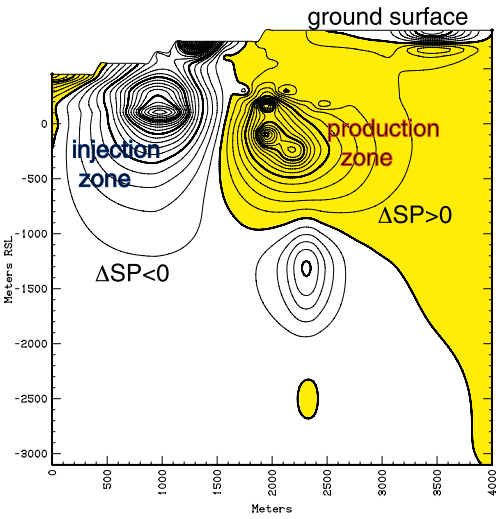
Reservoir Dynamics Research

- Monitoring and prediction of subsurface fluid flow -

Mathematical postprocessors have been developed in cooperation with NEDO to calculate time-dependent earth-surface distributions of geophysical observables such as microgravity, electrical self-potential, apparent resistivity (from either DC or MT surveys), seismic velocity/attenuation, and geomagnetic force. The temporal changes are caused by changing underground conditions (pressure, temperature, salinity, gas saturation, etc.) as computed by numerical unsteady multidimensional thermohydraulic reservoir/aquifer simulations. Although the initial application was for monitoring geothermal reservoirs during fluid production and reinjection, the postprocessors can be applied to various subsurface phenomena associated with groundwater in addition to management of geothermal resources.



Self-potential cross section calculated by "EKP-postprocessor"

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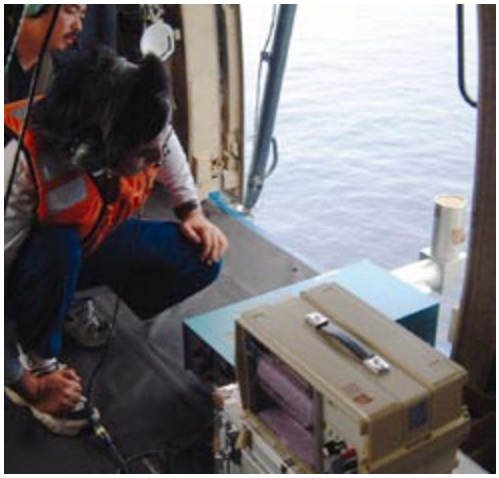
Monitoring of Gigantic SO_2 Emission from Miyakejima Volcano

An extremely large amount of volcanic gas has been released since mid-August 2000 from the volcanic island of Miyakejima, Japan, after formation of a summit. Variation of the SO_2 emission rate was monitored by repeated measurements with airborne COSPEC. In 2000, the SO_2 emission rate averaged at 42 kt/d, which is twice the global SO_2 emission rate from nonerupting volcanoes evaluated before this activity. The SO_2 emission rate gradually decreased to 7 kt/d by the end of 2002 and then remained constant until at least March 2004. The total SO_2 emission amounts to 19 Mt.



Monitoring of volcanic SO_2 using the COSPEC instrument

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