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Construction of 3D hegerogeneous structure model in subduction zone and integrated simulation from earthquake generation

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Conventionally,elastic half space model is used for calculations of earthquake generation and crustal deformation. However, the structure in subduction zone is obviously heterogeneous in 3D and such heterogeneity of the structure and material properties should affect the deformation and stress changes due to earthquake faultings and subduction processes. Considering the future development in HPC for the comming 10-20 years, such heterogeneity will be fully introduced in the calculations. We have already developed a method for generating a high-fidelity 3D finite element (FE) model of crustal structure with more than 100,000,000 degree of freedom. A method for elastic wave propagation and crustal deformation analyses with the generated model is also proposed. Hence, it should be possible to demonstrate earthquake generation cycle simultaions with much finner resolution along the fault or stochastic FEM calclations considering the ambiguity of structure heterogeneity if we use 100 - 1,000 times faster super computers which will appear in 10-20 years. It enable us to calculate various scenarios of earthquake generations with more appropreate error estimation depending on the observed data. Furthermore, we can convine the above structure model, which is Japan arc scale, and regional and/or local finner structure models and integrate the simulations from earthquake generation to ground shaking in a city.