# Proposal for Earthquake Prediction Program I: Short-term Prediction

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A national project for earthquake prediction has been conducted over several decades in Japan. However, no successful prediction has ever been made. One of the main reasons for this may be the fact that the program has always laid too much emphasis only on seismological observations. Needless to say that seismology is important and the national program has built the world's most advanced and reliable seismic networks that have already made great contributions to global seismology. Immediately after occurrences of every sizable earthquakes, including the 2011 M9 Tohoku mega-event, seismologists were always able to clarify what happened exactly, largely thanks to these networks. It is, however, also an almost consensus view of all concerned that it is difficult to achieve short-term earthquake prediction by seismic observation alone.

However, if it is short-term predicted the hazard will be diminished dramatically. In fact, many of the victims could have survived the Tohoku tragedy. We believe that among long-, mid- and short-term earthquake predictions, the last one is not only the most scientifically challenging but more importantly most directly concerned with people's security. Although long- and mid-term predictions have their own merits such as for city planning, for almost every citizen, an earthquake prediction means nothing but a short-term prediction.

It is clear to everybody that precursory signal is absolutely necessary for short-term prediction. Therefore, finding reliable precursory phenomena is the central issue for it but it has been considered impossible to find them for the present science, namely the present seismology. Therefore, there has practically been no solid program for precursor search in the national project, in particular, after the Kobe earthquake.

However, it now seems that the possibility of finding precursors comes from various researches, such as geoelectric and geomagnetic anomalies in a wide frequency range, emissions of radon and other gases, hydrology and geochemistry of underground water. These have been suggested in the past from many different parts of the world, but became more and more actively reported ironically at and after the Kobe earthquake when seismology gave up the precursor search. Of course, many of them are unreliable. However, some of them appear undeniably reliable and well based on scientific backgrounds. We are interested in them.

We must admit that above stated merely suggests short-term prediction may be in the range of our science. In order to develop a workable science and technology, we have to anew develop at least minimum relevant systems for monitoring and data analysis, basic experiments and theoretical grounds. All of these are rather foreign to conventional seismological ones. Therefore, these researches have to be supported with at least minimum funds and staff, which are nearly totally unavailable so far. Actually, there are almost no jobs available for continuation of the work for new PhDs or university graduates. They have to abandon their career soon, in a few years even if they are lucky enough to find some temporary jobs and make significant contributions. Here we urge that a research program on short-term prediction centered around seismo-electro magnetism be included at least at a modest scale in the national earthquake prediction program of the 21 century.

Short-term earthquake prediction and its science and technology transfer to earthquake prone countries in Asia, Oceania, Middle East, and the South and Middle American regions will be one of the best international contributions that Japan could ever make.

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