
Earthquakes and the End Times: A Geological and Biblical Perspective

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Introduction

According to a number of Christian writers and teachers on Bible prophecy, Jesus predicted in the Olivet Discourse that a pronounced increase in the frequency and intensity of earthquakes would occur just prior to His return to the earth. Many of the same writers and teachers claim that the decade of the 1990s has experienced a pronounced increase in both the frequency and intensity of earthquakes as compared to the earlier decades of the twentieth century. This coincidence of Jesus' prophetic statement and recent seismic events is viewed by these writers and teachers as clear demonstration of the nearness of the return of Christ.

Hal Lindsey, the world's best known Bible prophecy teacher and author of seventeen books on prophecy, writes in one of his latest books:

Earthquakes continue to increase in frequency and intensity, just as the Bible predicts for the last days before the return of Christ. History shows that the number of killer quakes remained fairly constant until the 1950s—averaging between two to four per decade. In the 1950s, there were nine. In the 1960s, there were 13. In the 1970s, there were 51. In the 1980s, there were 86. From 1990 through 1996, there have been more than 150. (Lindsey, 1970, p. 52¹; 1996, p. 85²; 1997, p. 296³).

What is the source of Lindsey's statistics? In his book *Planet Earth 2000 A.D.* Lindsey cites the United States Geological Survey (USGS) in Boulder, Colorado (Lindsey, 1996, p. 86⁴.) Yet he does not give details of the report (author, date, report name, location, etc.) (Lindsey, 1996, p. 105⁵). Lindsey's earthquake frequency numbers have been widely circulated by popular prophecy speakers such as Chuck Missler

and Jack Van Impe (Missler & Eastman, 1997⁶, pp. 170–172; Van Impe, 1997). However, Missler and Van Impe do not give any further information on the source of Lindsey's statistics.

Grant R. Jeffrey, another Bible prophecy teacher and author of nine best-selling books, could be the source of Lindsey's statistics. Two years before Lindsey's statement was published, Jeffrey (1994, pp. 310, 311⁷; 1996, p. 194; 1997⁸ pp. 251, 252) wrote:

However, since A.D. 1900, the growth in major earthquakes has been relentless. From 1900 to 1949 it averaged three major quakes per decade. From 1949 the increase became awesome with nine killer quakes in the 1950's; 13 in the 60's; 56 in the 1970's and an amazing 74 major quakes in the 1980's. Finally, in the 1990's, as [*sic*] the present rate, we will experience 125 major killer quakes in this decade (Source: US Geological Survey Earthquake Report, Boulder, Colorado).

J.R. Church and Gary Stearman, editors of the magazine *Prophecy in the News*, argued that data show a pronounced increase in the frequency of the largest earthquakes in the 1990s. Church (1997; p. 336⁹) writes of a distinct increase in our century. Stearman (1996, pp. 3–5) gives specific numbers of earthquakes, and he cites as his source the October 11, 1995 issue of the newspaper *Philadelphia Inquirer*:

According to that newspaper the number of Richter magnitude 6.0 and greater earthquakes worldwide has been increasing from 9 in the 1950s, to thirteen in the 1960s, to 51 in the 1970s, to 86 in the 1980s, and to more than 100 in the 1990s.

The computer-searchable archives of the *Philadelphia Inquirer* reveal no article on earthquake frequency in that newspaper on October 11, 1995 and

no other issue of that newspaper during the decade of the 1990s (*Philadelphia Inquirer*, 1998¹⁰). What is the source of Stearman's statistics? When several readers of Stearman's article confronted him with much more earthquake data than in the mysterious citation from the newspaper, he apologized in print for the bad statistics, but, then, after his apology, reaffirmed that earthquakes are indeed increasing (Stearman, 1996, pp.27–28).

John Hagee, founder and pastor of the 15,000-member Cornerstone Church in San Antonio, authored the book *Beginning of the End* which became a *New York Times* best seller. Hagee (1996, p.193) references a report from the National Earthquake Information Center of the U.S. Geological Survey: "... the number of large earthquakes (magnitude 6.0 or greater) have stayed relatively constant" and notes within the government report "... the last decade has produced substantially fewer large earthquakes than shown in the long-term averages". Remarkably, Hagee (1996, p. 193) goes on to contradict directly the government report:

... it is true that the Bible predicts that earthquakes will increase in the last days, and the number of earthquakes measured has increased 1.58 times between 1983 and 1992.

The documentation given to support the supposed increase is faulty. Adequate reason is not given as to why the conclusion of the government report (that is, decreasing earthquakes) is to be rejected (Hagee, 1996, pp.98 and 193¹¹; Capps, 1997, p.13¹²).

A different set of earthquake frequency numbers appears in the recent writings of Peter and Paul Lalonde (Duck, 1998, p.242; Lalonde & Lalonde, 1996, p.248¹⁵; Lewis, 1997, p.24¹⁷; Sumrall, 1995, p.68¹⁴; Van Impe, 1996¹⁶; Wilson, 1992, p.1¹³). These new statistics are used to indicate a very large increase in earthquake frequency in the 1990s:

Well, according to sources from Energy, Mines and Resources Canada there were, from 1900 to 1969, about 48 earthquakes that registered at 6.5 or more on the Richter Scale. This is an average of 6 per decade. From 1970 to 1989 there were 33 earthquakes measuring 6.5 or more. This is an average of 17 per decade. From January 1990 to July 1990 there were 10 earthquakes of 6.5 or greater. This is 10 major earthquakes in just six months. And from July 1990 to October 1992 there were 133 earthquakes which measured at 6.5 or greater. This averages out to 600 per decade .

What is the specific source within Energy, Mines and Resources Canada that supplied these statistics? Again, details are lacking.

In light of such slipshod documentation, we are concerned about the widespread claim within the Christian community that earthquakes are on the

increase. Can these recent statements be supported by rigorous documentation? Or have the deployment of more seismographs during the last few decades made detection and cataloging of earthquakes more complete, thereby enhancing the perception of increase? Does the public have the perception that earthquakes are on the increase because earthquakes now afflict our larger urbanized populations, and, therefore, are more often reported by the media? We believe the public perception and media characterization promotes the self-sustaining "urban legend" even among the Christian Church (Abanes, 1998¹⁹; Jonsson & Herbst, 1987, pp.46–87¹⁸). This "legend" widespread in western culture regards earthquakes of the twentieth century to be on the increase. We will cite data that directly confront the urban legend.

Evaluating Earthquake Data

The year 1997 marked the one hundredth anniversary of the general deployment of standardized and calibrated seismographs. It started with nine seismograph stations in 1898 that were capable of detecting, locating, and measuring earthquakes of magnitude 7.0 or larger ($M \geq 7.0$) anywhere in the globe. As a result, major earthquakes have been monitored globally and continuously for more than 100 years. By 1931 there were 350 stations operating worldwide that were locating and measuring $M \geq 6.5$ earthquakes globally. By the 1950s the system of seismographs could locate all $M \geq 6.0$ events occurring globally. Today a network of more than 4000 seismograph stations is locating and measuring more than 10,000 events with magnitude less than 5.0 each year.

Global earthquake data for the century have been synthesized and are available from several sources. These are usually extensive lists giving each earthquake as a time, location, and magnitude. Before we look to the earthquake data of the twentieth century for possible increase in frequency and magnitude, we need to be able to evaluate the suitability of catalog data. Three important properties are required of data used for frequency analysis. Data must be (1) accurate, (2) complete, and (3) uniform.

Accuracy

Earthquake data need to satisfy several technical requirements; the most important of which is accuracy. The consortium of seismological institutions has set standards. Normally the seismogram from the region of the earthquake is used to estimate "authoritative" earthquake parameters (time, location, fault mechanism, and magnitude). Also, other institutions farther away from the epicenter may estimate parameters (usually not considered "authoritative"). The submission process by the member organizations

generates the authoritative composite catalog (<http://quake.geo.berkeley.edu/cnss>.) Even with procedures for standardization, some noteworthy problems exist. Japanese and American seismologists usually differ with each other by 0.2 magnitude unit for the strength of surface waves of a particular earthquake (Perez & Scholz, 1984, p.685). Newspapers cannot be relied on for accurate data because they often do not cite the authoritative values established by the working relationship between the organizations.

Completeness

An earthquake catalog needs to be complete, not missing any events within the defined boundaries of the catalog. Complete data sets must be established by the painstaking process of checking numerous authoritative records. Some catalogs, which might be assumed to provide complete records, actually have noteworthy deficiencies.²⁰ For example, many events smaller than magnitude 6.5 ($M < 6.5$) have not been located or properly measured for the early decades of the century. One of the most extensive global catalogs of the present century, the Tsapanos Catalog, contains data on 9700 earthquakes of our century. This catalog is considered “complete” for $M \geq 6.5$ beginning in the year 1930 and “complete” for $M \geq 6.0$ beginning in the year 1952 (Tsapanos & Burton, 1991, p. 154). Therefore, a complete record for $M < 7.0$ for the early part of the century does not exist. Because of these limitations, we cannot compare effectively the frequency of events of $M < 7.0$ from the first and second halves of the century. However, the global synthesis of $M \geq 7.0$ is good, even for the earlier decades of the century. For example, the Tsapanos Catalog has been claimed to be “complete” for $M \geq 7.0$ from the year 1898 (Tsapanos & Burton).

Uniformity

The final quality of a good earthquake catalog is uniformity. There have been some small changes to the seismograph design during the last one hundred years which require back-calibration of the records to insure uniformity with recent measurements (Abe, 1984, pp.17–23). Early characterization of shallow earthquakes (focal depths less than 70 kilometers) and deep earthquakes (focal depths greater than 70 kilometers) required different magnitude measurement scales. Several magnitude scales have been used over the years—Richter magnitude (ML), surface wave magnitude (Ms), body wave magnitude (mb), moment magnitude (MW), and energy magnitude (Me) (Spence, Sipkin, & Choy, 1989, pp.58–63²¹). It has been recognized that the older ML, Ms and mb scales do not properly characterize the full wave-frequency range of the energy radiated

by an earthquake. The Ms scale, although widely used, does not characterize deep-focus earthquakes and great earthquakes ($M \geq 8.0$) very well. Therefore, newer magnitude scales use properties of the fault system (MW) or the total radiant energy spectrum (Me) to estimate the strength of an earthquake. These last two scales work for shallow and deep earthquakes as well as the largest earthquakes. However, MW and Me scales were not devised until recently, and, if used, require the recalibration of data from the major part of the early century to insure uniformity.

Global Catalogs

Having stated the requirements for a catalog being accurate, complete, and uniform, we can recommend five global catalogs of twentieth-century earthquakes.

1. The Zirbes Data File. The National Earthquake Information Center (NEIC) of the United States Geological Survey (USGS) maintains in Denver data on four million earthquakes from earliest records beginning in 2100 B.C. (<http://www.neic.cr.usgs.gov>). The summary data file currently updated yearly by Madeleine Zirbes of the NEIC includes global frequency data from this century for both shallow and deep earthquakes (<http://www.neic.cr.usgs.gov/neis/eqlists/7up.html>). The Zirbes file attempts to deal uniformly with the characterization of earthquakes ($M \geq 7.0$) of all focal depths globally.
2. The “Worldwide Earthquake Database.” Four million seismic events from 2100 B.C. to A.D. 1995 are collected into a composite catalog called the “Worldwide Earthquake Database.” Data are distributed by the National Geophysical Data Center (NGDC) of the National Oceanographic and Atmospheric Administration (NOAA). Numerous data files are included in the “Seismicity Catalog,” a two-volume CD-ROM produced in cooperation with the N.E.I.C. The component file called “1900.EQ” within the “Seismicity Catalog” (<http://www.ngdc.noaa.gov/seg/hazard/earthqk.html>) gives time, location, and magnitude for 17,690 $M \geq 6.0$ earthquakes, and 5667 $M \geq 6.5$ earthquakes globally from 1900 through 1995. The file lists shallow and deep earthquakes globally, lacks rigorous uniformity, and appears to be complete for $M \geq 6.5$ after about 1930, and $M \geq 6.0$ after about 1951²².
3. The Abe Catalog. Seismologists K. Abe and S. Noguchi from the Earthquake Research Institute of the University of Tokyo published an excellent global catalog of large, shallow earthquakes ($M_s \geq 7.0$) for the period from 1897 to 1980 (Abe, 1981, pp.72–92; Abe, 1984, pp.17–23; Abe & Noguchi, 1983a, pp.45–59; Abe & Noguchi,

1983b, pp. 1–11). This database is the early effort to apply rigorous standards to make an accurate, complete and uniform catalog for large shallow earthquakes. The catalog has a supplement adding deep-focus, global earthquakes ($m_b \geq 7.0$) for 1904 through 1974 (Abe & Kanamori, 1979, pp. 3589–3595). The accuracy, completeness, and uniformity of other catalogs should be evaluated by comparison to this noteworthy standard.

4. The Pacheco and Sykes Catalog. Javier Pacheco and Lynn Sykes of Lamont-Doherty Geological Observatory at Columbia University have published a global catalog of 697 shallow, large earthquakes ($M_s \geq 7.0$) which they argue is accurate, complete, and uniform for the period 1900 to 1989 (Pacheco & Sykes, 1992, pp. 1306–1349). This catalog, which is a revision of the Abe Catalog, normalizes the surface wave magnitude values of Abe with a particular assumption of uniform seismicity throughout the century. The normalizing assumption has generated significant debate.
5. The Tsapanos Catalog. Greek seismologists have produced a global catalog of 9700 earthquakes with $M \geq 5.5$ from the period 1898 to 1985 (Tsapanos, Scordilis, & Papazachos, 1988, p. 182). The catalog of shallow and deep earthquakes is claimed to be complete for $M \geq 7.0$ from 1898, for $M \geq 6.5$ from 1930, for $M \geq 6.0$ from 1952, and for $M \geq 5.5$ from 1966.

The Geological Evidence: Are Earthquakes Increasing?

If the popular notion of many prophecy teachers (Lindsey, Missler, Van Impe, Church, Jeffrey, Stearman, Hagee, Lalonde, etc.) is correct, two assertions about twentieth-century earthquakes must be true:

1. a noteworthy deficiency of big earthquakes existed in the first half of the century, and
2. an obvious increase in the frequency of big earthquakes occurred since 1950.

These two assertions must be made by prophecy teachers so as to support a notion of the unique “earthquake sign” occurring in the 1990s. Both assertions, we maintain, are false. Using the best earthquake catalog data and statements of seismologists, we have concluded exactly the opposite:

1. a noteworthy excess of big earthquakes existed in the first half of the century, and
2. an obvious decrease in the frequency of big earthquakes occurred since 1950.

Global Earthquake Data

The frequency of this century’s biggest earthquakes is summarized in Figure 1. The frequency of the

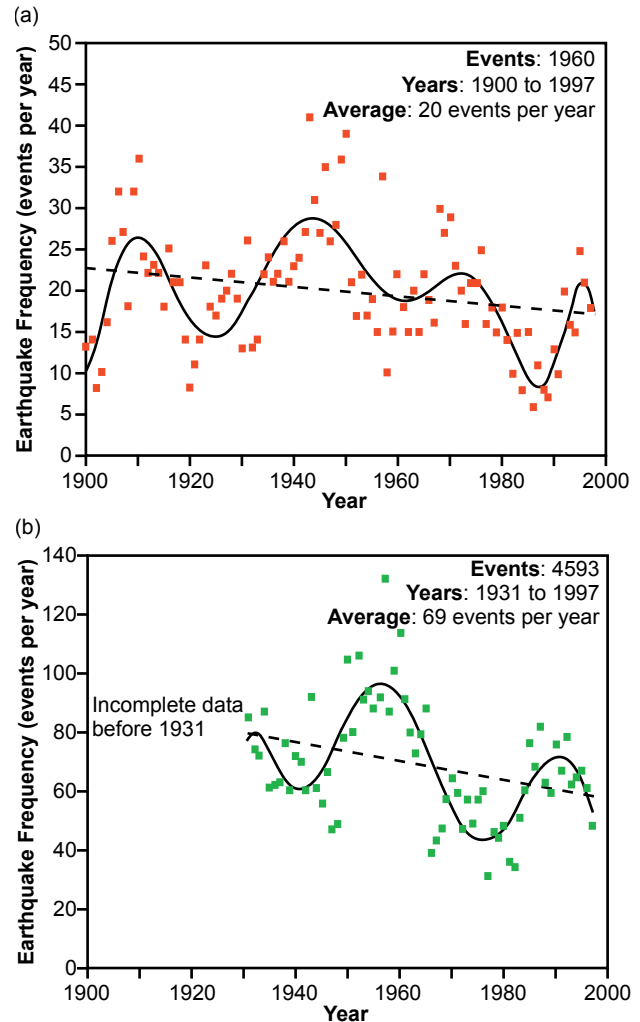


Figure 1. Global frequency of the largest earthquakes during the twentieth century. Graph (a) shows the frequency of $M \geq 7.0$ earthquakes during the entire century (1660 events). Graph (b) shows the frequency of $M \geq 6.5$ earthquakes after 1930 (4593 events). In both plots a general decrease in earthquake frequency is evident through the twentieth century.

biggest earthquakes ($M \geq 7.0$) by year from 1900 through 1997 is shown in Figure 1a. The data source for Figure 1a is the “Zirbes Data File” from the NEIC. Figure 1a shows a total of 1660 events, an average of 20.0 $M \geq 7.0$ earthquakes per year. Of the 20 events, an average of one per year is a “great” earthquake ($M \geq 8.0$), and an average of 19 per year are “major” earthquakes ($7.9 \geq M \geq 7.0$). Figure 1b shows the frequency of $M \geq 6.5$ earthquakes beginning in the year 1931, when the seismograph detection system became established well enough to record a “globally complete” set of these larger events. Figure 1b displays a total of 4593 events, an average of 69 $M \geq 6.5$ events per year. The data source for Figure 1b is file “1900.EQ” distributed by the N. G. D. C. (Seismicity Catalog, 1996²³).

Lines and curves are also plotted to the data in

Figure 1. Both graphical plots of global frequency data contain a dashed line showing the best-fit linear equation through the data. In both of the plots the best-fit linear equations have negative slope indicating an overall decreasing frequency, not increasing frequency with time. This decreasing seismicity trend is opposite of the common statements of many prophecy teachers.

The earthquake data of Figure 1 also reveal a space-time frequency pattern that specialists acknowledge is strongly nonrandom (Abe & Kanamori, 1979; Lirizis & Tsapanos, 1993, pp.93–108; Ogata & Abe, 1991, pp.139–161; Ogata & Katsura, 1993, pp.727–738; Xanthakis, 1982, pp.T7-T14). Because our century's frequency data are strongly nonrandom within both of the magnitude classes, two best-fit polynomial curves have been plotted to discern possible patterns of variation in earthquake frequency. The best-fit curves in Figure 1 are polynomial functions having the mathematical form $f(x)=a_0+a_1x+a_2x^2+\dots+a_nx^n$. A remarkable pattern is evident from both best-fit polynomial curves. Both curves indicate a thirty-year period, but are strongly out of phase, suggesting some type of cyclic frequency pattern for the biggest earthquakes of our century. The cyclic pattern is apparently characteristic of some type of periodic tectonic process working itself out in the twentieth century. The cause of earthquake periodicities, however, remains a mystery. These patterns, which have been an important topic of scientific discussion, are beyond the scope of this paper.²⁴

Is there a noteworthy deficiency of big earthquakes ($M \geq 7.0$) in the first half of the twentieth century as many prophecy teachers suppose? No, there is a noteworthy excess. The global earthquake frequency data can be used to argue just the opposite of the popular urban legend. For the data in Figure 1a we note 1093 big earthquakes for the first half of the century (1900 to 1949). That is an average of twenty-two big earthquakes per year. For the nearly completed second half of the century (1950 to 1997) we note just 867 big earthquakes. That is an average of just eighteen big earthquakes per year. When 1999 is completed, it is likely that the second half of the century will have about 900 big earthquakes. For $M \geq 7.0$ events, the second half of the century, therefore, is expected to have about 200 less earthquakes than the first half. Zirbes (1997) writes:

We continue to hear from many people throughout the world that earthquakes are on the increase. Although it may seem that we are having more earthquakes, earthquakes of magnitude 7.0 or greater have remained fairly constant throughout this century, and, according to our records, have actually seemed to decrease in recent years.

Has there been a noteworthy increase in the frequency of big earthquakes ($M \geq 7.0$) since 1950 as many prophecy teachers insist? No, there appears to have been a significant decrease. Figure 1a shows that the frequency of big earthquakes in the 1950s averaged 20.9 events per year, slightly above the average for the entire century.

There seems to have been a decline in frequency through the 1960s (20.4 events per year), 1970s (20.4 events per year), and 1980s (11.2 events per year). Those are the decades when Hal Lindsey says that the frequency of big earthquakes was increasing. From 1990 through 1997 there has been an average of 17.3 big earthquakes per year, which is still under the average of 20.0 earthquakes per year for the entire century. It is evident that the $M \geq 7.0$ frequency data do not confirm the urban legend. Hal Lindsey is aware of the Zirbes Data File and the evidence from the U.S.G.S. that $M \geq 7.0$ earthquakes are not increasing in our century (Lindsey, 1996, p.88). His response is:

The USGS traditionally defined a major earthquake as being "6.5 magnitude or greater, and causing significant death or damage." That is still the category heading used when they compile their own statistics. By the simple expedient of raising the minimum magnitude level for the basic criteria, earthquake statistics can be manipulated to support their contention of no increase in major earthquakes .

Is the USGS "selectively manipulating" (Lindsey, 1996, p.89)²⁵ its magnitude criteria (choosing to show data for $M \geq 7.0$ instead of $M \geq 6.5$) for the purpose of concealing the obvious increase in frequency as asserted by Lindsey? His claim of malpractice or deception by seismologists of the USGS is easily refuted by going to the $M \geq 6.5$ frequency plot in Figure 1b. This frequency plot is where the obvious rate increase of the 1980s and 1990s should be most apparent, according to Lindsey. However, we see that Figure 1b (a plot from data of file "1900.EQ") has general declining frequency with time like Figure 1a. The declining frequency is indicated by the best-fit linear equations shown by dashed lines possessing negative slopes in Figure 1a and 1b. No evidence of pronounced frequency increase is evident from Figure 1 for the 1980s and 1990s above earlier decades.

Another significant property of our century's data is evident in Figure 1. The figure shows that many prophecy teachers have grossly underestimated the number of larger earthquakes, especially in the earlier part of our century. Lindsey's statistics for $M \geq 6.0$ earthquakes appear in Table 1. His statistics seem to demonstrate increasing frequency of $M \geq 6.0$ earthquakes globally, thus, supporting the urban legend. However, Table 1 (Lindsey, 1996, p.85–86)²⁶

Table 1. Numbers of $M \geq 6.0$ earthquakes worldwide in the twentieth century. The numbers of earthquakes reported in the National Geophysical Data Center file called “1900.EQ” greatly exceed those reported by Hal Lindsey from his unspecified U.S. Geological Survey source.

	Lindsey's U. S. G. S. Source	N. G. D. C. File “1900.EQ”
1900 to 1949	16	4747*
1950 to 1959	9	3608*
1960 to 1969	13	2909
1970 to 1979	51	1575
1980 to 1989	86	3107
1990 to 1993	>100	1383

* denotes incomplete data before the year 1952

compares Lindsey's numbers from his unspecified USGS source with the numbers for equivalent decades from the NGDC data file “1900.EQ”. Because much higher frequency of $M \geq 6.0$ earthquakes has been demonstrated from “authoritative” sources (for example, NGDC data files), Lindsey's statistics are proven incomplete, and, therefore, faulty for the purpose of frequency analysis. Lindsey's conclusion concerning increasing global frequency, which has been derived from the faulty statistics, must be in error as well. Similar global earthquake statistics and conclusions of (Jeffrey, 1994, pp. 310, 311; Jeffrey, 1997, pp. 251, 252; Lalonde & Lalonde, 1996, p. 248; Stearman, 1996) must also be incorrect.

Regional Earthquake Data

Regional earthquake catalogs should show the recent increase in earthquake frequency if the urban legend is correct. What about California? Has there been a significant increase in earthquakes within America's most populated state? Hal Lindsey (1996, p. 86)²⁷ says yes:

There has been a rapid increase in major California quakes in the last 15 years. Since 1980, the state has experienced 18 quakes worse than 5.0. That is the same number of 5.0-plus quakes the state experienced in the entire century before 1980.

But, again, we must ask from where did Lindsey get these statistics? No documentation is given. Lindsey's statement that only eighteen magnitude 5.0-plus earthquakes occurred in California from 1900 to 1980 is contradicted by numerous seismicity catalogs of the region. Our search of the California region's historic seismic records revealed 408 earthquakes with $M \geq 5.0$ for the period 1900 through 1979.²⁸ Because California's seismograph systems were not well established until 1932, a significant number of $M \geq 5.0$ events were not located and measured before 1932. We can make a strong argument for more than 400 earthquakes with $M \geq 5.0$ in the California

region from 1900 through 1979, not just eighteen earthquakes during that period as Lindsey supposes. Two USGS geologists Ross Stein and Thomas Hanks constructed their “Southern California Catalog” that is complete for $M \geq 6.0$ earthquakes from 1903 through 1997 (Stein & Hanks, 1998, pp. 635–652). They provide superb documentation for the Southern California region of twenty-eight earthquakes ($M \geq 6.0$, 1903 through 1979). They ignored the more frequent but less well-documented earthquakes with $M < 6.0$, and they ignored all of Northern California. Still they have twenty-eight earthquakes, a higher number than Hal Lindsey obtained for the whole state, for a longer time, and for a lower magnitude. Lindsey's California earthquake statistics must be incomplete.

Is there evidence that California's $M > 5.0$ earthquakes have increased during the last half of the century as Lindsey supposes? Because of the much higher frequency of $M \geq 5.0$ that we have demonstrated from “authoritative” sources, Lindsey's statistics are proven to be faulty and his conclusion, therefore, becomes vacuous. Hutton & Jones (1993, pp. 313–329²⁹) performed a detailed study of $M \geq 5.0$ events since 1932 in Southern California and found no significant region-wide rate change, including the period after 1980. They start with the year 1932 because that is the year when the data are believed to become “complete” for $M \geq 5.0$ events. Stein & Hanks (1998, p. 635) say of Southern California, “... we find no evidence that the rate of seismicity is increasing, now or at any other time since 1900.” They contradict both the statistics and the conclusion of Lindsey.

What about the region of Japan? As the world's most seismically active region, Japan should have an interesting story to tell. Does it show a recent increase in the frequency of earthquakes as the urban legend supposes? (Lindsey, 1996, p. 85³⁰). The “Japan Catalog” (Utsu, 1982, pp. 401–463) is complete for $M \geq 6.0$ from 1885 to 1980. Abe's catalog of global earthquakes (large, shallow quakes between 1897 and 1980) was compared to the Japan Catalog (large, shallow quakes around Japan between 1885 and 1980). Variation of earthquake frequency between the entire world and the region of Japan was demonstrated to be synchronous by sophisticated statistical tests (Ogata & Abe, 1991, pp. 139–161). Ogata & Abe (1991 p. 131) wrote, “The occurrence rate of earthquakes in the two areas is high in the period of 1920s through 1940s and low in the last 30 years.” That similar pattern of variation between Japan and the rest of the world did not show increase in frequency in the last half of the century. Here, again, we have an important statement that directly confronts the urban legend.

The Biblical Evidence:

Did Jesus Predict An Increase In Earthquakes Before The End?

If earthquakes are not on the increase, then what shall we make of the biblical evidence that earthquakes will increase in the last days?³¹ As noted above, Hal Lindsey (1970, p. 52) says that earthquakes will continue to increase “just as the Bible predicts for the last days.” If earthquakes are not increasing, does this mean that the return of Christ cannot be near? Closer examination of the New Testament evidence will reveal that Lindsey’s statement is wrong on both counts. Not only are earthquakes not increasing, but also the biblical text never indicated that they would. The popular conception that an increase of earthquakes in frequency and severity is a key sign of the temporal nearness of the end results from a misreading of the biblical text.

Earthquakes in Biblical Literature

Earthquakes and other cataclysmic events often carry theophanic significance in Scripture, demonstrating God’s awesome power. At Mount Sinai the LORD’s presence was indicated by smoke and the shaking of the mountain (Exodus 19:18; cf. 1 Kings 19:11³²; Psalm 68:8; Job 9:6; Habakkuk 3:6). When the New Testament church prayed “the place where they had gathered together was shaken” and the Spirit’s presence was manifested (Acts 4:31). Paul and Silas were freed when God’s power and presence was manifested in an earthquake (Acts 16:26). The most unusual earthquakes were associated with the crucifixion and resurrection of Christ. When Christ died on the cross, an earthquake shook the temple and rent the curtain of the temple from top to bottom (Matthew 27:51). No human agency rolled away the stone that sealed Christ’s tomb; it was the angel in the presence of the earthquake (Matthew 28:2).

More specifically, many seismic theophanies are manifestations of God’s anger and righteous judgment (cf. 1 Samuel 14:15; Psalm 18:7,8; Isaiah 5:25; 13:13; 29:6; Joel 3:16; Amos 1:1,2; 8:7,8; Micah 1:3-7; Nahum 1:5,6; Haggai 2:6, 21). The Day of the LORD is the most elaborate judgment motif of Scripture. That day is without fail marked by earthquakes and associated celestial disturbances (Isaiah 2:19, 21; 13:13; 24:18; 29:5–6; Ezekiel 38:19–22; Joel 2:10; Zechariah 14:4, 5). For example, Isaiah’s description of the destruction of Babylon has cosmic overtones:

Therefore I shall make the heavens tremble,
 ... And the earth will be shaken from its place
 At the fury of the LORD of hosts
 ... In the day of His burning anger. (Isaiah 13:13).

Yet during the awesome shakedown of heaven and earth, “The LORD will have compassion on Jacob” (Isaiah 14:1), and all creation will recognize God’s

working (Isaiah 14:3–8). When Israel is attacked by the armies of Gog, those armies are demolished at the decree of the LORD by earthquake and cosmic hailstones (Ezekiel 38:17–23). Zechariah is even more explicit about the extraordinary geologic upheaval in the Holy Land associated with the Day of the LORD. A final earthquake at the LORD’s return will split the Mount of Olives, uplift Jerusalem on its site, and depress the surrounding Judean Mountains (Zechariah 14:1–10).

Earthquakes are also associated with God’s self-revelation in the eschatology of the book of Hebrews (Hebrews 12:25–29). The author warns his readers not to refuse to heed the God who speaks as he spoke at Sinai (“And His voice shook the earth then,” Hebrews 12:26; cf. Exodus 19:18). The author then passes through history from Sinai to the promise of a great cosmic upheaval of the end time (“Yet once more I will shake not only the earth but also the heaven,” Hebrews 12:26; cf. Haggai 2:6). God’s ultimate purpose is to give believers “a kingdom which cannot be shaken” (Hebrews 12:28) so that the faithful, having perceived his extraordinary power, can “offer to God an acceptable service with reverence and awe” (Hebrews 12:28).

Such passages provide the eschatological backdrop for the book of Revelation, where earthquakes are symbols of God’s final judgment upon the earth. They appear as climactic judgments throughout the book, producing terror, awe, and destruction among the earth’s inhabitants. Five earthquakes are described. These are at the opening of the sixth and seventh seals (6:12; 8:5), just before and after the seventh trumpet (11:13, 19), and during the seventh bowl (16:18). This last earthquake is identified as the greatest ever on earth (16:18), splitting Jerusalem into three parts and destroying the cities of the nations.

Although demonstrating the awesome power and presence of God, these passages do not indicate an increase in earthquakes in the present age. For those who follow a futuristic and dispensational interpretation of Revelation, these earthquakes occur during the Great Tribulation, not before it. They are not precursors to the Day of the LORD, but evidence of its presence.

The Olivet Discourse

The only Biblical evidence which might suggest an increase in earthquakes in the present age appears in Jesus’ Olivet Discourse in Matthew 24 (pars.). The discourse is set in the context of Jesus’ statement concerning the destruction of Jerusalem (24:1) and the disciples’ question: “Tell us, when will these things happen, and what will be the sign of Your coming, and of the end of the age” (24:2). Two questions are here asked, the first relating to the destruction of

Jerusalem and the second to Jesus' return (which is linked to the end of the age). The interpretation of the discourse is problematic because it is difficult to tell which question Jesus is answering at any particular point in the narrative. Is the discourse primarily about the destruction of Jerusalem or the coming of the Son of Man? Or is it both? If both, then was Jesus mistaken in concluding that the Son of Man would return at the time of the fall of Jerusalem? Or does the destruction in some sense serve as a preview of the judgment associated with the coming of the Son of Man? (Carson, 1984, pp. 491–495; Pentecost, 1964, pp. 277–278).

Our primary concern is with the first part of the discourse, where Jesus warns against being deceived by false christs or being alarmed at wars, rumors of wars, famines, and earthquakes:

And Jesus answered and said to them, "See to it that no one misleads you. For many will come in My name, saying, 'I am the Christ,' and will mislead many. You will be hearing of wars and rumors of wars. See that you are not frightened, for those things must take place, but that is not yet the end. For nation will rise against nation, and kingdom against kingdom, and in various places there will be famines and earthquakes. But all these things are merely the beginning of birth pangs." (Matthew 24:4–8)

Among dispensationalists there are two main interpretations of these verses. As we shall see, neither confirms that earthquakes will increase as the present Church age draws to a close.

1. Some dispensationalists see the whole of the Olivet Discourse as relating to the tribulation period. Verses 4–8 are usually said to concern the disturbances of the first half of the tribulation while verses 9–26 concern the second half—the Great Tribulation (Barbieri, 1983, pp. 76–77³³; Pentecost, 1964, pp. 278–279; Pentecost, 1990, pp. 250–252). Evidence for this is claimed in the similarity between the events described in verses 4–8 and those associated with the seven seals of Revelation 6 (Pentecost, 1964, pp. 278–279). For advocates of this view, the earthquakes identified in verses 7–8 are not part of the present Church age, but rather the tribulation period. In this case, even if the birth image in verse 8 were to indicate an increase in earthquakes (which is not necessary—see discussion below), this increase occurs during the tribulation, not during the present Church age. Present (Church age) data concerning earthquake frequency has little or no bearing on the text.
2. Other dispensationalists (as well as many non-dispensationalists) claim that verses 4–8 (or verses 4–14) concern not the tribulation period, but general signs which are characteristic of the present age. Lewis Sperry Chafer (1948, p. 120)

wrote that the events described in verses 4–8 "are the characteristics of the unforeseen intervening or intercalary age"—that is, the Church age. John Walvoord (1974, p. 184; 1990, p. 381³⁴) similarly affirms that "verses 4–14 are general prophecies that can find fulfillment throughout the present age, with verses 15–30 fulfilled in the Great Tribulation." He adds, however, that these former events "are repeated in the Great Tribulation when what was perhaps partially fulfilled earlier then have a very literal and devastating fulfillment." (Walvoord, 1990, pp. 382–383). The primary evidence that verses 4–14 are signs characteristic of the present age are their general nature and the fact that Jesus identifies them as events which do not indicate the end ("but that is not yet the end") and so should not provoke apocalyptic fervor ("see that you are not alarmed").

Assuming for the sake of argument that this latter view is correct, why would Jesus feel the need to warn against taking such events as evidence of the end? The likely answer is that the apocalyptic expectations of the Jews at this time often associated catastrophic events with the nearness of the end. In the third vision of the apocryphal book of 2 Esdras (= 4 Ezra), Ezra asks the Lord when the signs he has been showing him will take place. The Lord responds:

Measure carefully in your mind, and when you see that some of the predicted signs have occurred, then you will know that it is the very time when the Most High is about to visit the world that he has made. So when there shall appear in the world earthquakes, tumult of peoples, intrigues of nations, wavering of leaders, confusion of princes, then you will know that it was of these that the Most High spoke from the days that were of old, from the beginning. (2 Esdras 9:1-5 NRSV; cf. 2 Baruch 27:7; 70:8)

Cataclysmic events, whether natural disasters or human conflicts, naturally raise expectations for a soon end (Josephus)³⁵. Hagner (1995, p. 691) captures the disposition of human thought concerning war,

The horror and human suffering connected with war are bound to raise eschatological thoughts—and they have indeed throughout history.

In this latter view, then, Jesus warns his disciples against mistaking catastrophic events in human history with the cataclysmic events that will characterize the End. Dispensational writers who take verses 4–14 as part of the present age recognize this qualitative difference between the "general signs" of verses 4–14 and the "specific signs" which follow in verses 15–26. John Walvoord (1974, p. 184) writes,

Taken as a whole, the opening section, ending with Matthew 24:14, itemizes general signs, events, and situations which mark the progress of the age, and, with growing intensity, indicate that the end of the

age is approaching. These signs, however, by their very characteristics and because they have occurred throughout the present age, do not constitute a direct answer to the question of “the sign” of the coming of the Lord.

While Walvoord affirms that these are events common to the present age and that they, therefore, do not constitute the answer to the disciples’ question (“what will be the sign of your coming?”), he jumps to the unwarranted conclusion that these “general signs” will increase in intensity as the end of the age approaches. But Jesus did not indicate such an increase. He rather downplayed their significance and encouraged his followers not to be alarmed or disturbed by them. He certainly did not say to count their frequency and calculate the end.

Eschatological Birth Pains

The only statement which might suggest an increase in famine and earthquake activity is the final clause, “But all these things are merely the beginning of birth pangs, (ὥδω)” (Matthew 24:8). Because birth pains begin small and then increase in intensity and frequency, this passage could be interpreted to mean that earthquakes will start small and infrequent and gradually increase. When they reach their greatest severity and frequency, they will give birth to the new age.

But is this the correct way to interpret this clause? If so, the lack of seismic increase we have noted above would confirm that Jesus’ return is not near. This would then contradict the many biblical statements that it is near! But there is good reason to believe that Jesus’ words do not indicate an increase in frequency or severity of these “general signs,” but only indicate their continued recurrence until the end of the age.

The image of eschatological birth pains was not new with Jesus, but was a common one in Jewish apocalyptic and later rabbinic writings. The “messianic woes” or “birth pains of the Messiah” referred to a period of suffering that would immediately precede the coming of the messianic age (Bertram, 1974, pp.670 ff.; Hagner, 1995, p.691). The primary conceptual significance of this image was not that the pain would increase in intensity, but rather that the present period of suffering would be followed by the joy of new birth (that is, salvation and restoration). Pain will give way to rejoicing for those who persevere.

The apostle Paul uses the birth image in a similar way in Romans 8:18–25. The present creation—for which salvation has been achieved but not consummated—“waits eagerly for the revealing” of the children of God (verse 19). This period of waiting is metaphorically described as groaning and suffering “the pains of childbirth (πόνος)” (verse 22). The point is not that creation’s pain is growing worse and

worse, but that the pain itself (the residual effects of humanity’s fall) provokes eager longing for the new birth (the consummation of salvation).

Paul uses the birth image elsewhere to illustrate the abruptness of the arrival of the Day of the LORD. It will be unexpected “like a thief in the night” and “like labor pains” on a pregnant woman (1 Thessalonians 5:2, 3). Paul’s two images are reminiscent, of course, of the Olivet Discourse (Matthew 24:8, 43, 44). Obviously, Paul is not saying here that we can predict our Lord’s appearance by noting precursor birth pains.

Conclusion

A number of prophecy teachers say that a pronounced increase in frequency and intensity of earthquakes has occurred in the latter part of the twentieth century, a worldwide trend fulfilling a prophecy made by Jesus. Contrary to these prophecy teachers, no obvious trend is found indicating an abnormal increase in the frequency of large earthquakes during the last half of the twentieth century. Neither is there a noteworthy deficiency of earthquakes in the first half of the century. Graphical plots of global earthquake frequency indicate overall a decreasing frequency of earthquakes through the century. The decades of the 1970s, 80s, and 90s experienced a deficit of larger earthquakes compared to earlier decades of the century. The 70s, 80s, and 90s are precisely those decades that many prophecy teachers suppose, erroneously, show a dramatic surplus of larger earthquakes. Regional earthquake data from California and Japan also do not argue for increasing earthquake frequency in the latter decades of our century.

At the time of Christ the Jews had a heightened anticipation that wars, famines, pestilence, and earthquakes communicated signs having apocalyptic significance. Jesus responded to apocalyptic expectations in the Olivet Discourse. Whether one interprets Matthew 24:4–14 as (1) events which will occur during the tribulation period, or (2) general signs of the present age, there is no clear scriptural warrant for the claim that earthquakes will increase dramatically prior to the return of Christ. In the former interpretation, these earthquakes would be part of the tribulation period and so of little significance for any increase in earthquakes during the present Church age. In the latter interpretation, earthquakes are seen as recurring catastrophic events common to the present age—events that must not be misinterpreted as “signs” of an immediate end. It is ironic that a passage that intentionally teaches that earthquakes are not indicators of the “end of the age” should be so frequently interpreted as teaching exactly the opposite.

Jesus' statement, "all these things are merely the beginning of birth pangs" (Matthew 24:8), has been misunderstood to imply that pain would increase steadily in time. The birth image associated with such signs does not point (necessarily) to an increase in pain with time. Paul's understanding of creation's pain (Romans 8:18–25) is not that pain will grow steadily worse, but that the present period of suffering provokes eager longing for the new birth and the consummation of the coming age. The author of Hebrews sees a similar hope, not in anticipating a future "sign" of increasing earthquake activity, but in the coming of a sudden cosmic cataclysm producing a "kingdom which cannot be shaken" (Hebrews 12:28).

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- magnitude 6.0 and greater.
- The term “killer quake” is not defined herein.
 - Table 2 lists Lindsey’s earthquake statistics.
 - Lindsey’s citation here is suspicious. Though he claims to be using a USGS source, his endnote (p.105) refers only to the *Los Angeles Herald Examiner*, May 22, 1984. One wonders how a newspaper published early in 1984 could provide data for an increase in earthquakes in the 1980s and 1990s.
 - On page 170 the authors say: “In the last 100 years there has been a dramatic increase in the frequency and intensity of earthquakes worldwide.”
 - Jeffrey gives no information on how a copy of this report can be obtained (author, date, report name, and location). Furthermore, the numbers from Jeffrey’s USGS source differ slightly from Lindsey’s USGS source. Which is the better source? Jeffrey repeats these statistics in his later books *The signature of God* and *Armageddon: Appointment with destiny*.
 - Jeffrey is very confident in his earthquake statistics: “Anyone who examines the record of massive increases in earthquakes in our century must acknowledge that this is extremely unusual. The increase is unprecedented in recorded human history, and in light of the Bible’s prophecies, these statistics provide incontrovertible evidence that we are living in the last days.”
 - J.R. Church writes; “Nevertheless, when one looks at modern records, one invariably sees a steady increase in earthquake activity, ranging across the spectrum from large events to small tremors.”
 - We searched all earthquake articles of the 1990s through June 1998.
 - Hagee writes on p.98, “... the number of earthquakes recorded has risen from 2588 in 1983 to 4084 in 1992.” Here Hagee has committed a serious error by citing the “No Magnitude” row in the National Earthquake Information Center (NEIC) worldwide seismic frequency table. He supposes erroneously that the “No Magnitude” row is the total number of earthquakes that have been located globally for both of the years. The NEIC “Preliminary Determination of Epicenters” database (PDE) for 1983 locates 9842 events globally (2588 events with no magnitude data given), and that database for 1992 locates 19,548 events globally (4084 events with no magnitude data given). The apparent doubling of earthquake frequency from 1983 to 1992 is caused by significant improvement by 1992 in the detection and location of magnitude less than 5.0 earthquakes. For magnitude greater than or equal to 5.0 the PDE locates 1813 events in the year 1983, but locates only 1668 events in 1992. For magnitude greater than or equal to 6.0, the PDE locates 140 events in 1983, but locates only 127 events in 1992. The data might better argue for decreasing frequency with time, contrary to the conclusion of Hagee. The above numbers were obtained on December 28, 1998 by going to the NEIC files on the internet at <http://www.neic.cr.usgs.gov> and then going to the NEIC-PDE data using the “Search Earthquake Data Base” function. The earthquake data file cited by Hagee contains the cautionary statement, “As more and more seismographs are installed in the world, more earthquakes can be and have been located.: See the summary NEIC-PDE data file at: <http://www.neic.cr.usgs.gov/neis/eqlists/>

Footnotes

- Lindsey has been writing about the twentieth century increase of earthquakes for almost 30 years. This book sold over 20 million copies.
- Lindsey says these statistics refer to earthquakes of

- eqstats.html* which closely resembles the source of Hagee's numbers. Therefore, our analysis shows Hagee's argument for increased earthquake frequency in the 1990s to be seriously flawed.
12. Charles Capps commits a similar error by citing the much-increased lower-magnitude location ability within the most recent NEIC data: "A recent USGS report shows there were 4139 earthquakes in 1970 and 19,996 in 1996." Capps concludes, "... earthquakes are definitely on the increase." (p.13).
 13. On p.1 we find the former Seventh Day Adventist pastor predicting four global earthquakes beginning about 1994 and ending in 1998 with the Second Coming of Christ.
 14. Sumrall says on p.68: "In this century there have been more earthquakes than all the rest of history put together. ... Every 10 years, earthquakes double in number, and so it has been for the past 10 decades. During the later part of this decade, earthquakes will occur with increasing regularity, creating terror and panic throughout the world. Jesus said that was one of the signs of His coming." If earthquakes are increasing so rapidly in the 1990s, then what is there to prevent Christ's return?
 15. The Lalonde earthquake frequency numbers have been widely quoted in popular publications.
 16. Van Impe says: "In Matthew 24, Jesus predicted such fearful signs just before His return. He said they would be like birth pangs—increasing in frequency and intensity as the time of the end drew near.... From 1900 through 1969, a 70-year period, there were only 48 quakes of 6.5 magnitude or greater. But from July 1990 through 1992, a three-year period, there were 133 great quakes!"
 17. "... there have been more earthquakes in the last 50 years than in the previous 1500 years." p.24.
 18. See pp.46–87 for a review of authors before the 1990s who advocated the increase in frequency and intensity of twentieth-century earthquakes.
 19. A recent survey of thinking on earthquakes and other natural disasters as apocalyptic signs.
 20. An incident illustrates why earthquake catalogs need to be checked carefully for completeness. In 1997 we consulted the "Worldwide Earthquake Catalog" maintained by the Council of the National Seismic System (C.N.S.S.) for seismic events of the 1990s. The CNSS "Worldwide Earthquake Catalog" was examined at internet URL: <http://quake.geo.berkeley.edu/cnss> on December 28, 1997. Because this is a composite database assembled from the records of the thirty member organizations, we might assume it to be a "complete" catalog. However, when we consulted records maintained by CNSS member organizations, we found them to include earthquakes not in the composite database. We even found many earthquakes of the early 1990s with $M \geq 7.0$ that were not in the composite database. The lesson is obvious: careful study must be conducted before an earthquake catalog can be said to be "complete." It takes a deliberate process to make a "complete" catalog.
 21. This is an excellent summary of earthquake magnitude scales. The paper has been posted on the internet at URL: <http://www.neic.cr.usgs.gov/neis/general/handouts/measure.html>.
 22. The file "1900 EQ" is part of the global NGDC "Seismicity Catalog" on CD-ROM. The data file has not been screened rigorously for duplicate events below magnitude 6.5, and some of the events of lower magnitude, which normally might be supposed to be aftershocks or foreshocks, are likely duplicated listings. Therefore, the data file "1900. EQ" probably overestimates the frequency of magnitude 6.0 events globally.
 23. Anyone wishing to evaluate completeness of earthquake statistics globally for $M \geq 6.0$ cited by prophecy teachers should consult this file. The file is in ASCII code that can be read by any word processor and imported into a spread sheet. Because the file "1900.EQ" is not copyrighted, the authors can make a copy available on floppy disk to anyone requesting it.
 24. Researchers suggest the inhomogeneity of earthquakes may be related to some type of internal global fluctuation within the earth, perhaps a variation in the large-scale motion of the earth. Could a slight wobble during the earth's rotation correlate with the inhomogeneous data? Is there occasional chaotic motion within the earth's liquid outer core that correlates with earthquakes in the crust? Earthquake frequency cycles appear to be real, but the cause remains speculative. An observed might say it is like monitoring birth pangs. When will the next ones come? How long will we have to wait? The observed earthquake frequency pattern is consistent with creationist ideas suggesting overall exponentially declining tectonism and volcanism following a recent geologic upheaval such as Noah's Flood. The data may present a problem for the skeptic of the doctrine of Creation and the opponent to the reality of Noah's Flood. Such a uniformitarian skeptic would want to say, "everything goes on as it has since the beginning of creation" (2 Peter 3:4 NIV). The skeptic might not want to acknowledge such a declining pattern over time.
 25. "By selectively manipulating the criteria used to determine a 'major quake,' the USGS can effectively argue against any increase in seismic activity." Lindsey's assertion of selective manipulation is demonstrated to be incorrect by data displayed in Figure 1b.
 26. Lindsey's statistics for $M \geq 6.0$ earthquakes in Table 1 come from *Planet earth 2000 A.D.*, pp.85, 86.
 27. On page 85 Lindsey says: "One of the major birthpangs Jesus predicted would increase in frequency and intensity shortly before His return is earthquakes. Those of us who live in California are only too aware of the increase in earthquake activity in recent years."
 28. Our computer search of "authoritative" records revealed the date, location, and magnitude of 408 earthquakes with $M \geq 5.0$ during the eight-year period from 1900 through 1979 in the California region. We located these authoritative records for $M \geq 5.0$ by accessing the "US Geological Survey Earthquake Data Base" of the NEIC on the internet at URL <http://www.neic.cr.usgs.gov>. For the period 1900 through 1974, we searched at the NEIC website the California Division of Mines and Geology catalog ("CDMG) and located 364 earthquakes. For the period 1975 through 1979, we searched by rectangular areas the Preliminary Determination of Epicenters catalog (PDE) and found an additional 44 earthquakes. Our search was conducted totally within the NEIC database for $M \geq 5.0$ records on August 28, 1998.
 29. Hutton and Jones document 63 $M \geq 5.0$ events in Southern

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- California from 1932 through 1979, many more than the 18 events for all of California that Lindsey supposes from 1900 through 1979.
30. Lindsey refers to a recent earthquake increase in Japan: "But California is not the only place where earthquake activity has increased. There has been a destructive series of quakes in Armenia, Australia, Japan, China, India as well as California."
 31. Lindsey writes that Jesus said these signs "would increase in frequency and intensity just like birth pangs before a child is born."
 32. The point is here that God did not speak in the earthquake, the expectation is that he normally would have. The gentle whisper is contrasted with God's more typical theophanic manifestation of power.
 33. A modification of this interpretation extends the first half of the tribulation to verse 14
 34. While Walvoord is here describing various views (not identifying his own), this view is also expressed in his commentary on Matthew.
 35. Josephus describes an interesting episode which occurred following a severe earthquake in Judea in 31 B.C., an earthquake which reportedly killed 30,000 people. Hearing exaggerated reports of the devastation, the Arabs to the East seized the opportunity and invaded the territory of Herod the Great, embroiling his nation in war. When many of Herod's demoralized troops interpreted the earthquake as an evil omen, Herod responded with a speech declaring it to be an event without divine causation: "Do not let the convulsions of inanimate nature disturb you or imagine that the earthquake is a portent of a further disaster. These accidents to which the elements are subject have physical causes, and beyond the immediate injury inflicted bring no further consequence to mankind."