Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07672, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07672
EGU General Assembly 2008

Variability and trends of groundwater recharge in the last 200 years in a South Alpine groundwater system as consequence of climate change

T. Harum (1), W. Poltnig (1), C. Ruch (1), G. Freundl (2) and J. Schlamberger (3)

(1) Joanneum Research, Institute of Water Resources Management, Elisabethstraße 16, A-8010 Graz/Austria, (2) Carinthian Government, Department 18 Water Management, Mießtalerstraße 1, A-9020 Klagenfurt/Austria, (3) Carinthian Government, Department 15 Geology and Soil Protection, Mießtalerstraße 1, A-9020 Klagenfurt/Austria (till.harum@joanneum.at / Fax ++43 316 8769 1372 / Phone ++43 316 876 1372)

The Sattnitz area, an East – West elongated conglomeratic plateau (elevation up to 900 m asl) in the south of Klagenfurt (province of Carinthia, Austria), is an important region for the drinking water supply of the capital Klagenfurt and the surrounding municipalities. The area is built up of about 200 m thick conglomerates, which were deposited above upper miocene coal bearing clays.

The position of this rigid conglomerate block above the soft layers causes a disaggregation of the conglomerate with building of cracks and sinkholes because of gravitative sliding. The groundwater system can be characterized as fissured and partly karstified aquifer. Overland flow is practically absent. The greatest part of precipitation minus evapotranspiration is added to groundwater recharge.

The conglomerate block of Turiawald is a part of the Sattnitz area with all around outcrops of the aquifer bottom causing that this plateau is totally drained by various spring outlets. Therefore this part of the investigation area can be assumed as kind of natural lysimeter, where the establishment of the water balance is possible without important unknown losses to deeper zones.

Due to steep slopes and lack of water human settlements are rare on the top of the area. For this reason land use (mainly forest) did not change for the least 200 years.

A physically based distributed model of groundwater recharge (simulation of the processes of snow melt, interception, evapotranspiration and infiltration and with higher uncertainty of unsaturated flow), was calibrated for a period of one year (verification on the basis of all monitored spring discharges), extended to the last 22 years (period with dense meteorological data) and was adjusted to the last 200 years by regression analysis with long time meteorological parameters. The results show that groundwater recharge in the area decreased since the beginning of the 20th century from 600 mm/y to 465 mm/y corresponding to a reduction of the total available groundwater resources from 1338 to 1056 l/s. This significant negative trend is not the consequence of land use changes in the area, but is only produced by the effect of climate change.

These results could be confirmed by long time monitoring data of spring discharges from the water supply of a local municipality over the last 54 years, which show a significant and similar decrease. Tentative extrapolations indicate that in the nearer future discharges could be reduced to 50 – 80 % of the long term average depending on the storage capacity of the different groundwater systems. There is a high demand to extend such investigations to other Alpine groundwater systems to detect areas with possible future water scarcity and to adapt or develop improved concepts of water management.