CATASTROPHIC EARTHQUAKE HAZARD IN JAPAN: PREDICTION, MONITORING AND EXPERIMENT

In the coming two years there may occur a catastrophic earthquake of more than 8.5 in magnitude in the South Japan. Such a conclusion was made by Dr. A. Lyubushin on the basis of analysis of seismic noise structure (microseism) using the multi-fractal analysis methods. It was found that a number of parameters like singularity spectra support width $\Delta\alpha$ reflecting the measure of chaos (noise), generalized Hurst exponent, and correlation coefficients between the mentioned exponents are of seismoprognostic significance. The first two exponents are significant by location and the third one – by time interval of possible mega-EQ which is the most difficult to predict. This approach enabled Dr. A. Lyubushin to predict correctly the magnitude M8.5-9.0 of the Tohoku mega-EQ and to make retrospective estimates of the powerful Hokkaido EQ with M8.3 occurred in September 2003. Graphic representation of three seismic events estimated by three abovementioned exponents is given in Slides 10-12.

The instrument and methodical support of the Dr. A. Lyubushin prediction in order to reduce uncertainties by time component has been provided by the NTs OMZ's specialists and experts using the seismotectogenesis conception-based methods since July 2011. The main regularities of the seismotectogenesis conception reflecting the EQ pending and triggering mechanism and EQ signs in field structures of geospheres and triggering loop are given in Slide 2. Slides 3-6 present in more detail the conception application and realization in the ground-space system for monitoring EQ signs, in particular the most informative of them — cloud seismo-indicators (CSI), Slide 6.

Slide 7 illustrates the CSIs composite images based on cloud cover space images taken by low- and medium resolution scanners on the Russian METEOR-3M 1 and METEOR-M meteorological satellites dated 19 September 2003 and 19 February 2011 respectively before the Hokkaido EQ, September 25, 2003 M8.3 and Tohoku EQ, 11 March 2011 M9.0. The basic feature of these CSIs in both space

images is their angulate nature of tracing the areas of plate margins with up to 500km shift southward and alignment along seismomagnetic meridian (SMM). The shift took place towards areas of low values of Hurst and $\Delta\alpha$ exponents (see insets of exponent distribution maps). A similar nature of the seismo-tectonic processes reflection in cloud field in the form of CSI was revealed before powerful EQs: the Okinawa EQ, 8 November 2011, M6.9 and Izu island EQ, 1 January 2012, M6.8. The appropriate composite images are given in Slides 8 and 9. The characteristic features of CSI (alignment along SMM, shift to minimum area after Dr. A. Lyubushin, plate margin tracing) were observed in these cases as well. Note that the CSI (A) extent (Slide 8) is measured in 1170km that according to formula $M(A) = \ln 1170 \sim 7.1 \pm 0.2$ gave a potential magnitude M7.1. A real magnitude was M6.9. In a similar way, the magnitude M7.0 was calculated by the extent of trapezium-shape CSI (A) ~1150km (Slide 9). A real magnitude was 6.8.

The Dr. A. Lyubushin prediction support experiment yielded the following result. For the period July 2011 – January 2012 with no event missing, the predictions of all 15 earthquakes with M6.0+ in Japan were realized. Three of them, the most powerful with M6.7/6.9/6.8 coincided by all prognostic parameters. The experiment results are given in Slides 13-15.

The experiment will be continued till catastrophic EQ realization in Japan with the aim of its prediction. The Japanese geophysicists are expected to take part in this experiment.

Conclusions:
1. The cloud seismo-indicators of powerful EQs in Japan (2003-2012) manifested themselves to a great extent in extreme areas of the microseism multi-fractal parameters changing after Dr. A. Lyubushin. This fact is of seismoprognostic significance when localizing zones of potential EQ.
2. In accordance with Dr. A. Lyubushin method, the prognostic intervals of mega-EQ dates may be refined through their quantization by 2-3 week harmonics of seismo-effective geomagnetic disturbances using the regularities of seismotectogenesis conception and the earthquake prediction methods developed from it.