New Concepts in Global Tectonics NEWSLETTER

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For contact, correspondence, or inclusion of material in the Newsletter please use the following methods: NEW CONCEPTS IN GLOBAL TECTONICS. **1**. E-mail: editor@ncgt.org, ncgt@ozemail.com.au, or ncgt@hotmail.com, each file less than 5 megabytes; **2**. Fax (small amount of material): +61-2-6254 4409; **3**. Mail, air express, etc., 6 Mann Place, Higgins, ACT 2615, Australia (files in MS Word format, and figures in jpg or tif format); **4**. Telephone, +61-2-6254 4409. **DISCLAIMER**: The opinions, observations and ideas published in this newsletter are the responsibility of the contributors and are not necessary those of the Editor and the Editorial Board. NCGT Newsletter is a quarterly international online journal and appears in March, June, September and December. Annual subscription fees: electronic format - U$30 for individuals, U$50 for libraries. Hard copy - U$50 for individuals, U$70 for libraries. For more details see page 81.

COMMENT

Shou, Z., 2006. Precursor of the largest earthquake of the last forty years. *NCGT Newsletter*, no. 41, p. 6-15.

Page 1 of the Shou paper discusses water vapor only. Before the vapor there will be water and this should have been discussed. When the pressure increases one or two days before the occurrence of a moderate to large earthquake (magnitude > 6.5) the groundwater comes up in the form of fountains or springs. The vapor is from this water. The paper mentions that the vapor is from the epicenter.

Arun BAPAT
Consulting seismologist
Pune, India
Arun_bapat@vsnl.com

REPLY

It is logical that water existed before the vapor, but I have already discussed this. In the section entitled "Synopsis of the Earthquake Vapor Theory", I wrote, "Here is a brief description. When a huge rock is stressed by external forces, its weak parts break first and small earthquakes occur. The fact that a large earthquake produces a large gap suggests that small shocks generate small crevices, which reduce the cohesion of the rock. Next, **underground water** percolates into the crevices. Its expansion, contraction, and chemistry further reduce the cohesion **(1)**." My papers in the references show a table of all large earthquakes and preceding shocks within 10 km of them in Southern California since 1981 to support the proposed crevices **(2-4)**.

Table. All big earthquakes in Southern California & preceding nearby shocks (1981~2005)

No.	Date	Time UTC	Lat.	Long.	Mag. ML	Dep. km	within 5 km		within 10 km	
							All	Deeper	All	Deeper
1	19871124	1:54	33.09	-115.79	6.2	10.8	25	4	138	10
2	19871124	13:15	33.02	-115.85	6.6	11.1	186	7	558	33
3	19920423	4:50	33.96	-116.32	6.1	12.3	321	3	1602	14
4	19920628	11:57	34.20	-116.44	7.3	0.9	166	146	520	461
5	19920628	15:05	34.20	-116.83	6.3	5.3	141	128	345	256
6	19940117	12:30	34.21	-118.54	6.7	18.4	9	2	79	5
7	19991016	9:46	34.59	-116.27	7.1	0.02	250	226	430	373
8	20031222	19:15	35.71	-121.10	6.5	7.0	12	1	37	7
9	20040928	17:15	35.81	-120.38	6.0	5.5	44	35	90	79

Note:

1. All the above data are from the new catalog of the Southern California Earthquake Data Center (SCEC) of the USGS (http://www.data.scec.org/ftp/catalogs/SCSN/) since Feb. 20, 1981, covering the region 32~37N. Columns 8~9 and 10~11 indicate the number of shocks before and within 5 km and 10 km of an epicenter respectively.

2. Lat. = Latitude. Long. = Longitude. Mag. = Magnitude. Dep. = Depth.

3. Deeper indicates the number of preceding shocks with depths greater than or equal to those of the big earthquake. For example, earthquake No. 1 has 138 preceding shocks within 10 km of the epicenter, of which 10 shocks have a depth greater than or equal to the 10.8 km depth of the M6.2 hypocenter.

4. All large earthquakes have many preceding shocks around their hypocenters.

Figure 1 shows the depth distribution of the Northridge earthquake on Jan. 17, 1994 and preceding nearby shocks. Five shocks are deeper than the Northridge hypocenter. One of them was 200 meters below the hypocenter.

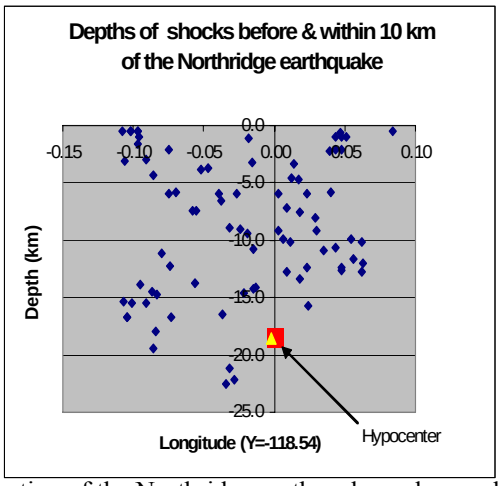

Figure 1: Depth distribution of the Northridge earthquake and preceding nearby shocks

Notes:

1. ***All the above data since Feb. 20, 1981 are from the same SCEC catalog.***
2. ***X-axis: Longitude. Its center is at -118.54 like that of the Northridge earthquake.***
3. ***Y-axis: Depth in km.***
4. ***The red square: the Northridge hypocenter at 34.21, -118.54 and 18.4 km in depth.***
5. ***The yellow triangle: the small shock at 34.19, -118.54 and 18.6 km in depth on March 21, 1991.***
6. ***Blue diamonds: 78 shocks within 10 km of the Northridge epicenter. Altogether, 5 shocks are deeper than the Northridge hypocenter.***

In "Earthquake Vapor, a reliable precursor" **(4)**, I cite Cox's excellent demonstration. On the one hand, chemical theory and experience in the manufacture of artificial diamonds show that the formation of diamond requires a high pressure of over 45 kilobars, which indicates a depth of over 150 kilometers and a temperature of over 1000°C in natural

conditions. On the other hand, diamond exists in river gravels. Thus, there must be a path from a depth of over 150 kilometers to the river gravels to let diamond and water pass through **(5)**.

I would like to repeat two important pieces of evidence about the water preceding the vapor. First, the USGS performed an experiment at the Rangely Oil Field in Western Colorado in 1969 **(6)**, in which water was injected into and pumped out of oil wells. Researchers found that there was a strong positive correlation between the quantity of water injected and seismic activity. Above a threshold fluid pore pressure, seismic activity was observed to increase dramatically. This work is supported by the results of laboratory studies of the yield strength of saturated rock. As the rock is heated, the yield strength changes only gradually until a threshold temperature is reached. Beyond this threshold, the rock becomes dehydrated and its yield strength drops rapidly (Fig.10 of **(7)**).

Since copyright prevents me from showing Fig.10 of **(7)**, I show Figure 2 instead. After working on both the theory and practice of earthquake prediction for 7 years, I thought that there should be a characteristic curve as in Figure 2 if my theory was true. I drew it and showed it to a librarian for help to find such a reference and confirmed it in 1997. The characteristic curves of various rocks looked just like that shown in Figure 2, but without the labels of "Vapor Eruption" and "Earthquake".

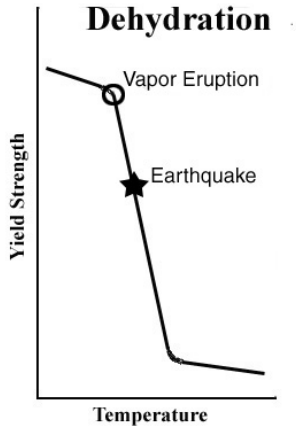

Figure 2: Dehydration
Note: I drew this figure to find reference for temperature vs. yield strength and I found it in 1997 (Fig.10 of **(7)**).

The above discussion shows that I did discuss the water preceding the vapor. Now, let's turn to Bapat's second comment, "When the pressure increases one or two days before the occurrence of a moderate to large earthquakes (magnitude > 6.5), the groundwater comes up in the form of fountains or springs. The vapor is from this water. The paper mentions that the vapor is from the epicenter." I wish his claim were true, so that evacuation would become very easy.

On Sept. 8-10, 1996, I carried out an investigation in Yellow Stone, Wyoming, where springs erupted every day. According to Bapat, I should have encountered a moderate earthquake at least, but I did not. Figure 3 showed a strong erupting spring with a height of about 8-10 meters, but it did not form any earthquake cloud. Moreover, satellite images do not show earthquake clouds there either, although springs appear every day. According to Bapat, Wyoming should have 182 moderate earthquakes a year at least, but the USGS does not report that many. These facts seem inconsistent with his claim.

To prove earthquake clouds from hypocenters, I will repeat two examples. First, the Bam cloud suddenly appeared from the Bam fault at 2:00 (UTC) on Dec. 20 and stayed there continuously for 24 hours, as shown in the following animation.
Animation of the Bam Cloud

Figure 3: Spring, photographed by me in Yellow Stone, Wyoming, USA on Sept. 10, 1996

Meteorology could not explain it, whereas at 0:58 UTC on Dec. 25, 2003 I made a public prediction of an earthquake of magnitude 5.5 or above in Fault AB within 60 days, using the following image.

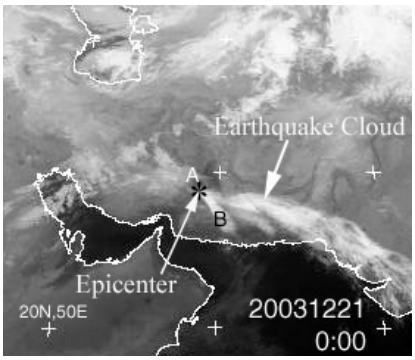

Figure 4: The Bam Cloud and the Predicted Fault AB. ***This infrared image (10.5-12.5 nm) is from EUMETSAT's IODC satellite (http://www.eumetsat.de/en/index.html), transformed and offered by Dundee University, UK (http://www.sat.dundee.ac.uk/pdus.html). It shows an earthquake cloud emerging from fault AB on Dec. 21, 2003, marked by a white arrow, by which I publicly predicted an M5.5 or bigger earthquake in Fault AB within 60 days on Dec. 25, 2003 (http://quake.exit.com). On Dec. 26, an M6.8 earthquake occurred in Bam (28.99N, 58.29E), Iran (marked by *), exactly where the cloud had emerged.***

This earthquake has been the only one with a magnitude greater than or equal to 5.5 there in recorded history, so my prediction is statistically significant. The fact that only my theory can explain this cloud and my prediction is statistically significant demonstrates that the cloud is from the Bam hypocenter. By contrast, there was no reported spring there and the duration from the cloud to the Bam earthquake was not 2 days.

Second, the M9 Indonesia cloud and its two partners are another good example. Three geoeruptions 1, 2 and 3 appeared suddenly at 0:00 on Nov. 15, 2004, and then developed into three long straight lines AX, BY and CZ. This atmospheric phenomenon is rare. Neither the plate theory nor meteorology can explain why those geoeruptions appeared locally and suddenly, why the three lines were so long (about 4,790 km each) and so straight, and what remarkable coincidence could have generated the three large earthquakes of magnitude 6.6, 7.5 and 9 at A, B and C respectively on Dec. 26, 2004. The whole process is shown in the following animation **(1)**.
http://quake.exit.com/Animation/20041226King0.2.gif

The only theory to explain this high coincidence is my vapor theory, which deduces that those clouds come from relevant hypocenters.

The above two examples are given in "Precursor of the Largest Earthquake in the Last Forty Years" **(1)**. I wonder why Bapat thinks those clouds come from springs less than 2 days before the earthquakes. According to my study on the spring precursor, I found it working sometimes, but not always. Moreover, its time window is not certainly within 2

days, e.g. "Petroleum erupted about 20 meters high" from a well **11 days** before the Tangshan earthquake **(8)**. "Water spouts erupted from as high as 115 feet above the valley floor at an estimated 400 cubic feet per second" **during** the 7.3 Borah Peak, Idaho earthquake on October 28, 1983 **(9)**. I feel that he should argue that a moderate or large earthquake has a spring within 2 days before and a spring triggers a moderate or large earthquake within 2 days after.

For readers' interest, I suggest looking at the Turkey Geothermal Eruptions on Feb. 23, 2000 (Fig. 7 of (**3**)) when a black point appeared at Point "X" at 14:00 and then tended to Point B and C where a couple of M4 earthquakes occurred exactly at B on April 2 and another couple of M4 earthquakes occurred exactly at C on May 7. I leave it to the readers to explain this phenomenon.

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Zhonghao SHOU
Earthquake Prediction Center
500E 63rd 19K New York, NY 10021
http://quake.exit.com/
earthquake.prediction@gmail.com

REPLY TO SHOU

What I meant was that water comes first and then it is followed by vapor/cloud. I was trying to say that in addition to vapor, it would be useful to study water. The explanation by Shou about water trickling through crevices, micro cracks and micro fractures needs to be corrected. Prior to the occurrence of any moderate to large earthquake (magnitude > 6.5) the ground water comes up in the form of a fountain or spring. This is due to increased pressure between two moving parts of rock. The groundwater is forced up by the rise in pressure. This has been seen prior to several earthquakes. I have two examples from Asian countries. The first is the Bhuj (Gujarat, India) earthquake, M = 7.8 on 26 January 2001 and another is Kashmir earthquake of magnitude 7.6 on 08 October 2005. A few days (up to 28 days) before the occurrence of the earthquake such fountains were seen. Shou's remark that there should have been 182 earthquakes at Yellow Stones, Wyoming is uncalled for and could have been avoided. I have never said that the water springs or fountains appear from any water body on the surface. The ground water is forced to come up (sometimes it cracks the ground before appearing).

Arun BAPAT