



British
Geological Survey

NATURAL ENVIRONMENT RESEARCH COUNCIL

Gateway to the Earth

Micro-organic groundwater contamination in the Indo-Gangetic aquifer system

Dan Lapworth*, Prerona Das, Shahid Jamal, Abhijit Mukherjee,
Gopal Krishan, Jade Petersen

*email: djla@bgs.ac.uk

British Geological Survey, Wallingford, UK

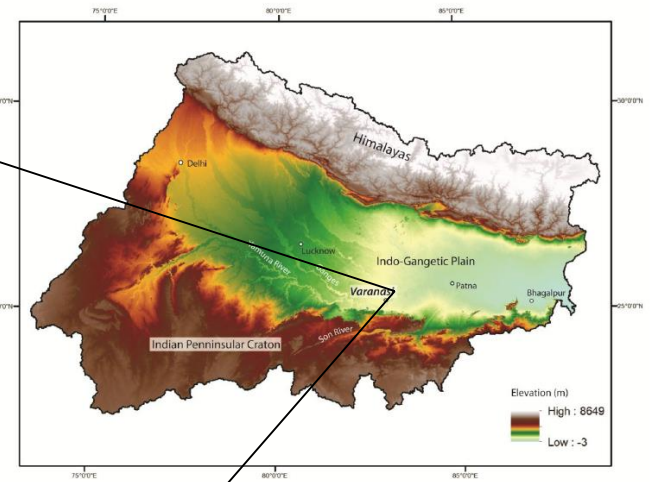
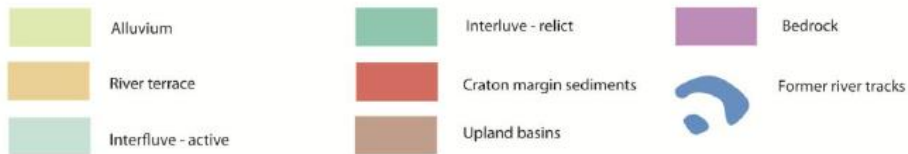
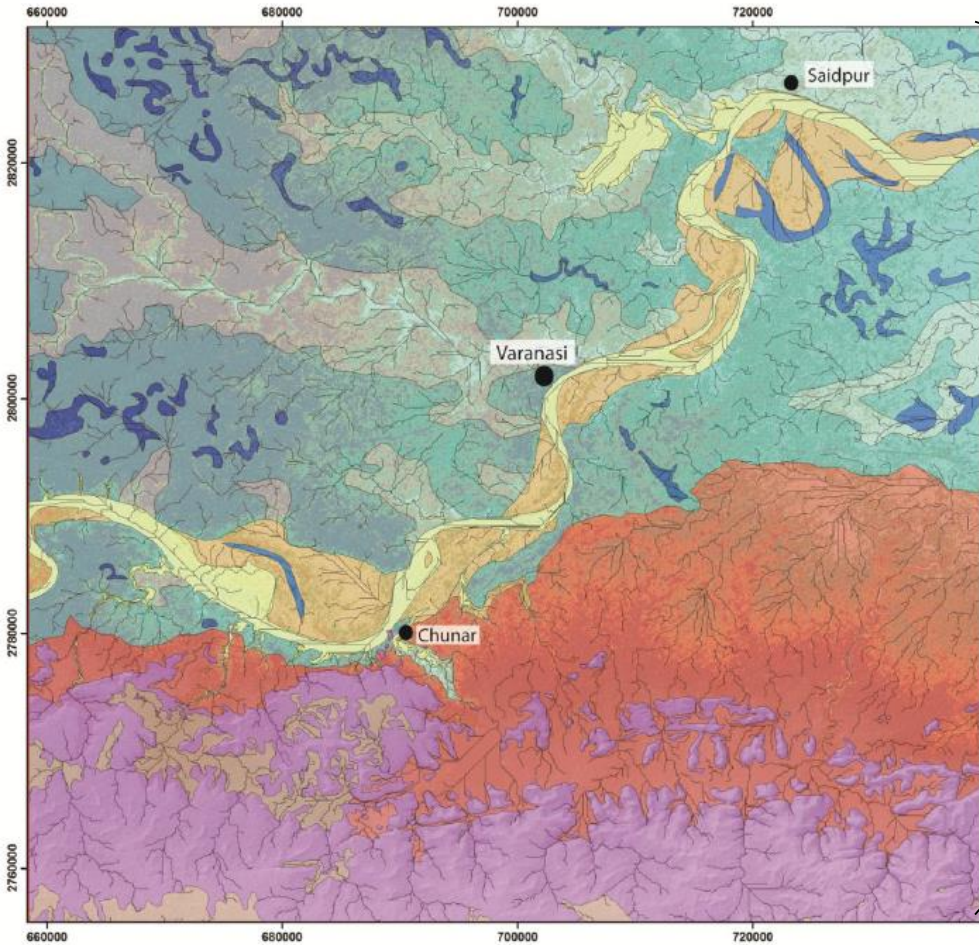
IAH 2016 Montpellier

Contaminants of emerging concern in India

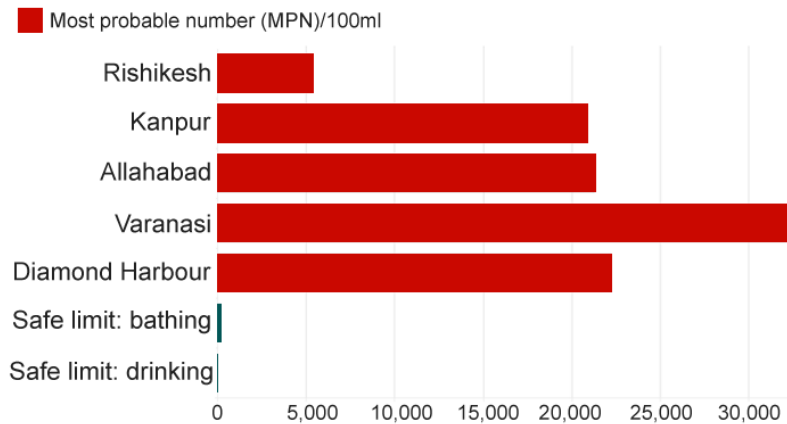


- New chemical & biologically active contaminants
- Pharmaceuticals and Personal Care Products, PFAS.....
- Shift in thinking required from traditional contaminants
- Different dispersal routes in the environment

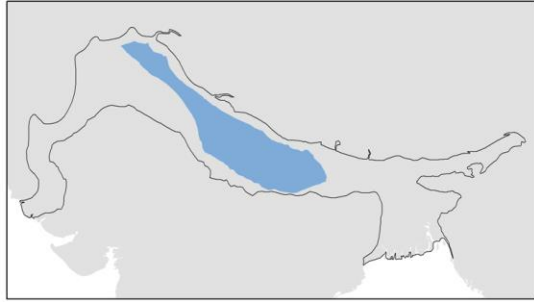
Varanasi, India



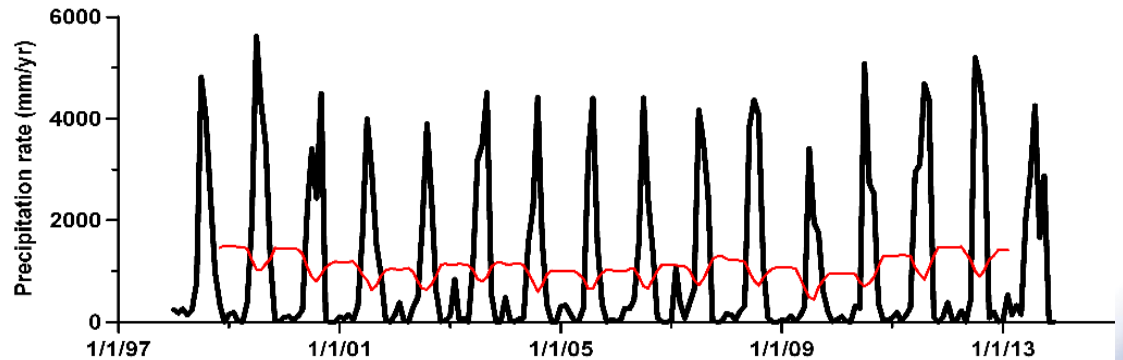
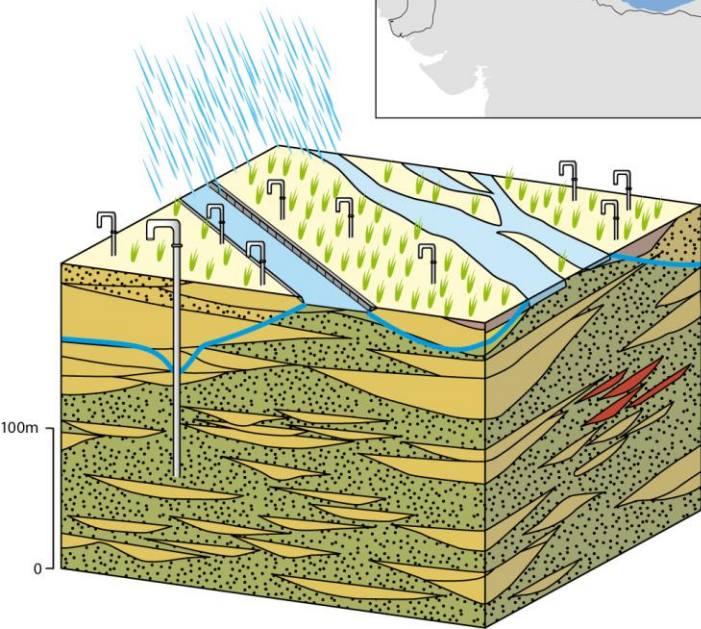
Faecal coliform bacteria in the River Ganges (2015)



Hydrogeology and groundwater use

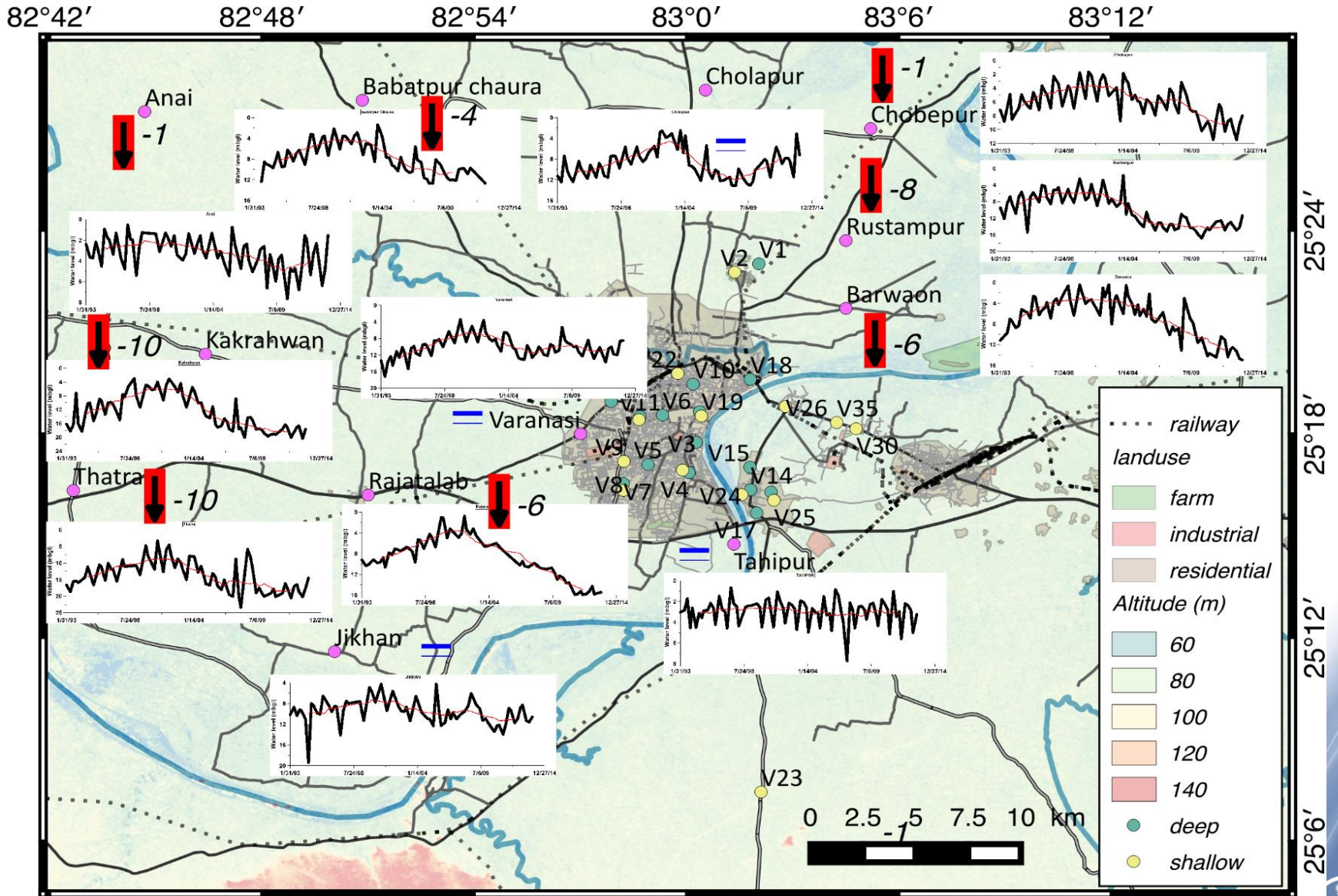


- 40% Municipal Groundwater
- 60% Municipal surface water
- Extensive private GW use

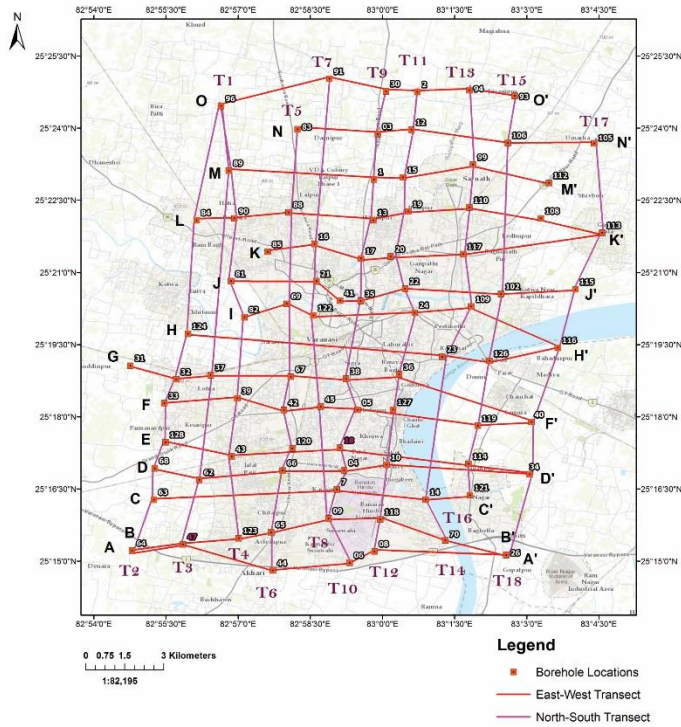


Source: Bonsor et al (In review)

GW level trends 1993-2013



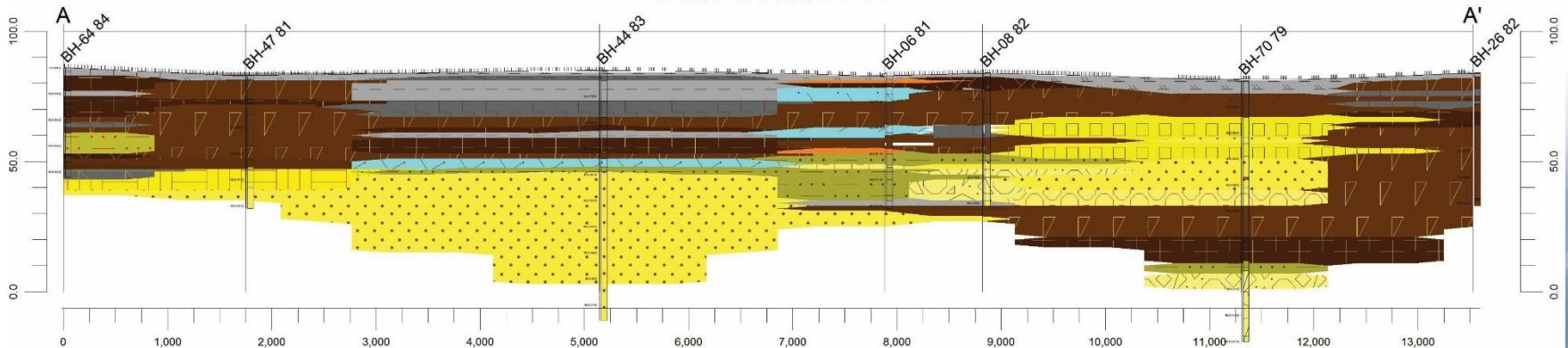
Lithology



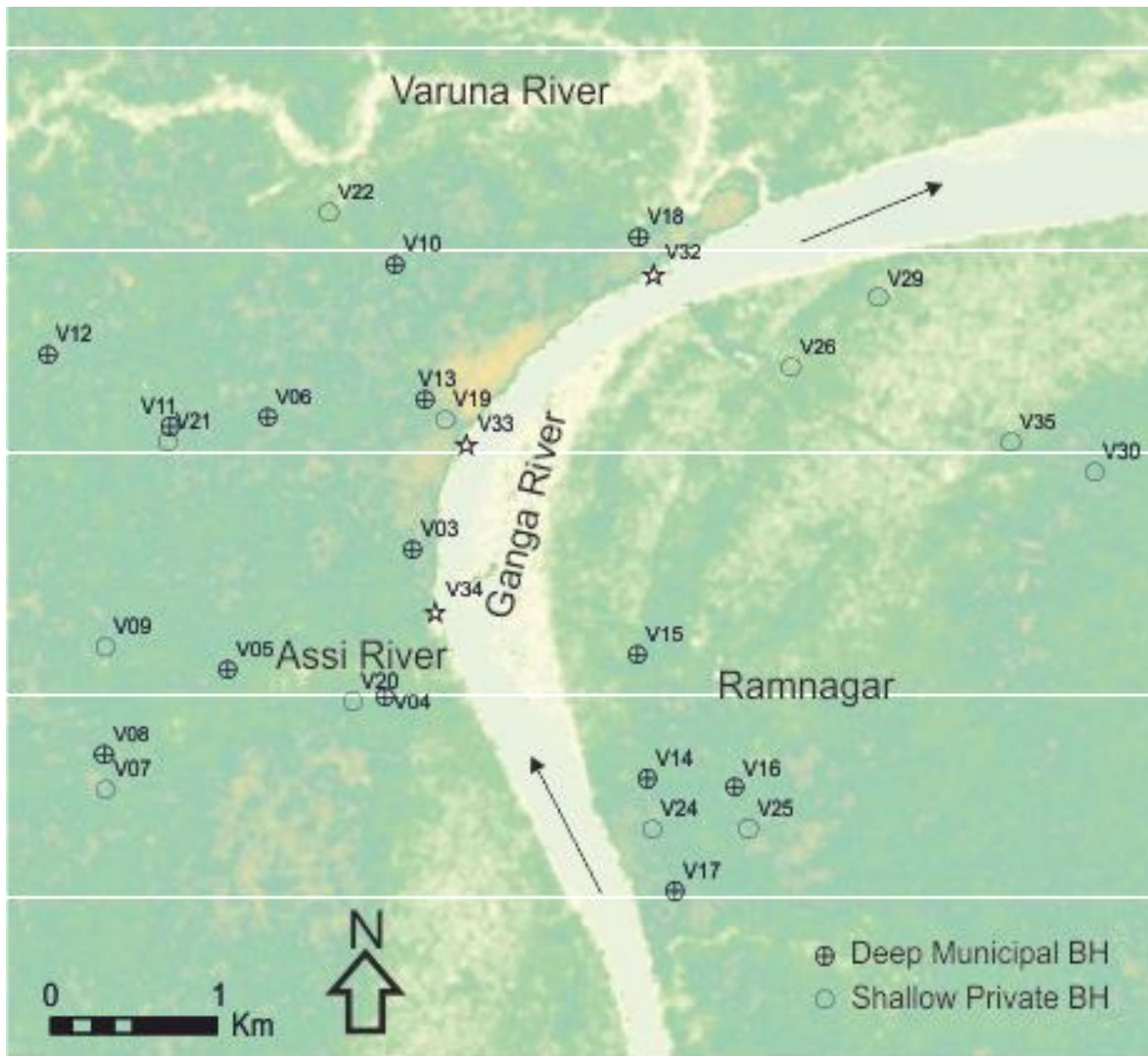
Lithology Index

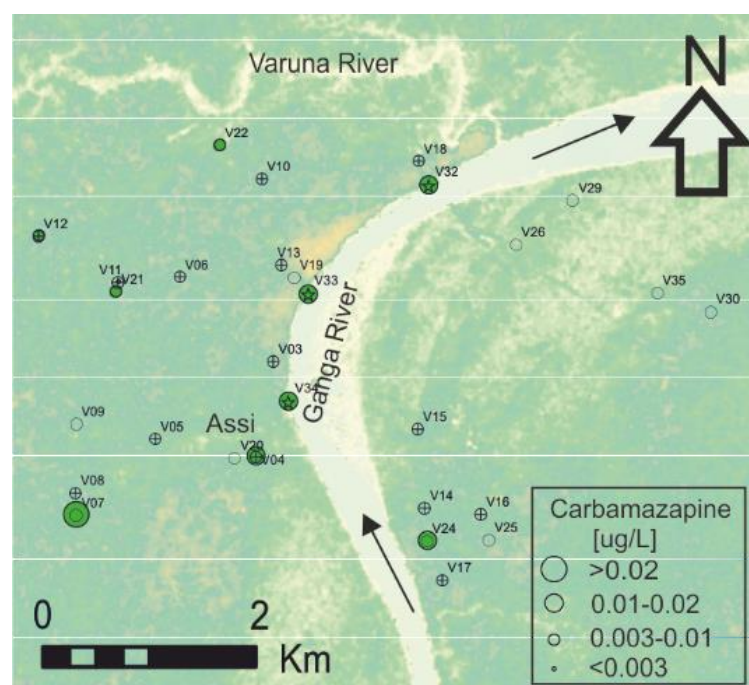
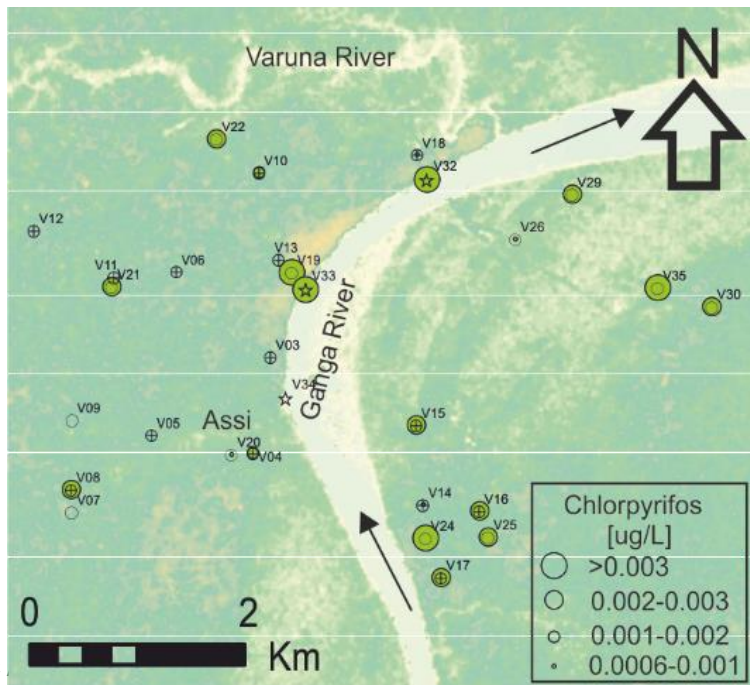
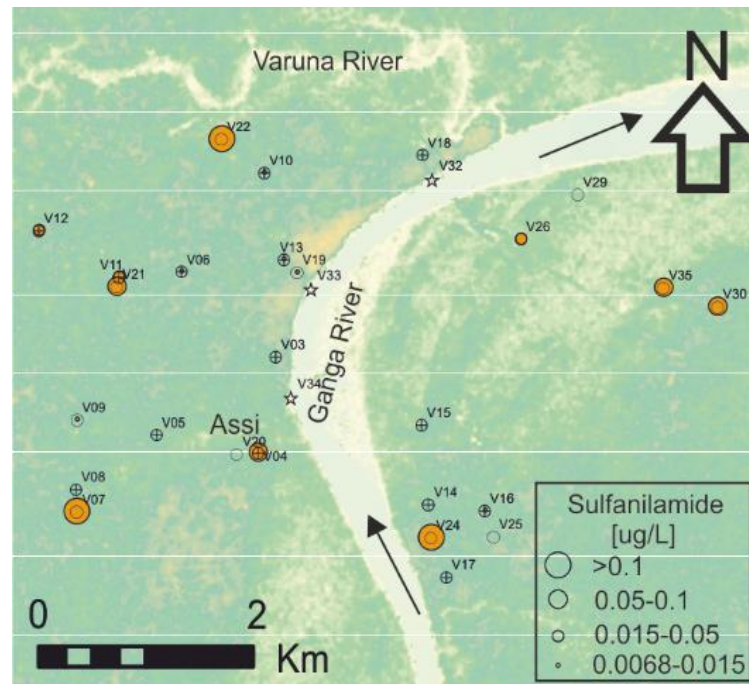
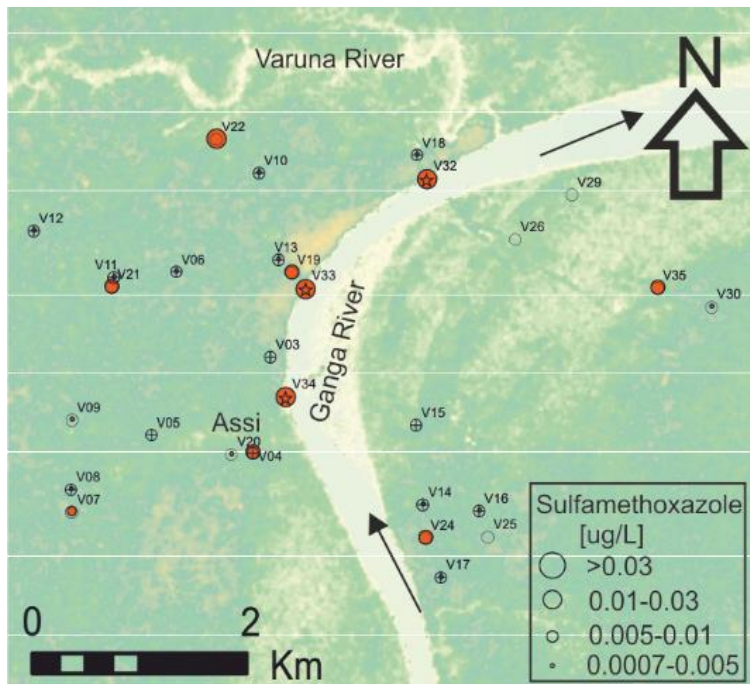


Cross-Section A-A'



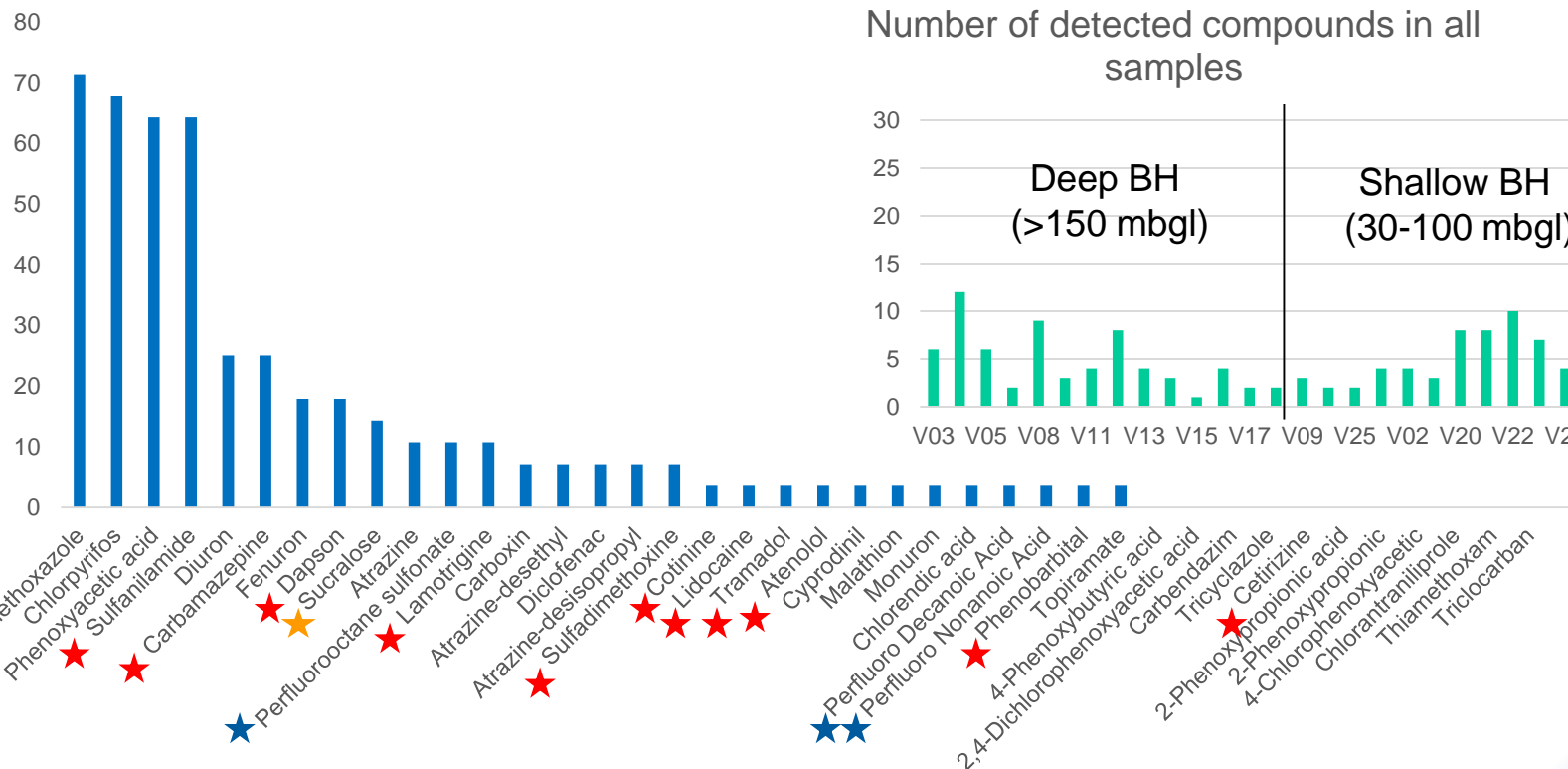
Sampling sites: 31 BHs and 3 River samples



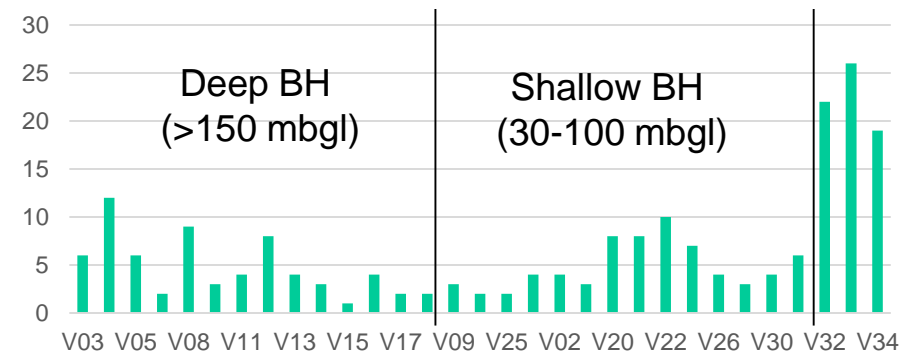


Emerging contaminants in groundwater

Frequency of detection in groundwater [%]



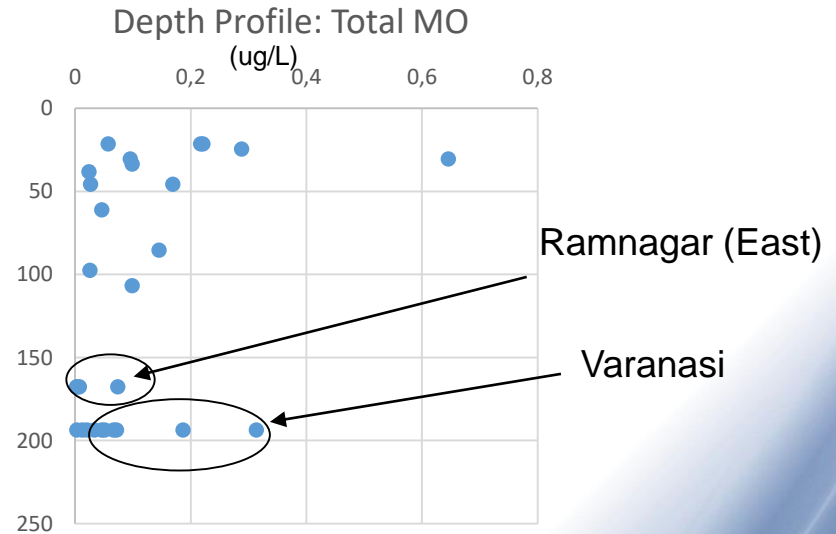
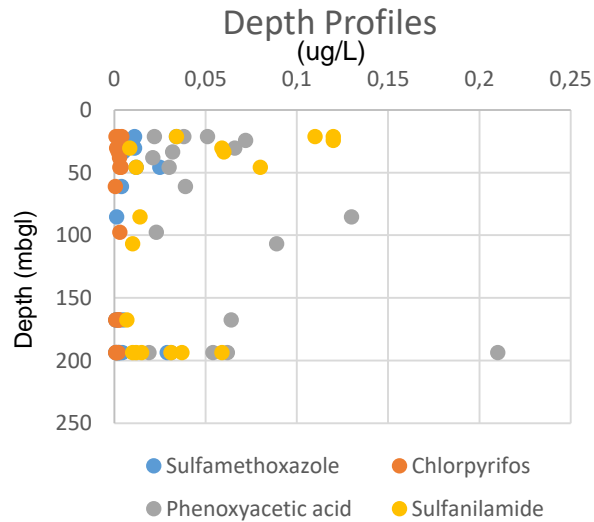
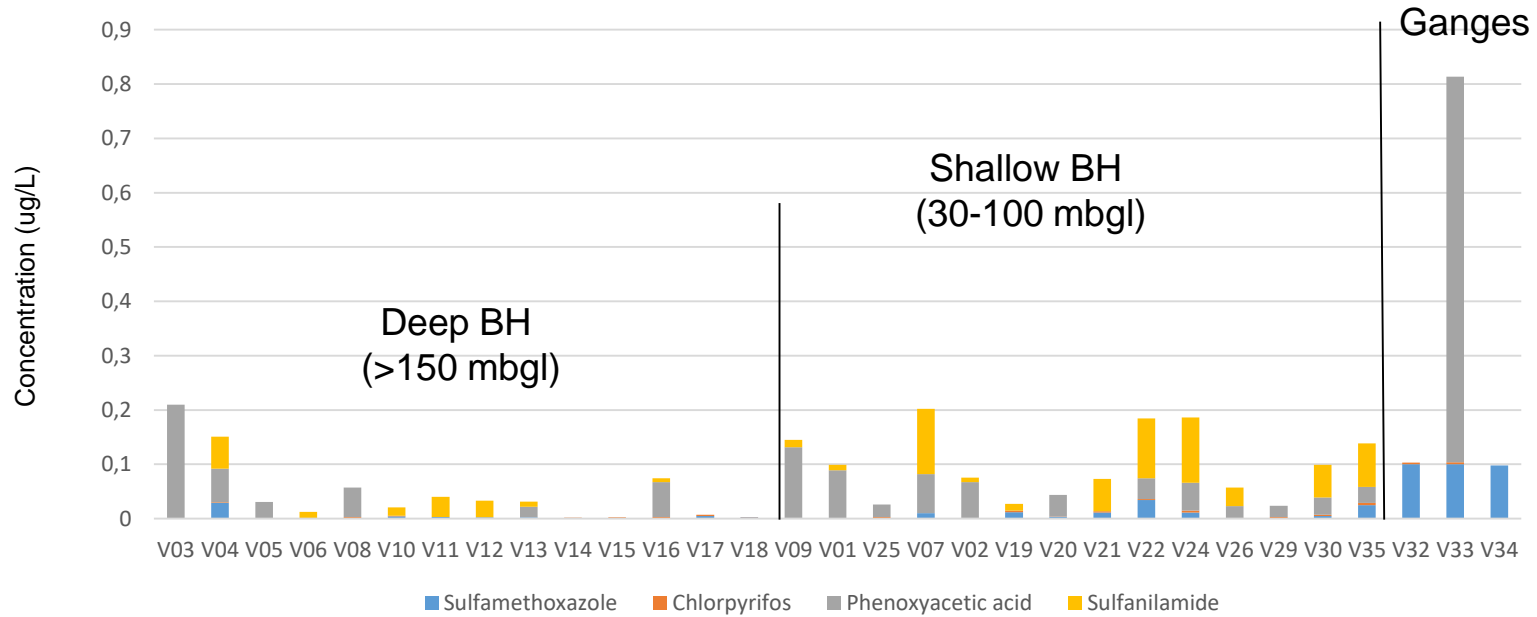
Number of detected compounds in all samples



Ganges

More detail in IAH talk later today: session 5.04 on Emerging Contaminants, 15:00

4 Most frequently detected compounds



Summary

- Frequently detected groups of MOs include pesticides, pharmaceuticals, PFAS...
- Although mostly detected in low ng/L concentrations in groundwater there are a broad range of compounds that are consistently detected in shallow groundwater
- There are hot-spots in the shallow aquifer and evidence of migration of MOs to depth within the aquifer – at least deeper than 100 m
- Widespread detection of sulfonamides. Sulfamethoxazole detected at 70% of sites at low very concentrations: 5-30 ng/L
- Surface water is highly contaminated compared to GW with between a 10-100 fold higher total* MO loading: implications for water treatment
- Ongoing need to prioritise monitoring and gather evidence. This is facilitated early on by the use broad screening methods

* LCMS broad screening for c. 1000 compounds

Research team

- **BGS:** Dan Lapworth
- **UK Environment Agency:** Wayne Civil
- **IIT Kharagpur:** Prerona Das; Shahid Jamal; Abhijit Mukherjee
- **NIH Roorkee:** Gopal Krishan



संस्कृति

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