

## Geology

### Breathing of the seafloor: Tidal correlations of seismicity at Axial volcano: Comment

John H. Glaser

*Geology* 2003;31:e3

doi: 10.1130/0091-7613-31.1.e3

---

**Email alerting services** click [www.gsapubs.org/cgi/alerts](http://www.gsapubs.org/cgi/alerts) to receive free e-mail alerts when new articles cite this article

**Subscribe** click [www.gsapubs.org/subscriptions/](http://www.gsapubs.org/subscriptions/) to subscribe to *Geology*

**Permission request** click <http://www.geosociety.org/pubs/copyrt.htm#gsa> to contact GSA

Copyright not claimed on content prepared wholly by U.S. government employees within scope of their employment. Individual scientists are hereby granted permission, without fees or further requests to GSA, to use a single figure, a single table, and/or a brief paragraph of text in subsequent works and to make unlimited copies of items in GSA's journals for noncommercial use in classrooms to further education and science. This file may not be posted to any Web site, but authors may post the abstracts only of their articles on their own or their organization's Web site providing the posting includes a reference to the article's full citation. GSA provides this and other forums for the presentation of diverse opinions and positions by scientists worldwide, regardless of their race, citizenship, gender, religion, or political viewpoint. Opinions presented in this publication do not reflect official positions of the Society.

---

#### Notes



## Breathing of the seafloor: Tidal correlations of seismicity at Axial volcano: Comment

### COMMENT

John H. Glaser\*

4 Woodpark Circle, Lexington, Massachusetts 02421, USA

Tolstoy et al. (2002) have shown that tidal forces influence earthquakes and volcanoes. The purpose of this comment is to add support to their correlation by demonstrating that when the tidal forces are strongest, earthquakes and volcanic eruptions are the most severe.

Three factors determine the magnitude of tidal forces: the distance between the Moon and Earth, the distance between the Sun and Earth, and the alignment of the Sun, Earth, and the Moon. The Sun's influence on tides is only 45% of that of the Moon, but when Earth is closest to the Sun (as it is in December–January), the Sun's effect is at its strongest. This could account for the great earthquakes of central Japan occurring exclusively from August to February since 684 A.D., as reported by Kerr (2001).

Within a day or two of a new moon or a full moon, the tidal forces of the Moon and the Sun act in concert. And if perigee occurs within a day or two of a new moon or a full moon, the tidal effects are further reinforced. As reported by the U.S. Geological Survey, six major earthquakes (magnitude 7.0 or greater) occurred in the first half 2002; four of these were within three days of perigee and a full moon ( $p < 0.02$ ) (Table 1).

In the second half of 2002, perigee will occur within a few days of a new moon during the periods 7–10 September, 5–8 October, 3–6 November, and 2–5 December. These are the periods when major earthquakes and/or significant volcanic eruptions are most likely to occur.

*Note added in proof: Precisely as predicted, a magnitude 7.6 earthquake occurred on 8 September, 2002, at Papua New Guinea.*

\*E-mail: [glaserj@alum.mit.edu](mailto:glaserj@alum.mit.edu).

TABLE 1. MAJOR EARTHQUAKES, FIRST HALF 2002

Location	Magnitude	Earthquake	Perigee	Full Moon
Vanuatu Islands	7.3	Jan. 2	Jan. 2	Dec. 30
Afghanistan	7.4	Mar. 3	Feb. 27–28	Feb. 27
Philippines	7.5	Mar. 5	Feb. 27–28	Feb. 27
Taiwan	7.1	Mar. 31	Mar. 28	Mar. 28
Mariana Islands	7.1	Apr. 26	Apr. 25	Apr. 27
Russia/China	7.3	June 28	June 19	June 24

TABLE 2. MAJOR EARTHQUAKES, SEPT. TO DEC. 2002

2002 month	Date of earthquake	Predicted dates	Location	Magnitude
Sept.	Sept. 8	Sept. 7–10	New Guinea	7.6
Oct.	Oct. 10	Oct. 5–8	Indonesia	7.6
Nov.	Nov. 2	Nov. 3–6	Indonesia	7.4
Nov.	Nov. 3	Nov. 3–6	Alaska	7.9
Nov.	Nov. 17	Nov. 3–6	Kuril Islands	7.3
Dec.	(none)	Dec. 2–5		

*Also, of the five major earthquakes that occurred from September to December 2002, three of the five took place during the predicted dates listed here. The predicted dates comprised a total of 16 days out of the 122-day period from September to December ( $16/122 = 13\%$ ), but 60% of the earthquakes occurred during those dates. See Table 2 added in proof.*

### REFERENCES CITED

- Kerr, R.A., 2001, Earth's breathing lessons: *Science*, v. 291, p. 584.  
 Tolstoy, M., Vernon, F.L., Orcutt, J.A., and Wyatt, F.K., 2002, Breathing of the seafloor: Tidal correlations of seismicity at Axial volcano: *Geology*, v. 30, p. 503–506.  
 U.S. Geological Survey, 2002, National Earthquake Information Center–World Data Center for Seismology: <http://neic.usgs.gov/neis/bulletin/mag7.html> (accessed September 2002).