

Probable time correlation between the eruption of Baitoushan volcano and the megathrust earthquakes in Japan

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From 2002, Baitoushan volcano revealed the sign of magma activity such as the increase in seismicity and upheaval of the summit. This activity ceased in 2005. After six years from this sign, the 2011 Tohoku earthquake occurred in Japan. This gave an anxiety of the eruption of Baitoushan volcano as in the case of active volcanoes in Japan. There is a historical basis in this anxiety like as in 9th century history in East Asia including Japan and the Asian continent.

To examine the possibility of the Baitoushan eruption, we need the knowledge of historical correlation between the eruption and megathrust earthquakes in Japan. We have many precise historical records on the megathrust earthquakes in Japan, contrary to this, we have poor knowledge on the ages of Baitoushan eruption. In this study, we identified the eruption ages of Baitoushan volcano carefully based on the analysis of old documents. They were compared with the ages of megathrust earthquakes in Japan.

The eruption age adopted for consideration is following five ages. June 24 1373, October 7-9 1597, June 9 1702, 1898 and 1903. In addition to these ages ca.940 is adopted as the millennium eruption age based on the wiggle matching dating and the analysis of history of turmoil in Northeast Japan. Although some papers adopted 1403, 1413, 1668, 1900 and 1925 as the eruption age, I did not adopt them because of no description in primary document or doubt of yellow sand.

Among these eruption ages (6 data), the age interval was 5 to 433 years, and was an average of 193 years. Total age interval with 3sigma (standard deviation) accuracy was as large as 860 years within the examination period covered for 1070 years after ca.940. Thus it was meaningless to assume a periodicity. On the other hand, the age difference ($t_B - t_J$) between the eruption (t_B) and the maximum proximity megathrust earthquake (t_J) [4 data sets; reliable data relatively] ranged from -8 to +12 years, and it was an average of +1.3 years. Within the examination period covered for 640 years from 1373 with document record to the present, the total age difference with 3sigma accuracy was only 43 years, enough small to assume the correlation between the eruption and the megathrust earthquake.

Then, does an eruption occur after the megathrust earthquake of 3.11 in Baitoushan volcano? Supposing it erupts, when does it occur? There are some facts related on this problem; historical correlation between the Baitoushan eruption and the megathrust earthquakes along the Japan Trench, recent magma accumulation, and the stress field change after 3.11 from compressional to extensional. All these facts indicate the possibility of eruption of the near future. If it will occur in relation to the 3.11 megathrust earthquake, the age will be by 2034 with 3sigma accuracy.