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強震動予測研究の進展
Progress in ground motion prediction

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Methodologies of ground motion prediction have developed rapidly during the last few decades incorporating the knowledge obtained through analysis of destructive earthquakes and taking advantage of progress in computers. The progress was highly accelerated thanks to the dens strong motion observation networks installed after the 1995 Hyogo-ken Nanbu earthquake.

In the modeling of source processes for anticipated earthquakes, as the patch asperities successfully explained the directivity pulses in downtown Kobe for the Hyogo-ken Nanbu earthquake (Kamae and Irikura, 1998), the asperity-based model has been the mainstream in Japan. The way to decide properties of asperities has been pursued by developing scaling relations for asperities estimated for observed earthquakes. The way to adequately locate asperities has been sought for in the relation between slip at depth and displacement along the fault traces or in the relation between asperity and fault geometry. In addition to asperities, realistic smaller-scale heterogeneity in the distribution of source parameters is considered to fill the deficiency of the wave excitation of asperity model and to moderate the forward directivity effect.

Underground velocity structure model with 3-dimensional variation like the Osaka basin model by Kagawa et al. (1993) was very rare before the Hyogo-ken Nanbu earthquake. Hyogo-ken Nanbu earthquake made us realize not only the difference in medium physical property but also the topography of the soft-hard boundary of the sedimentary-basin floor had great effect on the ground motion. This fact promoted the surveys and modeling of the velocity structure of large basins. Moreover, we have seen at every destructive earthquake that various aspects of the underground structure can cause locally large ground motions.

I am going to review how the methodology developed with our experience of destructive earthquakes and discuss whether we have successfully solved each problems.

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