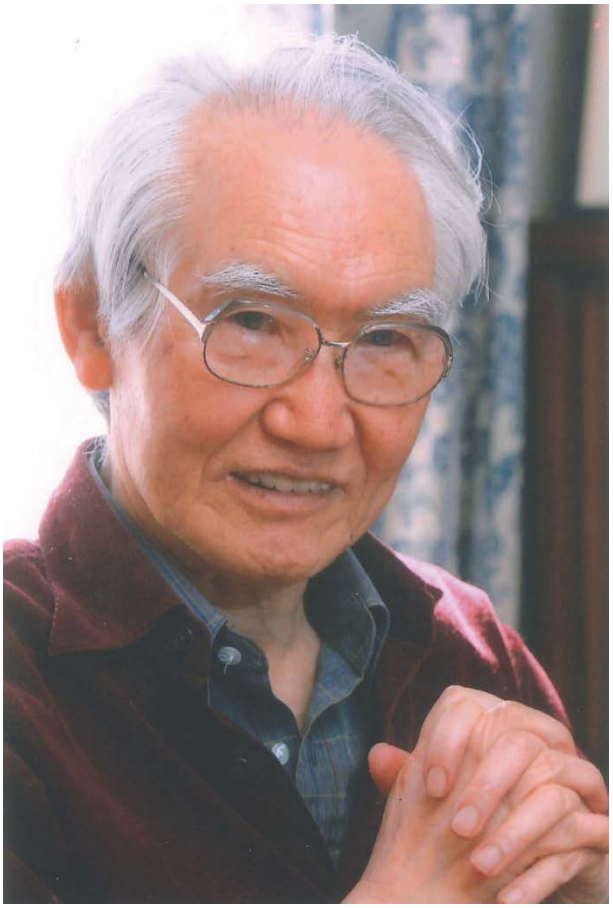
Kiyoo Mogi
(1929 – 2021)



On June 6, 2021, Kiyoo Mogi, Professor Emeritus of the University of Tokyo, AGU and JpGU fellow, passed away at the age of 91 in Chiba, Japan.

Born in Yamagata, Japan, Kiyoo Mogi received BSc (1953) and PhD (1962) in geophysics from the University of Tokyo. His first academic appointment was Research Associate at the Earthquake Research Institute (ERI) of the University of Tokyo in 1954, where he advanced to Associate Professor (1965) and Professor (1969). He was the director of ERI for 1988 – 1990. After retirement from ERI in 1990, he was a Professor of Earth Science at Nihon University until 2003.

While Kiyoo Mogi is well-known as the world pioneer of experimental seismology, his academic career started with volcano physics. His elastic model (1958) describing the crustal deformation from a spherical magma pressure, known as the 'Mogi model,' is still the first-choice analysis. Also, he was the one who introduced telemetry for geophysical monitoring of volcanos.

Since the early 1960s, Kiyoo Mogi vigorously made laboratory rock-fracture experiments. He has revealed the spontaneous concentration of microfractures onto the plane of upcoming macroscopic failure (1968), which has set a course for the physics-based approach to earthquake preparation processes. It may be appropriate here to raise a less known experiment (1981). During the final stage of the constant-load failure test, the b-value decreased beautifully in an accelerating way. This result cannot be ascribed to the negative dependence on stress, which has become something like an official interpretation of b-value these days, however.

Kiyoo Mogi was also a pioneer in highlighting the essential role of inhomogeneity of crustal materials and structures, which started with a charming experiment comparing microfractures in specimens of different degrees of inhomogeneity, from resin to pumice (1962). Along this line, he proposed many ideas to interpret natural seismicity, including foreshocks, aftershocks, swarms, and the frequency-size distribution (ca. 1962 – 1990).

While he was such a meticulous experimentalist devising elaborate details that culminated in the world-first true-triaxial rock fracture apparatus (ca. 1967 – 1981), he was sometimes agile and dynamic. On June 25, 1980, nighttime, an earthquake swarm started east off the Izu Peninsula. He immediately persuaded Japan Coast Guard to give him a ship, men, and a hydrophone. The ship kept circling above the swarm from the evening of June 28 through the morning of June 30, during which an M6.7 earthquake occurred right below the ship, giving them over a thousand high-frequency (50–300Hz) events delineating the fault (1983).

Kiyoo Mogi's superb intuition also led him to notice several characteristic patterns (ca. 1968 – 1989) of natural seismicity related to the cycle of large earthquakes, including seismic gap, temporal clustering, migration, and quiescence shortly preceding large earthquakes (Mogi doughnut). Suitably for the nature and prominence of his science, Kiyoo Mogi played a pivotal role in the history of earthquake prediction research in Japan. Analyzing the long-term triangulation survey, he found substantial strain accumulation in the Tokai region (1970), which the government later designated as the Tokai high-risk area for intense real-time monitoring. Furthermore, he later (1985) found a remarkable accelerating ground tilt during a few days before the 1944 M 8.2 Tonankai earthquake, by thoughtful analysis of old campaign leveling-survey data at the eastern edge of the focal area, when the 10-km section was surveyed many times from 7 days before through 2 days after the earthquake (The timing of the survey was just a miracle). Since Tonankai and Tokai are neighboring segments of the Nankai trough, Kiyoo Mogi did not hide his realistic expectation of capturing a similarly conspicuous short-term precursor for the feared Tokai earthquake.

Kiyoo Mogi took responsibility. He served as Chairman of Coordinating Committee for Earthquake Prediction (1991 – 2001) and Chairman of Earthquake Assessment Committee for Tokai earthquake (1991 – 96). The latter was a grave responsibility in Japan because, for 1979 – 2017, the prime minister was supposed, by law, to order shutdowns when the Committee judges the observed anomaly is the short-term precursor of the Tokai earthquake. While seeing a realistic possibility of short-term prediction, Kiyoo

Mogi, a humble student of inhomogeneities and complexities, also deemed that scientific assessment would be grey in most cases. He insisted that the government allow the Committee to issue a grey conclusion as a soft advisory, which does not force economically damaging shutdowns. Kiyoo Mogi resigned from the Committee in March 1996, openly in protest.

Frequently seen on TV news, he was the most well-recognized seismologist to Japanese citizens. After 1996, he wrote at least seven books for them and one book for rock mechanicians (2007). Mogi sensei's deep insight and strong originality will keep inspiring all of us.

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