VÚV TGM VÝZKUMNÝ ÚSTAV VODOHOSPODÁŘSKÝ T.G. MASARYKA

LANDESAMT FÜR UMWELT, LANDWIRTSCHAFT UND GEOLOGIE | Freistaat SACHSEN

GRACE – Groundwater Absence in Cretaceous Sandstone Aquifers

Společně využívané podzemní vody na česko-saském pomezí – Gemeinsam genutzte Grundwasserressourcen im tschechisch-sächsischen Grenzgebiet

GRACE is funded by financial resources of the European Regional Development Fund (ERDF), the Czech Republic and the Free State of Saxony (Germany). Lead partner of the project is the Czech water research institute VUV T. G. Masaryk (Prague). Cooperating project partner is the department of surface water and groundwater in the Saxon State Agency of Environment, Agriculture and Geology (Dresden).

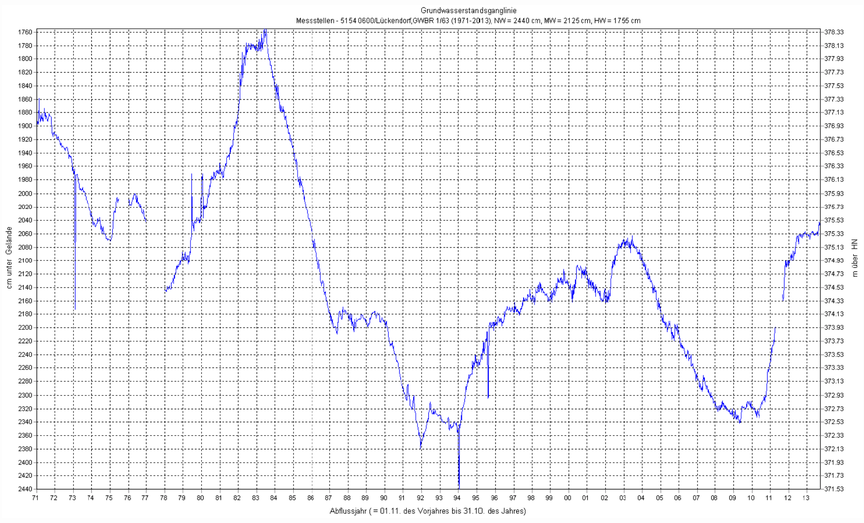

Fig. 1: Hydrograph of a groundwater well in ‘Zittauer Gebirge‘

Initial Situation

Since the 1980s a depression of groundwater levels has been observerd in parts of ‘Saxon-Bohemian Switzerland’ and in the mountains ‘Zittauer Gebirge‘ (Fig. 1). Both areas are covered with cretaceous sandstones, which are part of the Saxon-Bohemian cretaceous basin. The phenomenon of declining groundwater levels can be observed in two transnational groundwater bodies in the Czech Republic and Germany. Due to decreasing groundwater levels, both groundwater bodies affected are in a bad quantitative status according to the European water framework directive. Groundwater has been used for regional water supply since mid of 1980s.

Aims of GRACE

→ Cause study of decreasing groundwater levels – natural or anthropogenous effects?
→ Development of a strategy for a sustainable management of groundwater resources

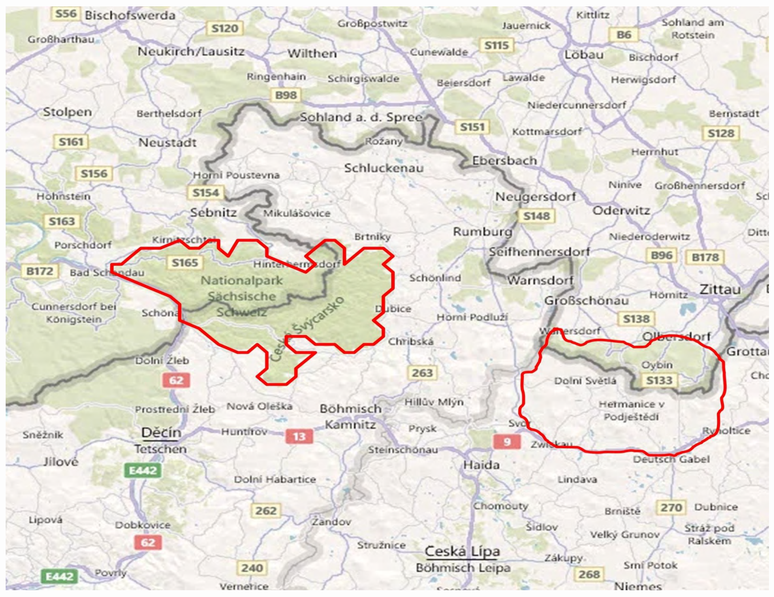

Fig. 2: Locations of GRACE-investigation areas

Investigation areas

The locations of the investigation areas are depicted on the map on the left (Fig. 2). The catchment of Křinice/ Kirnitzsch in ‘Saxon-Bohemian Switzerland’ and the groundwater resources of Petrovice-Lückendorf-Jonsdorf-Oybin in ‘Zittauer Gebirge’ (Fig. 3) are affected by decreasing groundwater levels. Both areas are build up by cretaceous sandstones with its oldest parts originating from the Cenomanian and the youngest parts from the Turonian (Coniacian). Aquifers are divided from aquitards by fine grained clayey, silty and calcareous sandstones.

Fig. 3: Sandstone formations in Oybin/ ‘Zittauer Gebirge’ (Picture: P. Börke, LfULG)

Activities in GRACE

→ Non-steady-state modelling of groundwater flow, for groundwater supply and source water protection with Visual MODFLOW®
→ Building of geological and 3D-aquifer-aquitard-models in the project areas (Fig. 4)
→ Isotope study – Tritium, Helium, Deuterium, ^{18}O for age and mixing of groundwater
→ Borehole geophysics on groundwater wells
→ Impacts of climate change on the groundwater system

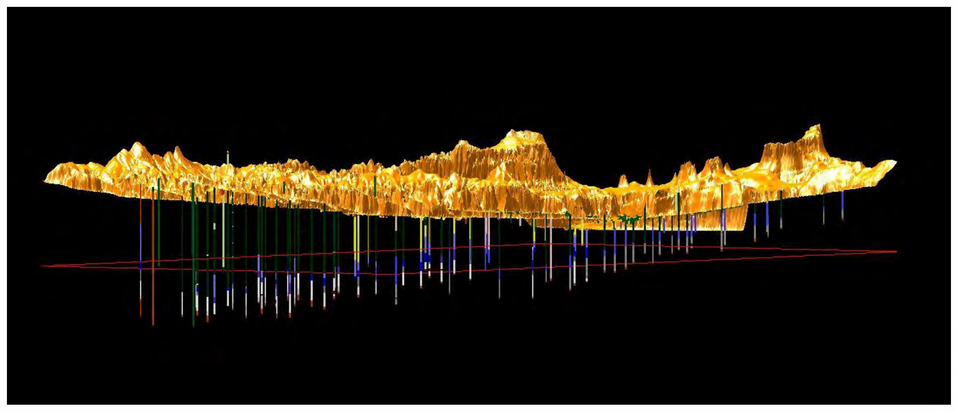

Fig. 4: 3D-modelling process (Picture: R. Löser, G.E.O.S INGENIEURGESELLSCHAFT MBH)

→ Ecological characterisation of groundwater by its stygofauna (Fig. 5)
→ Capture of springs and spring discharge

Fig. 5: *Niphargus aquilex* (Picture: H. J. Hahn, INSTITUT FÜR GRUND-WASSERÖKOLOGIE GMBH)

Present state of the project – >>PANTA RHEI<<

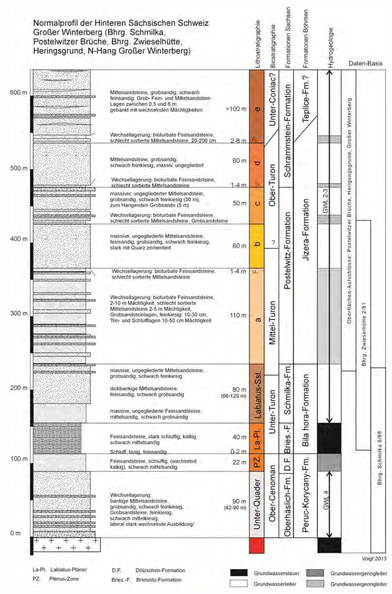

Fig. 6: Geological Norm Profile Kirnitzsch area (VOIGT 2013)

→ Geological model is finished
→ Hydraulic modelling is still running

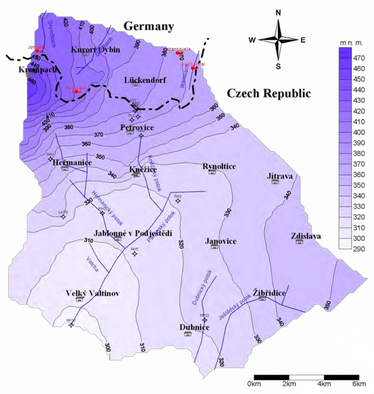

Fig. 7: Modelled groundwater levels in ‘Zittauer Gebirge‘ (AQUATEST 2012)

Fig. 8: Groundwater sampling in Kirnitzsch area (Picture: A. Böhm, LfULG)

→ First results from climate impact analysis and stable isotopes

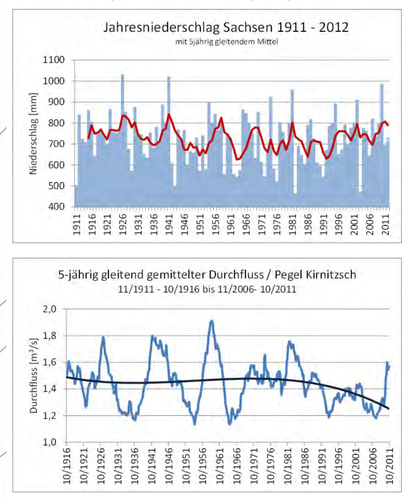

Fig. 9: Statistical analysis of precipitation and discharge (MELLENTIN, LFULG, 2013)

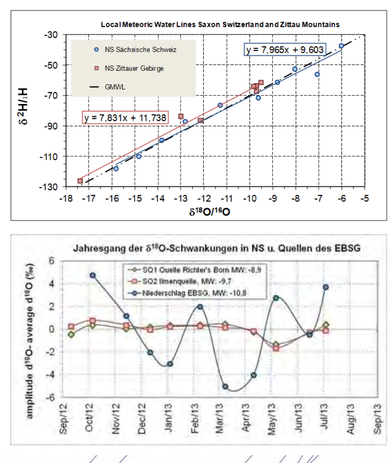

Fig. 10: Stabel isotopes in precipitation and springs (BURGHARDT, TU DRESDEN, 2013)

Europäische Union. Europäischer Fonds für Regionale Entwicklung: Investition in Ihre Zukunft / Evropská unie. Evropský fond pro regionální rozvoj: Investice do vaší budoucnosti

Ziel 3 | Cíl 3
Ahoj sousede. Hallo Nachbar.
2007-2013. www.ziel3-cil3.eu

http://www.gracecz.cz/

CONTACT:
Eng. Marie Kalinova – Project coordinator VUV (marie_kalinova@vuv.cz)
Karin Kuhn – Project coordinator LfULG (karin.kuhn@smul.sachsen.de)
Dr Anna K. Böhm – Desk officer GRACE (anna-katharina.boehm@smul.sachsen.de)