[JJ] Evening Poster | H (Human Geosciences) | H-RE Resource and Engineering Geology

[H-RE13]Availability of earth science data in renewable energy field

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Renewable energy penetration is increasing dramatically in the world. Renewable energy power generations have become a strong presence in an electric power system. However, it is a challenge for renewable energy to be stable power sources due in part to natural variability of renewable energy and its uneven distribution. For effective use of renewable energy, a combinational of power resources (e.g., thermal power plants, hydropower systems) and energy storage technologies (e.g., pumped-storage power generation and storage battery system) should be desired. Therefore, we need to understand the amount of renewable resources, causes of variation, and the predictability of power output. Then, observation and forecast information from earth science field should be analyzed and applied to power energy field to achieve easy use of earth science databases.

Recently, observation databases from remote sensing technology and/or forecasts from numerical models have become essential for both renewable energy and electric power system fields. This proposed session needs your presentation from the whole of renewable energy fields (solar power, wind power, geothermal power, tidal power, wave power and biomass power generations). Our goal of this session is to exchange views with various researchers between renewable energy field and earth science field (e.g., usage-trends of earth science datasets for renewable energy field, the subjects in hand, earth science datasets availability, and a request from renewable energy field to earth science field, and so on).

[HRE13-P01]Evaluation of shallow groundwater quality for use in an open-loop type, groundwater-based heat pump system in the Aseishi River watershed

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In cold snowy regions, a fossil fuel such like kerosene has been used for the heater and for snow- melting during winter season. Recently, the usage of geothermal heat has been closed up from the view of sustainable energy use and of minimizing greenhouse gas emissions. The heat pump system using shallow geothermal heat classified mainly into closed-loop system and open-loop system. The open system is more efficient than the closed system, however, for which the groundwater is needed to pump up. Once groundwater is pumped up, the formation of mineral precipitation (called as *scale*) could occur inside of the system due to temperature change and influence of oxygen, depending on chemical and physical properties of the groundwater.

It is well known that groundwater quality change spatially. In this research, regional differences of groundwater quality was examined to evaluate the possibility of scale formation at four sites, from the upstream to the downstream in the Aseishi River watershed. We conducted groundwater sampling from a total of four observation wells, in which the three have approximately 10 m deep and one has unknown depth in the Aseishi River alluvial fan on the Tsugaru Plain, Aomori Prefecture. In the field, pH, electric conductivity, and water temperature were measured. In the lab, Na^+, NH_4^+, K^+, Mg^{2+}, Ca^{2+}, F^-, Cl^-, Br^-, NO_3

$^{-}$, SO_4^{2-}, Fe, Mn, Sr, Ba, Si, and alkalinity were measured. Scale generation was evaluated thermodynamically using PHREEQC.
As a result, carbonate minerals and amorphous silica were found to be unsaturated and precipitation was unlikely to occur at all four sites. Iron was also unsaturated in respect with $Fe(OH)_3$, thus the precipitation was unlikely to occur only at the most upstream location. We can conclude that the upstream of the fan has the most advantageous for utilizing groundwater heat from the viewpoint of scale formation.