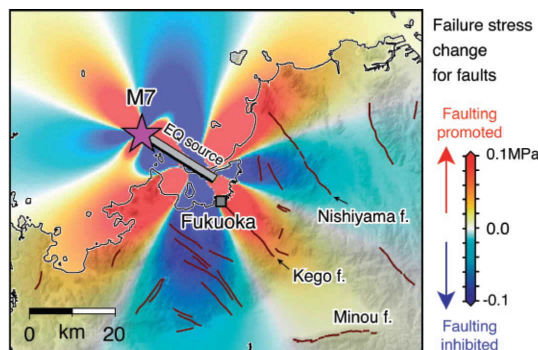
Change in future earthquake probability due to fault interaction

We develop a new method of probabilistic estimate for a large earthquake originated from an active fault, incorporating stress transfer from an adjacent earthquake. We applied the method to the Kego fault that is an active fault just beneath the city of Fukuoka. The earthquake probability for the next 30 years on the Kego fault is now raised to about 7 % due to stress transferred from the March 20, 2005 Fukuoka-ken-seiho-oki, Japan, earthquake.



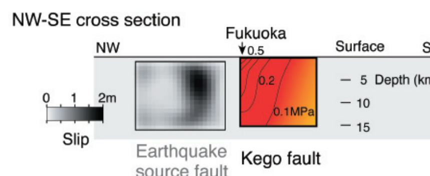


Figure: Failure stress change resolved on faults in the crust (upper panel) and onto the Kego fault beneath the city of Fukuoka (lower panel) caused by the Fukuoka-ken-seiho-oki earthquake.

Shinji Toda
Active Fault Research Center

E-mail:
s-toda@aist.go.jp

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The relationship between seismic motion and geology

On March 20th, 2005, the West Off Fukuoka Earthquake (M 7.0) occurred near northern Kyushu, Southwest Japan. This earthquake caused a significant amount of damage on Genkai Island off the coast of Fukuoka City. However, minimal damage occurred on mainland Kyushu. On October 23rd, 2004, the Niigata-Ken Chuetsu Earthquake (M 6.8) occurred, resulting in extensive damage despite its relatively small magnitude. Thick, soft sedimentary layers in the Chuetsu area caused the speed of seismic wave propagation to decrease, while the waves themselves were amplified. Sedimentary layer thickness is directly related to the amount of damage that occurs when an earthquake occurs.

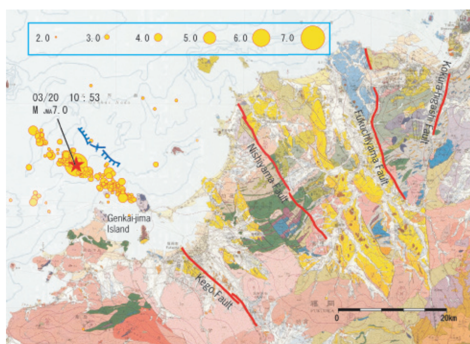

Fig 1: Geological map of Northern Kyusyu and Epicental distribution of aftershocks occurred in Genkai-Nada in March 20th, 2005(10:53:40-17:58:39). (Epicentral data provided from National Research Institute for Earth Science and Disaster Prevention).

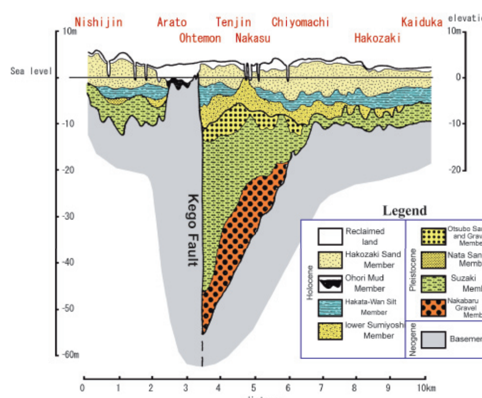

Fig 2: Cross section across the Kego Fault. Thick soft sediments deposit along the Fault.

Yoshinori Miyachi
Institute of Geology and Geoinformation

E-mail:
y-miyachi@aist.go.jp

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