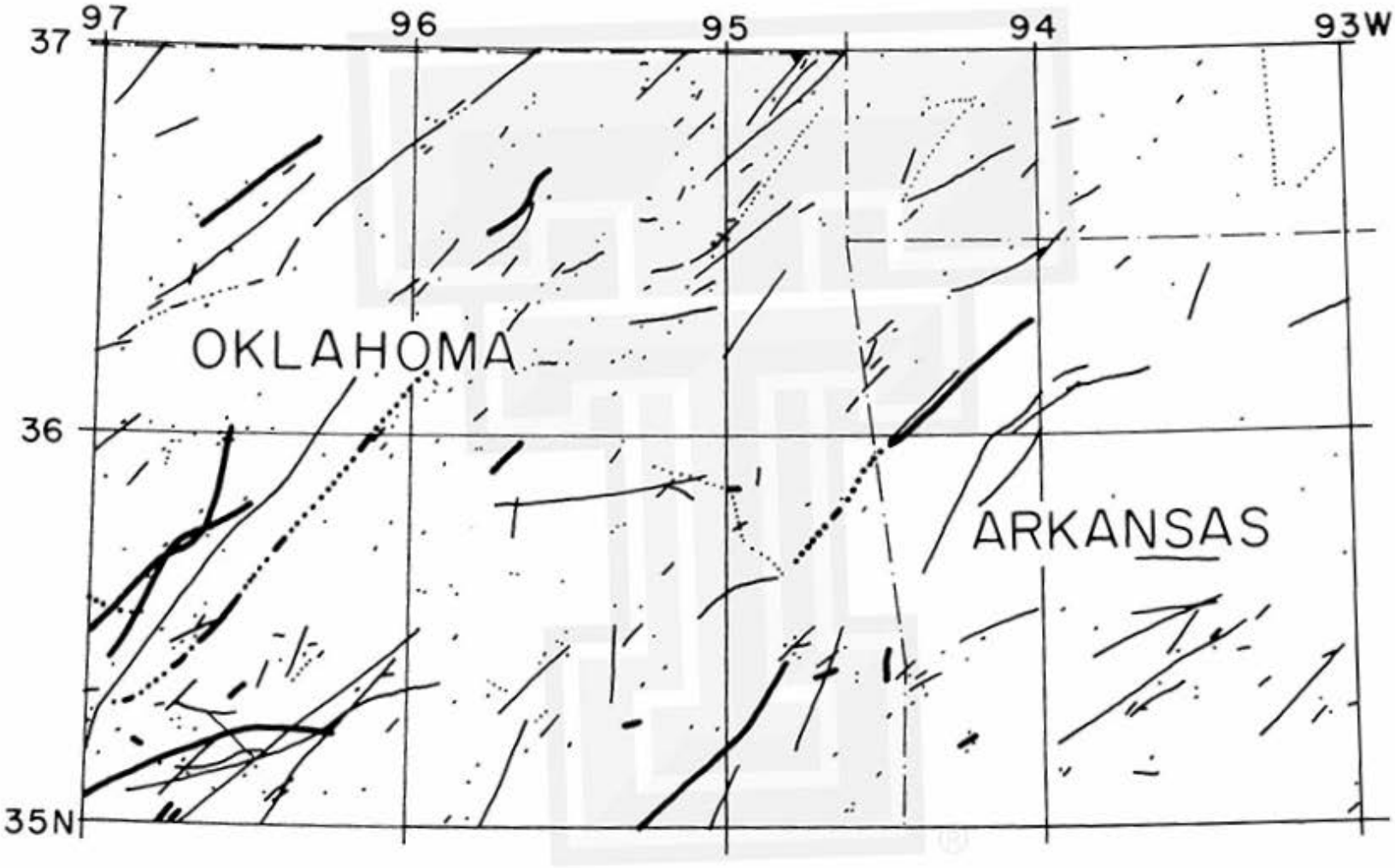
LEGEND

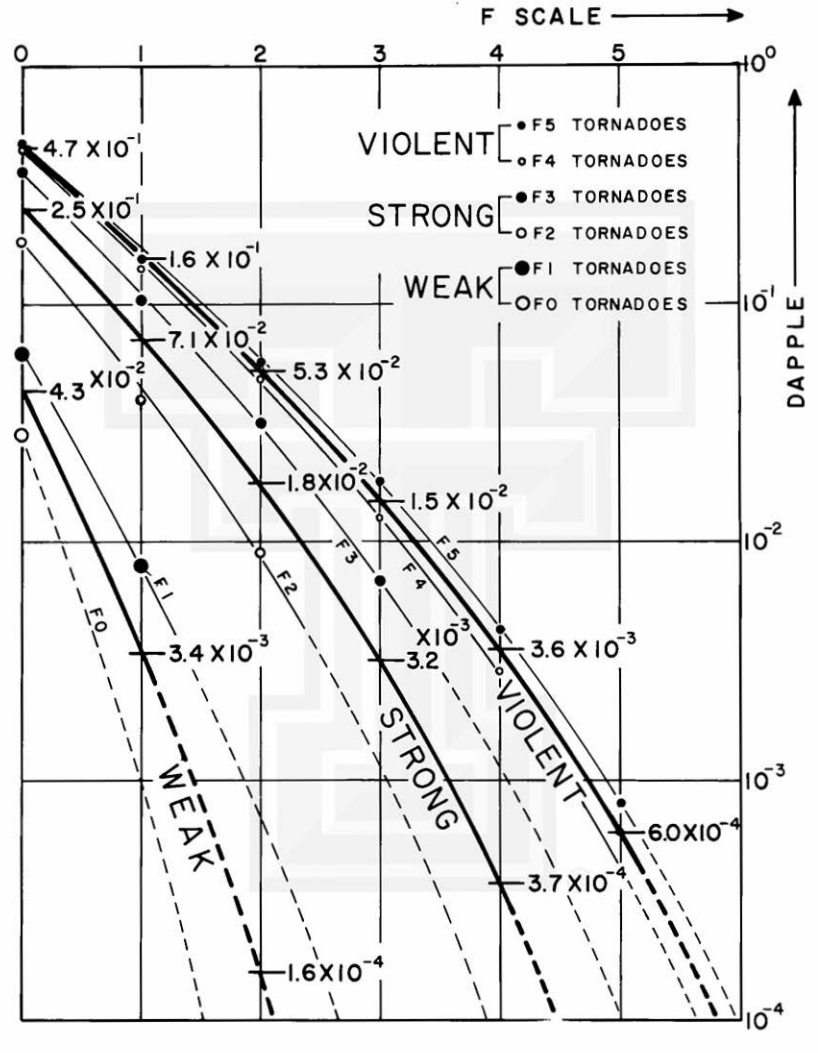
F4	F5
F2	F3
F0	F1

R Abbey


1950-1972
10^{-7}
10^{-7}
10^{-7}
$5X10^{-7}$
10^{-7}
$5X10^{-7}$
10^{-7}
10^{-7}
10^{-6}
$5X10^{-7}$
10^{-7}
10^{-7}
10^{-6}
10^{-7}
10^{-7}
10^{-7}


93
92
91
90
89
35
34
33N
ARKANSAS
MISSISSIPPI


97
96
95
94
93W
37
36
35N
OKLAHOMA
ARKANSAS


F SCALE
0
1
2
3
4
5
DAPPLE
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
VIOLENT
F5 TORNADOES
F4 TORNADOES
STRONG
F3 TORNADOES
F2 TORNADOES
WEAK
F1 TORNADOES
F0 TORNADOES
4.7×10^{-1}
2.5×10^{-1}
1.6×10^{-1}
7.1×10^{-2}
5.3×10^{-2}
4.3×10^{-2}
1.8×10^{-2}
1.5×10^{-2}
3.4×10^{-3}
3.2×10^{-3}
3.6×10^{-3}
6.0×10^{-4}
3.7×10^{-4}
1.6×10^{-4}
F0
F1
F2
F3
F4
F5
WEAK
STRONG
VIOLENT