Computational Seismology and Grid Computing – Application and Potential

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Taiwan is formed by a collision between the Philippine Sea plate and the Eurasian continental margin, with a convergence rate of about 80 mm/year. This extremely rapid rate of crustal deformation has resulted in high seismicity in the Taiwan region. Under this background, investigation and monitoring of earthquakes are undoubtedly imperious scientific missions for regional seismologists. Currently, two of notable advances have been made in computational seismology in Taiwan: (1) the rupture process of fault—what happens on a time scale of seconds when a fault breaks during an earthquake; and (2) the propagation of seismic wave—how the seismic wave propagates within the earth and produces the ground motion at surface. Combined with the increasing computational capabilities and resources, these advances in seismology make it possible to create the simulation of source rupture and seismic wave propagation in a fully 3-D scale. Such studies are crucial in seismology as they are necessary for understanding earthquake phenomena and seismic hazard assessment.

However, constructing a realistic earthquake simulation from source and path models of constituent phenomena and executing that simulation on suitable computing platforms becomes increasingly complex. This is due to the difficulty of configuring compatible simulation codes, source complexities, crustal models and mapping those models onto computing resources. These complexities will limit our ability to perform accurate earthquake modeling. We hope to deal with this problem by considering an integrated simulation environment. This goal is possible to be achieved via Grid platform. The study will be conducted by collaboration between researchers in the information technology areas (i.e. ASGC) and earthquake scientists associated with IESAS.