

## A characteristic pattern observed in earthquake precursory signals and earth tides as a possible contributor

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There have been long discussions on contribution of earth tides to occurrence of earthquakes. Recently Tanaka et al. showed that there are significant effects of earth tides when their directions coincide with P-axes of earthquakes[1].

Also the author investigated characteristic of the regions whose earthquake focal mechanisms (directions of P-axis) are the same, and found that earthquakes occurred under specific phases of the Moon in each region[2].

Then, he with other investigators investigated earthquake precursory signals, and found a specific pattern. I.e., the earthquake precursory signals show, during one month (or longer) prior to a main shock, a typical maximum-minimum-maximum pattern, which can be regarded as when the crust is under heavy load it emits large signals and when it is under minimum load it emits minimum signals, which are caused by earth tides[3].

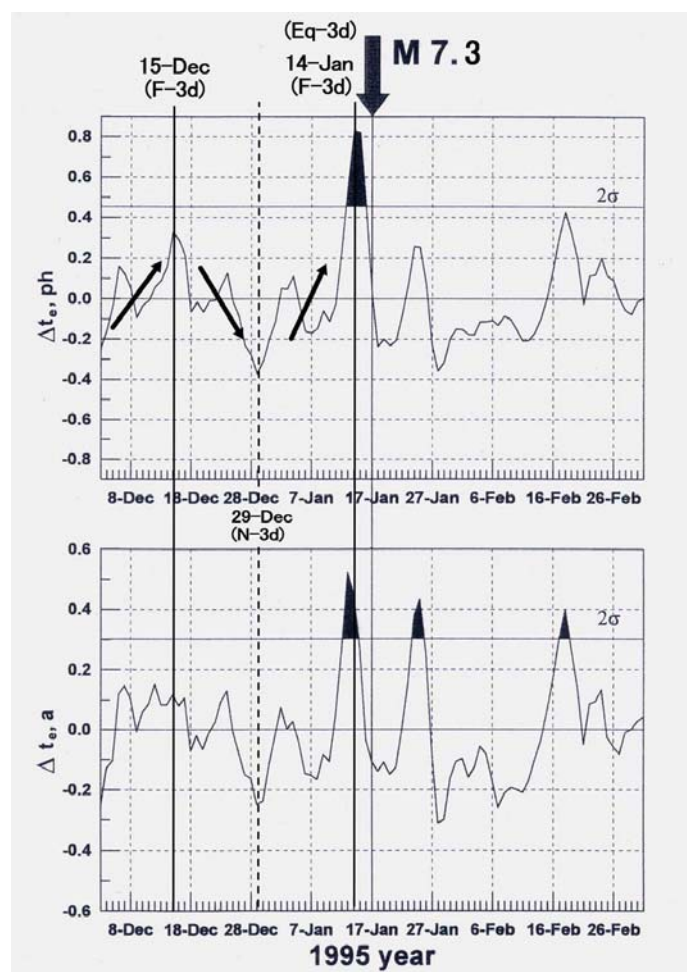


Fig.1 Variation of VLF terminator time (evening, upper:phase, lower:amplitude) observed at the 1995 Kobe earthquake (M7.3). Anomaly exceeding 2-sigma was observed on 3 days before the main shock. Further, during one month to the main shock, there was the maximum on the day of same lunar phase (F-3d, F:Full moon), and on the day of middle (for this observation, it was on the exact opposite day; N-3d, N:New moon) there was the minimum, and finally the maximum just before the main shock[3].

### References:

- 1) S. Tanaka, M. Ohtake, and H. Sato, Earth Planets Space, Vol.56, No.5, p.511-515, 2004.
- 2) Sue, Y., J. Atmos. Electricity, 29, 53-62, 2009.

3) Hayakawa, M., Sue, Y., and Nakamura, T., Nat. Hazards Earth Syst. Sci., 9, 1733-1741, 2009.

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