

Brittle-Ductile 相互作用の仮説と震源要素の時系列解析によるその物理的モデル

Brittle-Ductile Interaction Hypothesis and Its Physical Model by Time Series Analyses of Earthquake Source Parameters

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カタログから抽出した震源要素を時系列解析すれば、決定論的な地震発生過程が大地震発生に発展する事を観察する事ができる(武田, 特願 2003, Takeda & Takeo, AIP Conf. Proc. 2004)。この観測は、2003 年以来、決定論的な短期地震予知にうまく応用されてきた (www.tec21.jp)。観測の鍵は、破壊のユニークなサイズに相当するマグニチュードが約 3 から 4 となる M_c (Aki, EPS 2004) を使用し、地殻の Brittle 層を支配している地震活動の自己相似性からの微妙な逸脱を検出する事である。その決定論的な大地震発生過程の物理的なモデルを、ここに提案する。それは、Aki と Jin により提案されている Brittle-Ductile (B-D) 相互作用仮説の進展である。

安芸敬一先生は、複雑な地震現象を把握し B-D 相互作用仮説へと導いた驚くべき物理的洞察を講義ノート(地震・火山噴火予知の地震学、2003)に残した。2005 年初め頃の 2 ヶ月と言う短期間中、私の地震予知の仕事にも激励と、私が見つけた僅か 2 つの独特なタイプからなる大地震の予兆 - 1995 年阪神淡路大震災の予兆 (CQK) と 2000 年鳥取地震の予兆 (CQT) - を支持する多くのコメントとを、30 通からなる電子メールにも残した。私の解析と比較した先生の見解には次の様な物もある。

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Dear Takeda - san:

My excitement continues from reading your paper.

First, you do not seem to be bothered by the 60 - event periodicity, attributing it to some process at the brittle-ductile transition zone. Seismologists would react with the suspicion that some artifact in analysis causing it, and discredit your finer interpretation as your imagination. I am amazed in your confidence as a physicist that such fluctuation can be expected as a physical phenomenon. Personally I believe that this periodicity is real, indicating a clear departure of the process involved from the self-similarity, possibly due to the unique size of the fractures in the brittle part of the lithosphere (a few hundred meters to about a km) that I have proposed since the 1989 JGR paper with Anshu Jin. There are numerous observations supporting the existence of such a unique length as I described in my Trieste lecture note, but I still cannot prove it. For example, as you find in the fluctuation of coda Q and $N(M_c)$ in California by Jin and Aki (as quoted in my 2004 EPS paper), we saw a periodicity of about 10 years. The fluctuations in these parameters in other areas are usually several years, much longer than what you showed in your figures. So there must be some artifact in the apparent periodicity that needs to be clarified before convincing seismologists about their physical reality.

Secondly, your distinction of CQT (T for Tottori) and CQK (K for Kobe) is extremely interesting because the high resolution map of coda Q obtained from the 1000 Hi-net stations and the map of $N(M_c)$ from the JMA data both obtained recently by Anshu also identify the two areas not only as anomalous, but also in distinctly different ways. I have not digested fully these observations, but I feel that both you and Anshu are detecting the common phenomenon through different windows. Would you two exchange papers and start communicating each other? There is not much time left, because Anshu must quit her position at NIED at the end of March, as I mentioned in my earlier mail.

Have you read the extended abstract of my paper titled –A perspective on engineering application of seismology– presented at an international symposium organized by the Society of Exploration Geophysicists (SEG), Japan, which I asked Anshu to mail a copy? I have a feeling that my dream about the future of earthquake prediction described in that paper may be realized by you. Perhaps that was the intension of someone in the heaven who arranged several accidental meetings between you and me!

With best regards,

Kei