Evolution of a non-volcanic hydrothermal system caused by formation of a high permeability fracture zone

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In Japan, high-level radioactive wastes from reprocessing plants will be disposed at the depth deeper than 300m. This disposal site will be under the stable situation, but in this region a large earthquake may form a high permeability fracture zone. By the activity of the crust, the disposal site may be affected by a non-volcanic hydrothermal system. Therefore, we estimated this influence by using HYDROTHERM Ver2.2, which is a three-dimensional numerical reservoir simulator. The model field is the northwestern part of Kego Fault, which was formed by a series of earthquakes called the 2005 West off Fukuoka Prefecture Earthquakes (the main shock of M_{JMA}7.0 on 20 March 2005). The results of the numerical simulations show the development of a hydrothermal system as a new fracture zone is formed. The permeability of the fracture zone is influential on the fluid flow rates. At the beginning, convection occurs in the fracture zone when the fracture zone is formed. Then, the convection reaches to the steady state in the zone. At the end, the larger convection evolves widely and slowly outside of the fracture zone. Therefore, it is inferred that a non-volcanic hydrothermal system will be formed after formation of a permeable fracture zone and the distributions of underground temperature and groundwater flow will change in the long term, even if no hydrothermal feature appears just after the seismic events.