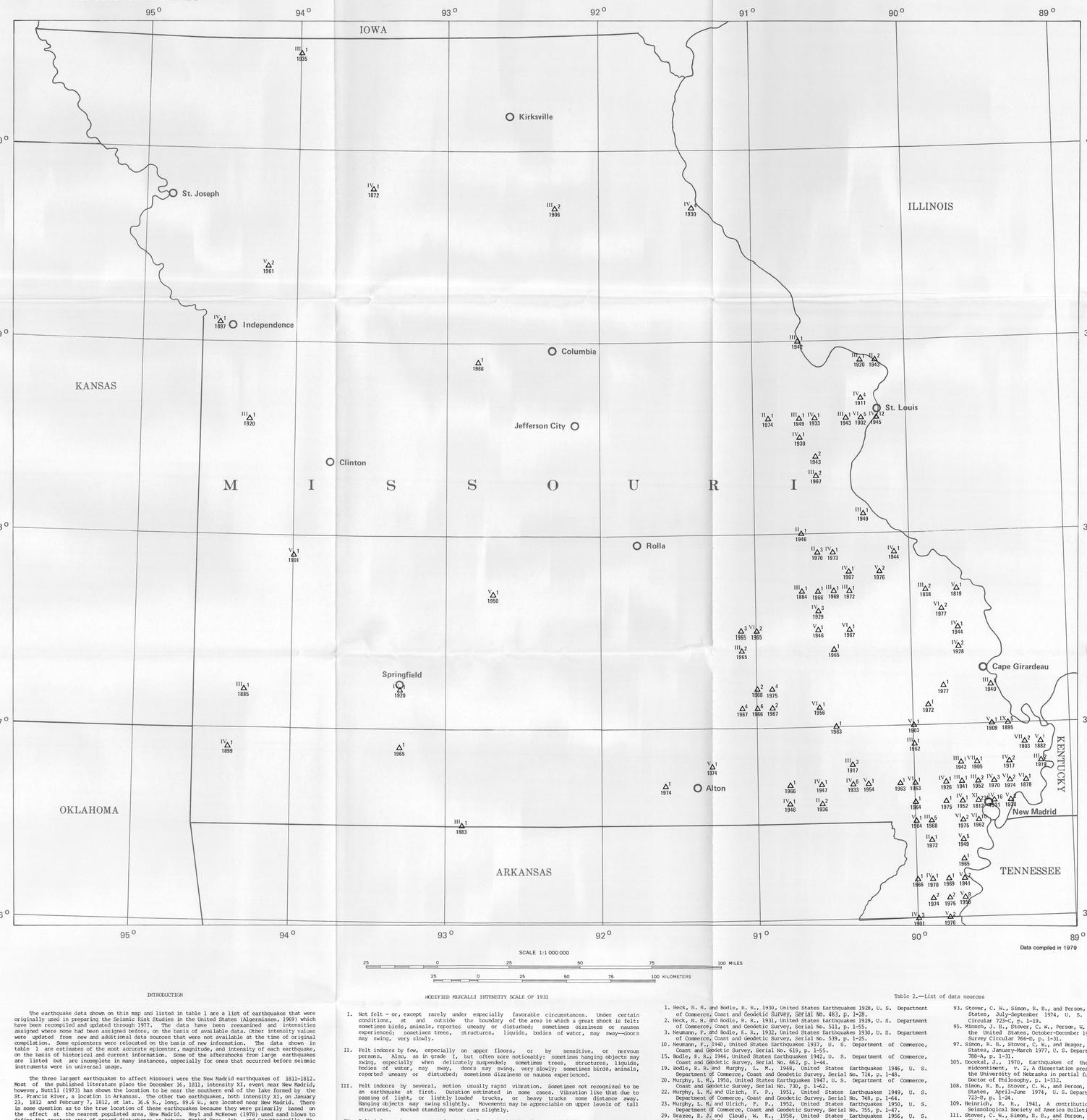
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1155
SEISMICITY, MISSOURI



INTRODUCTION

The earthquake data shown on this map and listed in table 1 are a list of earthquakes that were originally used in preparing the Seismic Risk Studies in the United States (Algermissen, 1969) which have been recompiled and updated through 1977. The data have been reexamined and intensities assigned where none had been assigned before, on the basis of available data. Other intensity values were updated from new and additional data sources that were not available at the time of original compilation. Some epicenters were relocated on the basis of new information. The data shown in table 1 are estimates of the most accurate epicenter, magnitude, and intensity of each earthquake, on the basis of historical and current information. Some of the aftershocks from large earthquakes are listed but are incomplete in many instances, especially for ones that occurred before seismic instruments were in universal usage.

The three largest earthquakes to affect Missouri were the New Madrid earthquakes of 1811-1812. Most of the published literature place the December 16, 1811, intensity XI, event near New Madrid, however, Nuttli (1973) has shown the location to be near the southern end of the lake formed by the St. Francis River, a location in Arkansas. The other two earthquakes, both intensity XI, on January 23, 1812 and February 7, 1812, at lat. 36.6 N., long. 89.6 W., are located near New Madrid. There is some question as to the true location of these earthquakes because they are primarily based on the effect at the nearest populated area, New Madrid. Heyl and McKeown (1978) used sand blows to define the greatest area of ground disturbance as between Marked Tree, Ark., and Caruthersville, Mo. This implies that the actual locations of the two 1812 New Madrid earthquakes may lie somewhere within this area defined by the sand blows with locations somewhat southwest of New Madrid. The 234 epicenters shown at location lat. 36.6 N., long. 89.6 W., are most likely aftershocks of the two intensity XI earthquakes, aftershocks that probably lie along the same southwest trending area defined by the sand blows.

The data in table 1 were used to compile the seismicity map. The latitude and longitude were rounded to the nearest tenth of a degree and sorted so that all identical locations were grouped together and counted. A triangle represents the epicenter plotted to a tenth of a degree. The number of earthquakes at each location is shown on the map by the number to the right of the triangle. A Roman numeral to the left of a triangle is the maximum Modified Mercalli intensity (Wood and Neumann, 1931) of all earthquakes located at that geographic position. The absence of an intensity value indicates that no intensities have been assigned to earthquakes at that location. A year shown below a triangle is the latest year for which the maximum intensity was recorded.

EXPLANATION OF THE TABLES

The data are listed chronologically in table 1 in the following categories: date, origin time, N. latitude, W. longitude, depth, hypocenter quality and referenced data sources, magnitude, and intensity (MMSI and Mercalli) and intensity source references. There are some basic limitations in terms of the size (magnitude or intensity) of the earthquakes listed. Prior to 1965 all recorded felt earthquakes are listed, after 1965 only felt earthquakes those with magnitudes greater or equal to 2.5-3.0 range are listed; the lower magnitude levels apply mostly to the eastern United States. The low magnitude events located in recent years with dense seismograph networks have not been included.

Listed below is an explanation of the symbols and codes used in the tables:

1. Leaders (..) indicate information not available.
2. Latitude and longitude are listed to a hundredth of a degree if they have been published with that degree of accuracy, or greater; however, most historical events have been published only to the nearest degree or tenth of a degree and are therefore listed at this accuracy in table 1. An asterisk (*) to the right of the longitude indicates that the latitude and longitude were not given in the source reference, but were assigned by the compilers of the data file. An (x) to the right of the longitude indicates that the event is an explosion, a suspected explosion, rockburst, or a nontectonic event; these have not been plotted on the map.
3. The letter code in the HYPOCENTER, QUAL column is defined below:
   a. Determination of instrumental hypocenters are estimated to be accurate within the ranges of latitude and longitude listed below; each range is letter coded as indicated:

	Latitude	Longitude
A	0.0°-0.1°	
B	0.1°-0.2°	
C	0.2°-0.5°	
D	0.5°-1.0°	
E	1.0° or larger	

   b. Determination of noninstrumental epicenters from felt data are estimated to be accurate within the ranges of latitude and longitude listed below; each range is letter coded as indicated:

	Latitude	Longitude
F	0.0°-0.5°	
G	0.5°-1.0°	
H	1.0°-2.0°	
I	2.0° or larger	

4. The reference identification numbers in the HYPOCENTER, REF and INTENSITY, REF columns indicate the sources of the hypocenter and intensity. They are listed in numerical order in table 2.
5. The magnitudes listed under "USGS" are mb values (Gutenberg and Richter, 1956) published in the Preliminary Determination of Epicenters (PDE) by the National Earthquake Information Service, U. S. Geological Survey and predecessor organizations. Associated with the magnitude values listed under "OTHER" are the source code and type. Type is defined by a M. (Richter, 1958), 2 = mbLg (Nuttli, 1973), 3 = MS (Bath, 1966), and 4 = mb (Gutenberg and Richter, 1956). The source codes are listed below:
   NU - Nuttli, O. W., 1973, Seismo. Soc. of America Bull., v. 63, no. 1, p. 227-248.
   SLM - St. Louis University, St. Louis, Mo.
6. An asterisk (*) in the INTENSITY, MM column indicates that the intensity was assigned by the compiler on the basis of the available data at the time the catalog was compiled.

REFERENCES

Algermissen, S. T., 1969, Seismic risk studies in the United States: Fourth World Conference on Earthquake Engineering, Santiago, Chile, January 13-18, 1969, Proceedings, v. 1, p.14-27.
Bath, Markus, 1966, Earthquake energy and magnitude, in v. 7 of Physics and chemistry of the Earth: Oxford and New York, Pergamon Press, p. 115-165.
Gutenberg, B. and Richter, C. F., 1956, Magnitude and energy of earthquakes: Annali di Geofisica, v. 9, no. 1, p. 1-15.
Heyl, A. V. and McKeown, F. A., 1978, Preliminary seismotectonic map of the central Mississippi Valley and environs, U. S. Geological Survey Miscellaneous Field Studies Map MF-1011.
Nuttli, O. W., 1973, The Mississippi Valley earthquakes of 1811 and 1812: Intensities, ground motion and magnitudes: Seismological Society of America Bulletin, v. 63, no. 1, p. 227-248.
Nuttli, O. W., 1973, Seismic wave attenuation and magnitude relations for eastern North America: Journal of Geophysical Research, v. 78, no. 5, p. 876-885.
Richter, C. F.,1958, Elementary Seismology: San Francisco, Calif., W. H. Freeman and Co., Inc., 768 p.
Wood, H. O., and Neumann, F., 1931, Modified Mercalli Intensity Scale of 1931: Seismological Society of America Bulletin, v. 21, no. 4, p. 277-283.

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MODIFIED MERCALLI INTENSITY SCALE OF 1931

I. Not felt - or, except rarely under especially favorable circumstances. Under certain conditions, at and outside the boundary of the area in which a great shock is felt: sometimes birds, animals, reported uneasy or disturbed; sometimes dizziness or nausea experienced; sometimes trees, structures, liquids, bodies of water, may sway—doors may swing, very slowly.

II. Felt indoors by few, especially on upper floors, or by sensitive, or nervous persons. Also, as in grade I, but often more noticeably: sometimes hanging objects may swing, especially when delicately suspended; sometimes trees, structures, liquids, bodies of water, may sway, doors may swing, very slowly; sometimes birds, animals, reported uneasy or disturbed; sometimes dizziness or nausea experienced.

III. Felt indoors by several, motion usually rapid vibration. Sometimes not recognized to be an earthquake at first. Duration estimated in some cases. Vibration like that due to passing of light, or lightly loaded trucks, or heavy trucks some distance away. Hanging objects may swing slightly. Movements may be appreciable on upper levels of tall structures. Rocked standing motor cars slightly.

IV. Felt indoors by many, outdoors by few. Awakened few, especially light sleepers. Frightened no one, unless apprehension from previous experience. Vibration like that due to passing of heavy or heavily loaded trucks. Sensation like heavy body striking building or falling of heavy objects inside. Rattling of dishes, windows, doors; glassware and crockery clink and clash. Creaking of walls, frame, especially in the upper range of this grade. Hanging objects swung, in numerous instances. Disturbed liquids in open vessels slightly. Rocked standing motor cars noticeably.

V. Felt indoors by practically all, outdoors by many or most; outdoors direction estimated. Awakened many, or most. Frightened few—slight excitement, a few ran outdoors. Buildings trembled throughout. Broke dishes, glassware, to some extent. Cracked windows—in some cases, but not generally. Overturned vases, small or unstable objects, in many instances, with occasional fall. Hanging objects, doors, swung generally or considerably. Knocked pictures against walls, or swung them out of place. Opened, or closed, doors, shutters, abruptly. Pendulum clocks stopped, started or ran fast, or slow. Moved small objects, furnishings, the latter to slight extent. Spilled liquids in small amounts from well-filled open containers. Trees, bushes, shaken slightly.

VI. Felt by all, indoors and outdoors. Frightened many, excitement general, some alarm, many ran outdoors. Awakened all. Persons made to move unsteadily. Trees, bushes, shaken slightly to moderately. Liquid set in strong motion. Small bells ring—church, chapel, school, etc. Damage slight in poorly built buildings. Fall of plaster in small amount. Cracked plaster somewhat, especially fine cracks chimneys in some instances. Broke dishes, glassware, in considerable quantity, also some windows. Fall of nick-knacks, books, pictures. Overturned furniture in many instances. Moved furnishings of moderately heavy kind.

VII. Frightened all—general alarm, all ran outdoors. Some, or many, found it difficult to stand. Noticed by persons driving motor cars. Trees and bushes shaken moderately to strongly. Waves on ponds, lakes, and running water. Water turbid from mud stirred up. Incaving to some extent of sand or gravel stream banks. Rang large church bells, etc. Suspended objects made to oscillate. Damage negligible in buildings of good design and construction, slight to moderate in well-built ordinary buildings, considerable in poorly built or badly designed buildings, adobe houses, old walls (especially where laid up without mortar), spires, etc. Cracked chimneys to considerable extent, walls to some extent. Fall of plaster in considerable to large amount, also some stucco, broke numerous windows, furniture to some extent. Shook down loosened brickwork and tiles. Broke weak chimneys at the roof-line (sometimes damaging roofs). Fall of cornices from towers and high buildings. Dislodged bricks and stones. Overturned heavy furniture, with damage from breaking. Damage considerable to concrete irrigation ditches.

VIII. Fright general—alarm approaches panic. Disturbed persons driving motor cars. Trees shaken strongly—branches, trunks, broken off, especially palm trees. Ejected sand and mud in small amounts. Changes: temporary, permanent; in flow of springs and wells; dry wells renewed flow; in temperature of spring and well waters. Damage slight in structures (brick) built especially to withstand earthquakes. Considerable in ordinary substantial buildings, partial collapse: racked, tumbled down, wooden houses in some cases; threw out panel walls in frame structures, broke off decayed piling. Fall of walls. Cracked, broke, solid stone walls seriously, also ground on steep slopes. Overturned or displaced by force of flow: tanks, chimneys, columns, monuments, also factory stacks, towers. Moved conspicuously, overturned, very heavy furniture.

IX. Panic general. Cracked ground conspicuously. Damage considerable in (masonry) structures built especially to withstand earthquakes. Threw out of plumb some wood-frame houses built especially to withstand earthquakes; great in substantial (masonry) buildings, some collapse in large part; or wholly shifted frame buildings off foundations, racked frames; serious to reservoirs; underground pipes sometimes broken.

X. Cracked ground, especially when loose and wet, up to widths of several inches; fissures up to a yard in width ran parallel to canal and stream banks. Landslides considerable from river banks and steep coasts. Shifted sand and mud horizontally on beaches and flat land. Changed level of water in wells. Threw water on banks of canals, lakes, rivers, etc. Damage serious to dams, dikes, embankments. Severe to well-built wooden structures and bridges, some destroyed. Great damage to substantial man-made structures, including their foundations, some destroyed. Most masonry and frame structures, also their foundations, Bent railroad rails slightly. Tore apart, or crushed endwise, pipe lines buried in earth. Open cracks and broad wavy folds in cement pavements and asphalt road surfaces.

XI. Disturbances in ground many and widespread, varying with ground material. Broad fissures, earth slumps, and land slips in soft, wet ground. Ejected water in large amounts charged with sand and mud. Caused seawaves ("tidal" waves) of significant magnitude. Damage severe to wood-frame structures, especially near shock centers. Great to dams, dikes, embankments, often for long distances. First to fall, any (masonry) structures remained standing. Destroyed large well-built bridges by the wrecking of supporting piers, or pillars. Affected yielding wooden bridges less. Bent railroad rails greatly, and thrust them endwise. Put pipe lines buried in earth completely out of service.

XII. Damage total—practically all works of construction damaged greatly or destroyed. Disturbances in ground great and varied, numerous shearing cracks. Landslides, falls of rock of significant character, slumping of river banks, etc., numerous and extensive. Wrenched loose, tore off, large rock masses. Fault slips in firm rock, with notable horizontal and vertical offset displacements. Water channels, surface and underground, disturbed and modified greatly. Damned lakes, produced waterfalls, deflected rivers, etc. Waves seen on ground surfaces (actually seen, probably, in some cases). Distorted lines of sight and level. Threw objects upward into the air.

Table 1.—Chronological listing of Earthquakes for the State of Missouri

DATE YEAR	MONTH	DAY	ORIGIN TIME(UTC) H	M	S	LAT. (N.)	LONG. (W.)	DEPTH (KM)	HYPOCENTER QUAL	REF	MAGNITUDE USGS	OTHER	INTENSITY MM	REF
1812	JAN	23	15	00	..	36.6	89.6	..	G	38	..	7.1NU 4	XI*	172
1812	JAN	23	19	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	JAN	24	04	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	JAN	24	11	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	JAN	25	04	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	JAN	25	..	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	JAN	26	..	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	JAN	27	..	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	JAN	27	14	50	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	JAN	28	15	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	JAN	29	03	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	JAN	29	15	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	JAN	29	17	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	JAN	30	15	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	JAN	30	21	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	JAN	31	15	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	JAN	31	..	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	01	15	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	02	08	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	02	15	00	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	02	18	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	03	04	45	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	03	06	36	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	03	12	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	03	14	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	03	20	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	04	21	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	04	22	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	05	14	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	05	17	15	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	05	19	45	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	05	20	37	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	05	22	48	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	06	..	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	07	02	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	07	09	15	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	07	09	45	..	36.6	89.6	..	G	38	..	7.4NU 4	XII*	114
1812	FEB	07	11	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	07	18	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	07	21	45	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	08	02	10	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	08	04	10	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	08	08	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	08	18	05	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	09	02	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	09	03	25	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	09	04	40	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	09	14	45	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	09	21	46	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	09	22	10	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	10	15	08	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	10	16	13	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	10	16	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	10	17	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	10	17	50	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	10	21	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	11	02	25	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	11	09	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	11	11	40	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	11	12	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	11	16	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	11	18	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	12	15	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	13	00	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	13	15	19	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	13	16	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	13	18	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	14	..	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	14	16	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	14	18	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	15	17	20	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	15	18	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	15	21	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	16	15	15	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	16	18	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	17	04	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	17	16	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	17	17	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	17	21	07	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	18	20	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	19	14	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	20	..	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	21	..	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	21	04	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	21	05	50	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	21	17	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	22	02	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	22	03	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	22	15	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	23	06	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	23	22	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	24	02	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	24	06	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	24	15	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
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1812	FEB	28	19	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	29	..	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	29	14	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	FEB	29	14	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	01	00	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	01	15	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	01	20	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	02	20	35	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	03	02	35	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	03	12	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	03	14	35	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	03	20	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	03	21	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	04	..	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	04	16	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	04	23	25	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	05	12	10	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	05	16	36	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	05	18	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	05	21	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	06	09	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	06	17	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	06	21	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	06	23	35	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	07	14	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	07	17	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	08	14	30	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	08	15	36	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	08	18	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	09	02	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	09	03	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	09	13	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	09	18	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	10	12	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	10	16	25	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	10	18	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	10	18	25	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	10	21	20	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	11	20	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	11	08	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	11	15	20	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	11	16	00	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	12	18	25	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	12	12	50	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	12	13	08	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	12	14	20	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	12	21	00	30	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	13	02	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	13	20	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	14	16	40	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	15	03	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	15	..	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	16	15	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	17	15	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	18	14	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	18	14	10	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	19	..	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	19	..	..	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	19	20	00	..	36.6	89.6	* ..	H	143	..	.. ..	...	..
1812	MAR	20	15	20	..	36.