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G@GPS Membership

G@GPS is an open research network. Participation is free of charge. Everybody interested in palaeogroundwater, isotope and dating techniques of groundwater is welcome to participate.

More than 80 scientists participate in GPS. Please feel free to distribute this newsletter to colleagues who may be interested.

To become a G@GPS participant or to receive the list of participants, please contact Dr. Martine van der Ploeg: martine.vanderploeg@wur.nl
List of G@GPS Basins (December 2013)
(Year of registration as a G@GPS Basin in brackets)
For location, see figure below. More information about the individual basins is found on the G@GPS webpage: www.gw-gps.org

Africa:
1. North West Sahara Basin (Algeria, Tunisia, Libya, 2011)
   Contact: Najiba Chkir, najiba_chkir@yahoo.fr
2. Nubian Sandstone Aquifer (Libya, Chad, Sudan, Egypt, 2013)
   Contact: Niels Schroeder Schroeder@ruc.dk
3. Benin Coastal Aquifers (Benin, 2013)
   Contact: Henri Totin sourouhenri@yahoo.fr
4. The Kahe Basin (Tanzania, 2013)
   Contact: Ibrahim Chikira Mjemah chikira@suanet.ac.tz
5. Maputo Groundwater Basin (Mozambique, 2012)
   Contact: Mussa Achimo achimo.mussa@gmail.com
6. Naukluft Basin (Namibia, 2013)
   Contact: Jodie Miller jmiller@sun.ac.za

America:
   Contact: Jason Gurdak jgurdak@sfsu.edu
8. South America: Guarani Aquifer System (Argentina, Brazil, Paraguay, Uruguay, 2011)
   Contact: Ofelia Tujchneider ofeliatuichneider@yahoo.com.ar; pichy@fich.unl.edu.ar

Asia:
9. North China Plain (China, 2011) Contact: Jianyao Chen chenjianyao@hotmail.com

Europe:
10. Baltic Artesian Basin (Estonia, Latvia, Lithuania, Poland Belarus, Russia, 2011): Contact: Rein Veikmäe Rein.Vaikmae@ttu.ee
11. Zealand Coastal Basin (Denmark, 2013) Contact: Niels Schroeder

Oceania:
12. Great Artesian Basin (Australia, 2011) Contact: Dioni I Cendón dce@ansto.gov.au or Jianyao Chen chenjianyao@hotmail.com
13. Sydney Basin (Australia, 2011) Contact: Dioni Cendón dce@ansto.gov.au
15. West Canning Basin (Australia, 2013) Contact: Dioni I Cendón
Report from the 40th IHA Congress
(International hydrogeologists association) "Solving the groundwater challenges of the 21st century" Perth (Australia) from the 15-20th of September.
(Dioni I. Cendón)

Theme: Paleo-hydrogeology: integrating paleoclimatology and hydrogeology.

In many parts of the globe, we are utilising a groundwater resource which is ‘fossil’, with groundwater recharge occurring thousands to millions of years ago. Our use of such a resource is effectively mining groundwater, and is likely to be unsustainable. This session seeks to bring together paleoclimatologists and hydrogeologists who have an interest in groundwater-climate interactions over millennial or longer time-scales. Archives and data that would be particularly relevant to this session include: regional-scale syntheses of groundwater ages; lake archives of paleohydrology; speleothem archives of paleorecharge; aquitard porewater archives of the paleogroundwater; high temporal-resolution paleo archives of the frequency of groundwater recharge; groundwater and or climate models of millennial or longer time-scales.

The session had been organized with Prof Andy Baker, (UNSW, NCGRT, and co-author of ‘Speleothe
tem Science: from process to past environments’) and Dr. Dioni Cendon, (ANSTO, and Groundwater@Global Paleoclimate Signals) as conveners. Due to the high number of submissions we were divided in two groups, this last minute change prevented us from having an ever higher audience.

Achievements of Meeting

A number of mostly Australian plus one from Estonia scientists gathered around a specific session of the IAH-2013. Approximately 15 scientists registered with IGCP-618 attended. Sessions were open to other conference participants so our talks were well attended (40-50) scientist different participant countries. We established a good level of discussion between palaeoclimatologist particularly those working in high resolution speleotheme records with those working in low resolution groundwater records. Potential synergies amongst those groups were discussed and specific examples on records in SW and SE Australia (Perth Basin and Sydney Basin) compared.

Groundwater records from China were also summarised (Dr. Matthew Currell, Australia) and as well as recent results from the Baltic Artesian Basin (Dr. Valle Raidla, Estonia)
Forthcoming G@GPS – related meetings

SWIM: Salt water intrusion meeting
Husum, Germany June 14-20, 2014
http://www.swim-site.org/
Yossi Yechieli will try to organize a session on old seawater intrusion and palaeoclimate
Contact: Yoseph Yechieli (yechieli@gsi.gov.il)

IAH 41st Congress: Groundwater: Challenges and Strategies
Marrakech, Morocco 15-19 Sep 2014
http://www.iah2014.org/

3rd annual G@GPS meeting
Santa Fe, Argentina
Contact: Ofelia Tujchneider (ofeliatujchneider@yahoo.com.ar)

Funding Sources for G@GPS-related research, some of them with particular reference to Africa

IAEA: Sharing water in the Parched Sahel
G@GPS contact person: Dioni I Cendón (dce@ansto.gov.au)

Horizon 2020: The EU framework programme for research and innovation
http://ec.europa.eu/programmes/horizon2020/
Concerning funding from Horizon 2020: The EU framework programme for research and innovation. Contact person: Dioni I Cendón (dce@ansto.gov.au) or Niels Schrøder (schroeder@ruc.dk)

ERRIN (European Regions Research and Innovation Network) WATER 14_2015: Africa, water and global change: vulnerabilities, risks and cost-effective adaptation measures.
G@GPS contact person: Niels Schrøder (schroeder@ruc.dk)

ACP Science and Technology Programme: An ACP-EU co-operation programme in the field of science and technology
http://www.acp-st.eu/

NATO-The Science for Peace and Security Programme
http://www.nato.int/cps/en/natolive/topics_85373.htm

Bilateral funding programs between South Africa and other African countries:
G@GPS contact person: Jodie Miller (jmiller@sun.ac.za)
G@GPS Basins Reports

Asia:
North China Plain: Data series of two caves Dongge and Hulu, were collated from the literature (Wang et al, 2001; Dykoski et al, 2005) and compared with paleoclimatic signal from the North China Plain aquifer. Similar $\delta^{18}O$ pattern from 16 ka to 10 ka was detected, indicating regional variations in the eastern China. An increase trend in $\delta^{18}O$ was identified from 14-15 ka to 4-5 ka in the NCP, while similar trends were detected from 15-16 ka to 8-9 ka in the stalagmite calcite of two caves. The gaps here and the difference from 16 ka to 15 ka could be due to the impact of the varied climatic zones as two caves are located in the humid/semi-humid zone, while NCP is located the semi-arid zone. Some sub-events during 14-15 ka to 4-5 ka from the aquifer of the NCP were also detectable, e.g. valley (low value) event at around 6 ka, which is coincidence with the recharge event in the other areas. Signal from the NCP was then compared with those from great artisan basin (GAB) and lakes of Australia. Similar spectral patterns were obtained, showing a global pattern of paleoclimatic change in the last 30-40 ka.

Europe:
Baltic Artesian Basin: Deep groundwater samples for noble gas analysis were collected in late 2012. Samples were heavily contaminated with natural oil, their handling in noble gas laboratories was extremely complicated, the first results got available only late 2013. To enhance the interpretation of $^{81}$Kr results additional sampling for $^{39}$Ar analysis was organised in August 2013 in deep wells from Estonia and Lithuania. Therefore the publication of those data was shifted on 2014. Additional field sampling of deep groundwater for noble gas tracers in cooperation with Bern and Heidelberg Universities and for $^{14}$C analysis from DOC in groundwater over the entirety of BAB area in cooperation with IAEA was completed during the summer of 2013. A project “Groundwater flow history, Global Palaeoclimate signals and Antropogenic influence in the Baltic Artesian Basin: a synthesis of numerical models and hydrogeochemical data” has been awarded to Prof. Vaikmäe for period 2014-2018 with (US$160,230 pa). In addition a Cooperative Research Project (CRP) was signed with the IAEA to carry out field sampling and laboratory isotope geochemical analysis of BAB groundwater for this project (US$8,800 pa). Therefore we succeeded to secure our research in the frame of G@GPS for the coming years.

The Zealand Basin (Denmark) was registered as a new G@GPS basin in 2013. Here the groundwater dynamic is correlated with the glacial chronology. Modern and old seawater intrusion is a major applied aspect.

North America: A new three year (2013-2016) research grant (US$321,800) titled Groundwater teleconnections with interannual to multidecadal climate variability
was awarded to North American Leader Gurdak by the US National Science Foundation (NSF), Hydrologic Sciences Program. The project is in collaboration with Prof. Ty Ferre (University of Arizona, USA), Prof. Ed Maurer (Santa Clara University, USA), Prof. Cintia Bertacchi Uvo (University of Lund, Sweden), and Drs. Randy Hanson and Jesse Dickinson (U.S. Geological Survey). The project will fill a critical knowledge gap by testing the hypothesis that transient recharge rates and corresponding groundwater-level fluctuations respond to the complex, heterogeneous interactions of local-scale vadose zone processes and properties and global-scale atmospheric-ocean circulation systems. Although this project is focused on the High Plains aquifer flag basin and other principal aquifers of the US, Gurdak is actively discussing with other G@GPS members how best to leverage this funding to advance work in other G@GPS flag basins. A new paper about climate change and groundwater dependent ecosystems was published in Journal of Hydrology (Klove et al., 2013). Gurdak, van der Ploeg, Cendon, and other G@GPS leaders are actively writing a paper that synthesizes the understanding about paleoclimate signals in groundwater of the flag basins. An outline has been drafted and the target publication date is late 2014 in Journal of Hydrology: Regional Studies.

**Oceania:**

**Sydney Basin:** All results recently analysed in the Sydney basin have been put together and presented in Perth (IAH-2013). Some portions have been submitted for publication. The main scientific outcomes are: A) Groundwater in the Sydney Basin preserves broad palaeoclimatic information. with gaps interpreted as lack of deep wells particularly in the Sydney Basin. Continuous recharge over the last ~40 ka is detected in other areas of SE-Australia. B) Water stable isotopes in the Central Coast and Lower Blue Mts. show a trend to more depleted values towards the LGM, consistent with lower recharge temperatures. C) High recharge took place between 5-6 ka, as suggested by the \(^{14}\text{C}\) residence time distribution. Decreasing recharge started from ~6 ka. This is similar to conclusions from high resolution regional records. D) Cl concentrations show a tendency to decrease with gw residence time, also suggesting more rainfall/dilution between 5-6 ka than today. E) D-excess in GW is like that of modern rainfall, suggesting similar sources of humidity and rainfall patterns over the last ~15 ka.

**Westernport coastal aquifer (Victoria):** A paper was published during 2013 with continuing research into 2014 to better understand links to seawater fluctuations and their effect on groundwater. The main scientific outcomes are: A) Low radiocarbon activities in the main aquifer indicate most of the gw was recharged in pre-modern times (early Holocene, late Pleistocene). B) Modern recharge of gw at the eastern and western margins of the basin is supported by the presence of tritium (\(^{3}\text{H}\)) and relatively high \(^{14}\text{C}\). C) Despite intense gw abstraction no modern recharge is observed at the zone of pumping, water moves from undeveloped areas to
seasonally recover pressures. D) Seawater is the source of solutes in saline gw near the coast. However, this may not be modern seawater but trapped in the past.

*The West Canning Basin (Pilbara):* A report is being finalised for this portion of the second largest sedimentary basin in Australia. There is an increase of residence times from the recharge areas to the coast with results showing maximum residence times ($^{14}$C) of up to 20 ka in the more isolated portions of the basin. The water stable isotopes show an enrichment along the flow but this has not been linked yet to climatic variables in the area. The isotopic rainout effects and the variability of monsoonal fronts, responsible for effective recharge, maybe too large to produce any time related trends that could be linked to temperature variations.

Location of G@GPS basins shown on WHY-Map (Groundwater resources of the world) Source: *BGR & UNESCO.*


You are welcome to register new G@GPS basins (contact Dioni I. Cendón (dce@ansto.gov.au)) and to join the studies in the already registered basins (contact persons are listed above). *There is still a lack of G@GPS basins in northern Eurasia, northern South America, western Asia and central Africa.*
G@GPS is organised through the following international bodies:


- IGCP Project 618: Palaeoclimate information obtained from past-recharged groundwater

UNESCO – GRAPHIC
Groundwater Resources Assessment under the Pressures of Humanity and Climate Change

We wish all of you
A Happy New Year 2014!