

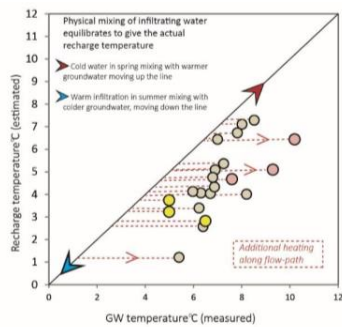
## Apparent heating of groundwater in the Gardermoen Aquifer, Norway

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Noble gas data from the Gardermoen Aquifer indicate heating of groundwater along flow-path. Tracking climatic changes is of importance to monitor sensitive nature reserves. Measured groundwater temperatures display a large range (1-10 °C), while estimated paleo-infiltration temperatures reconstructed from noble gases vary from 1 to 7 °C, and have no obvious relation with depth below the groundwater table. The majority of initial groundwater recharge is cold, infiltrating during spring (snowmelt) and autumn [1, 2]. The deviation of measured groundwater temperature and the estimated infiltration temperatures allows quantification of “heating” of groundwater along flow path (Fig. 1)



**Figure 1:** Infiltration temp. vs. measured groundwater temp.

Neither anthropogenic (e.g., airport) nor geological (e.g., low geothermal gradient) factors can explain the elevated groundwater temperatures. The trend of increasing temperature is interpreted to be caused by warming of cold pulses due to heat transfer and physical mixing with water retaining heat closer to the annual average temperature.

[1] Colleuille & Haugen, 2007: *Vann i jord*, NVE report **20-2007**. [2] Jørgensen & Østmo, 1990: *Hydrogeology in the Romerike area, southern Norway*, NGU Bull. **418**, 19–26.