

Assessing passive samplers for source water characterization and event-based data collection

Strategic Research & Innovation

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Source water characterization

Passive samplers offer several benefits over grab samples

**Collect data
through space
and time
(including
events)**

**Reduce need
for routine
access to
difficult sites**

**Easy
deployment
and retrieval**

Investigating novel monitoring technologies

Passive samplers use molecular diffusion and sorption to measure various analytes *in situ* and are useful for environmental monitoring

- Completely power free
- Deployed in water, soil/sediments, and air
- Lower detection limits than traditional grab sampling

Pollutants can be measured:

- Pesticides
- PFAS
- Metals
- Nutrients
- Pharmaceuticals
- Radionucleotides

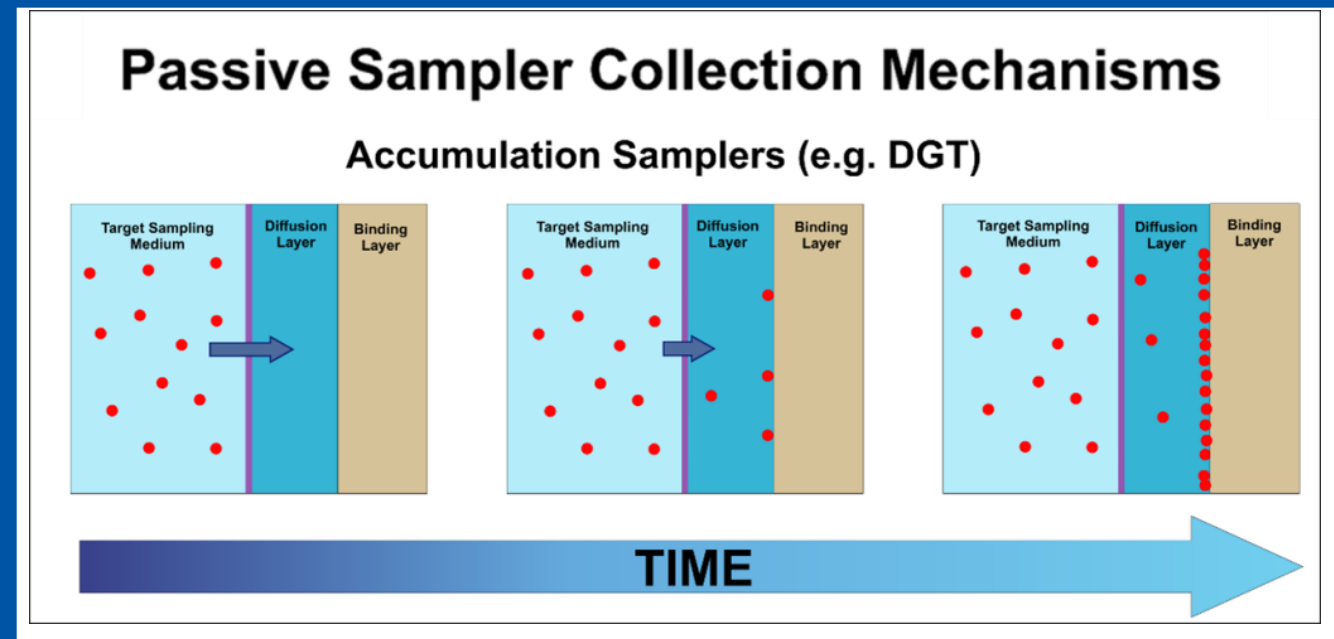


Image from itrcweb.org

Kedumba Valley - Field Trial of DGTs



Diffusive gradient in thin film (DGT) passive samplers for nitrates and cationic metals

- Year long monthly deployments

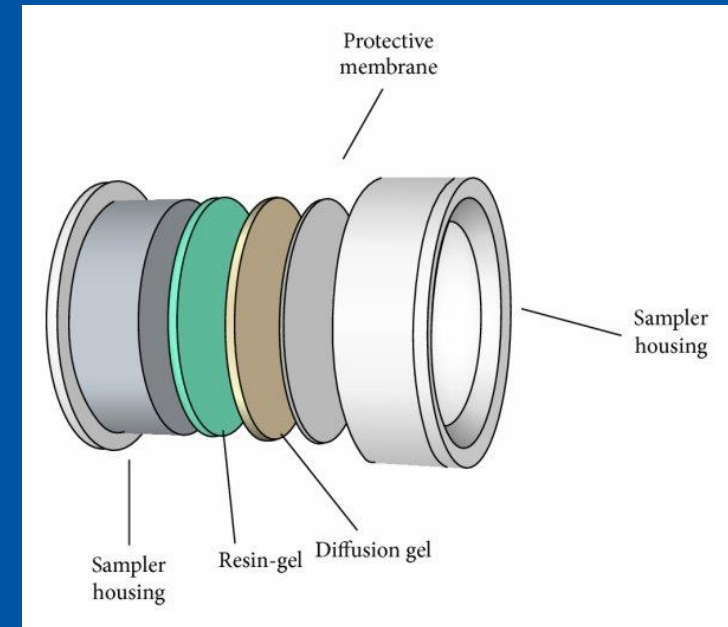


Image from Knutsson et al 2014

Kedumba – Experimental design

Comparison of multiple data types across temporal resolutions to better understand system flux during wet weather; time weighted and temperature calibrated

Metals

Grab samples vs monthly DGTs

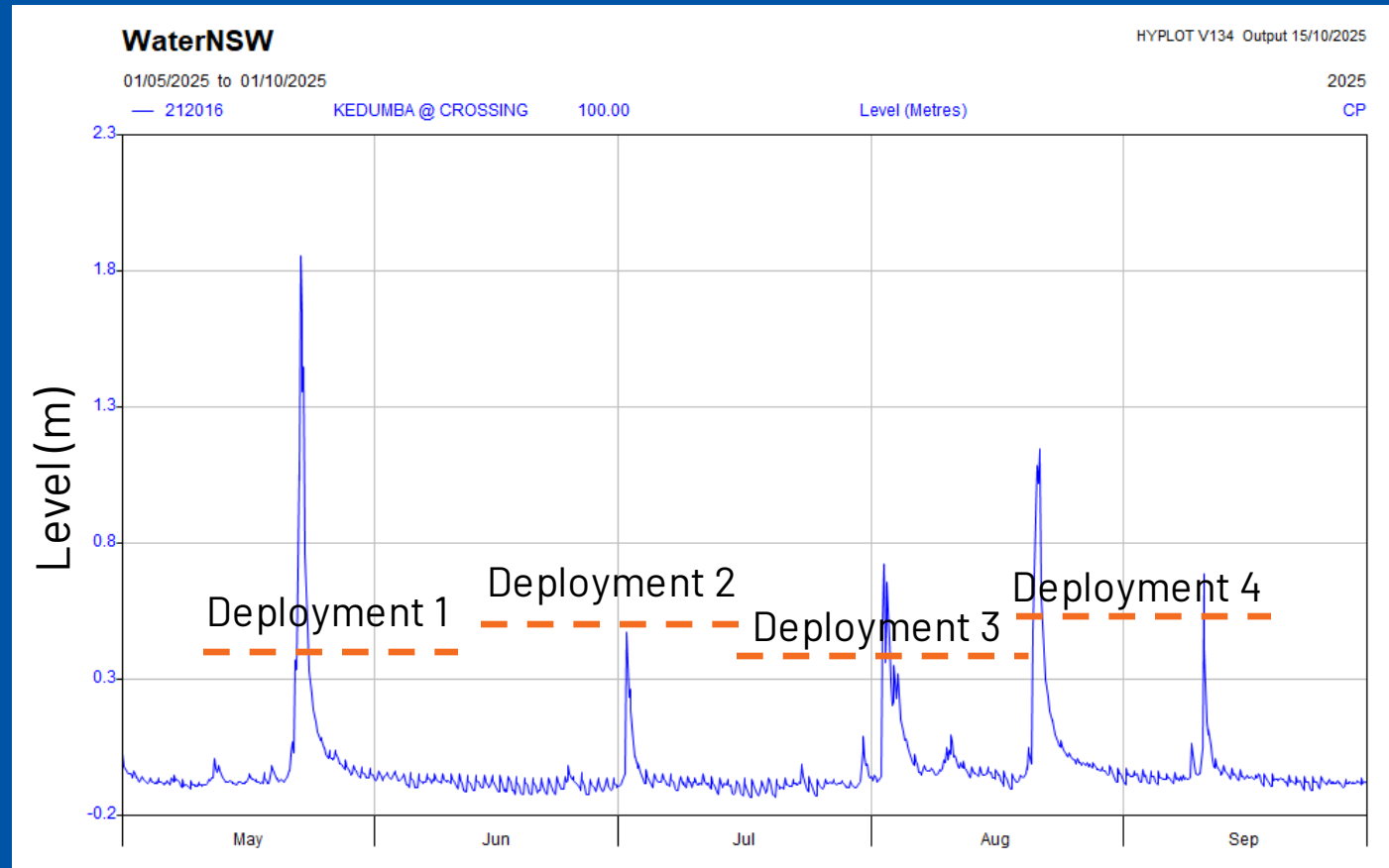
- Grabs represent both filtered and total metal concentration
- Passive samplers represent “available” metals

Nitrate

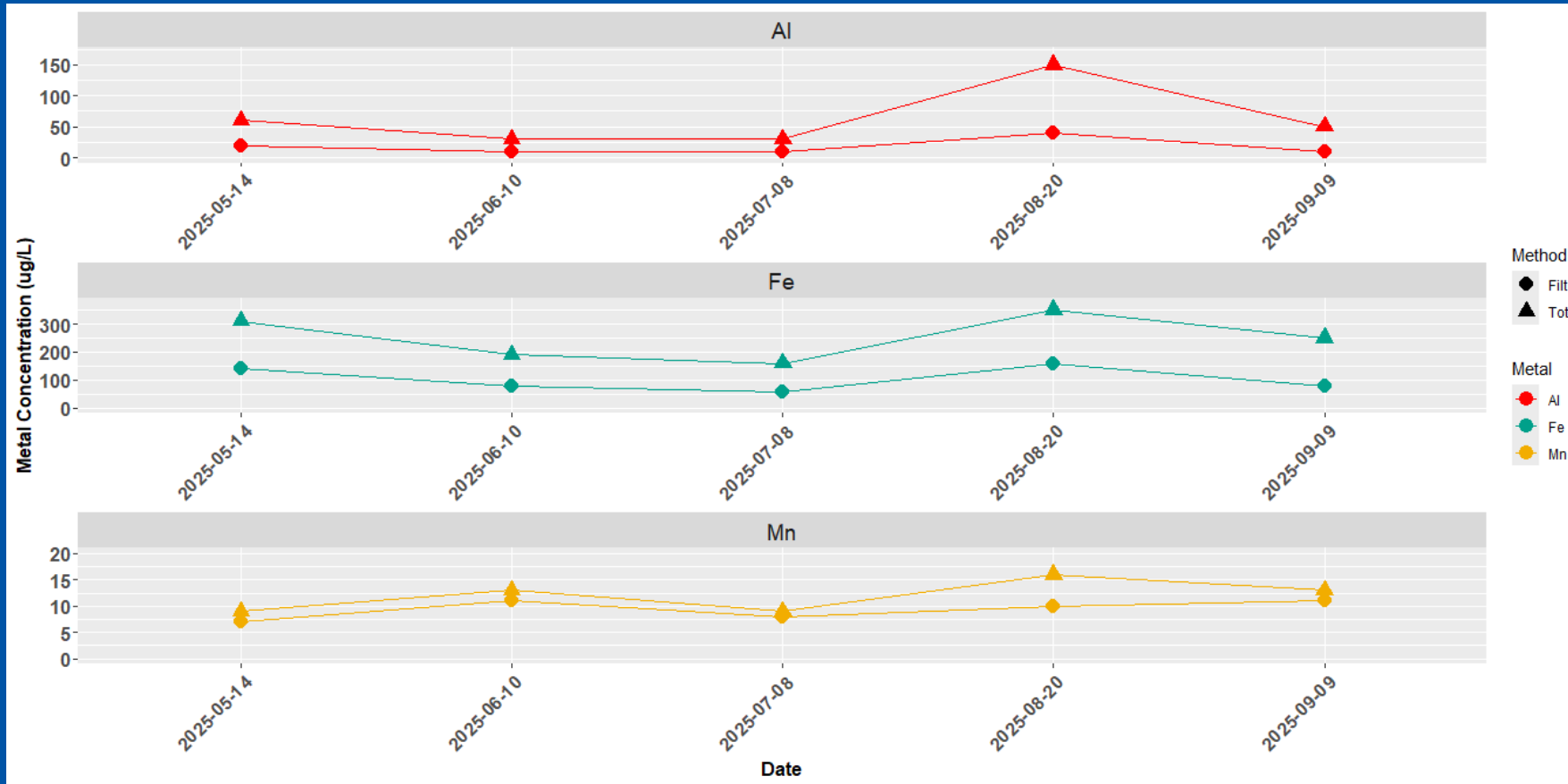
Grab samples vs monthly DGTs vs in situ NitraLED sensor

- Grabs represent “snapshot” in time while DGTs represent time weighted average concentration
- NitraLED gives real time readings every 15 minutes continuously through time including during events

Kedumba Hydograph



Metal Grab Samples



ANZG
55 ug/L

ADWG
100 ug/L

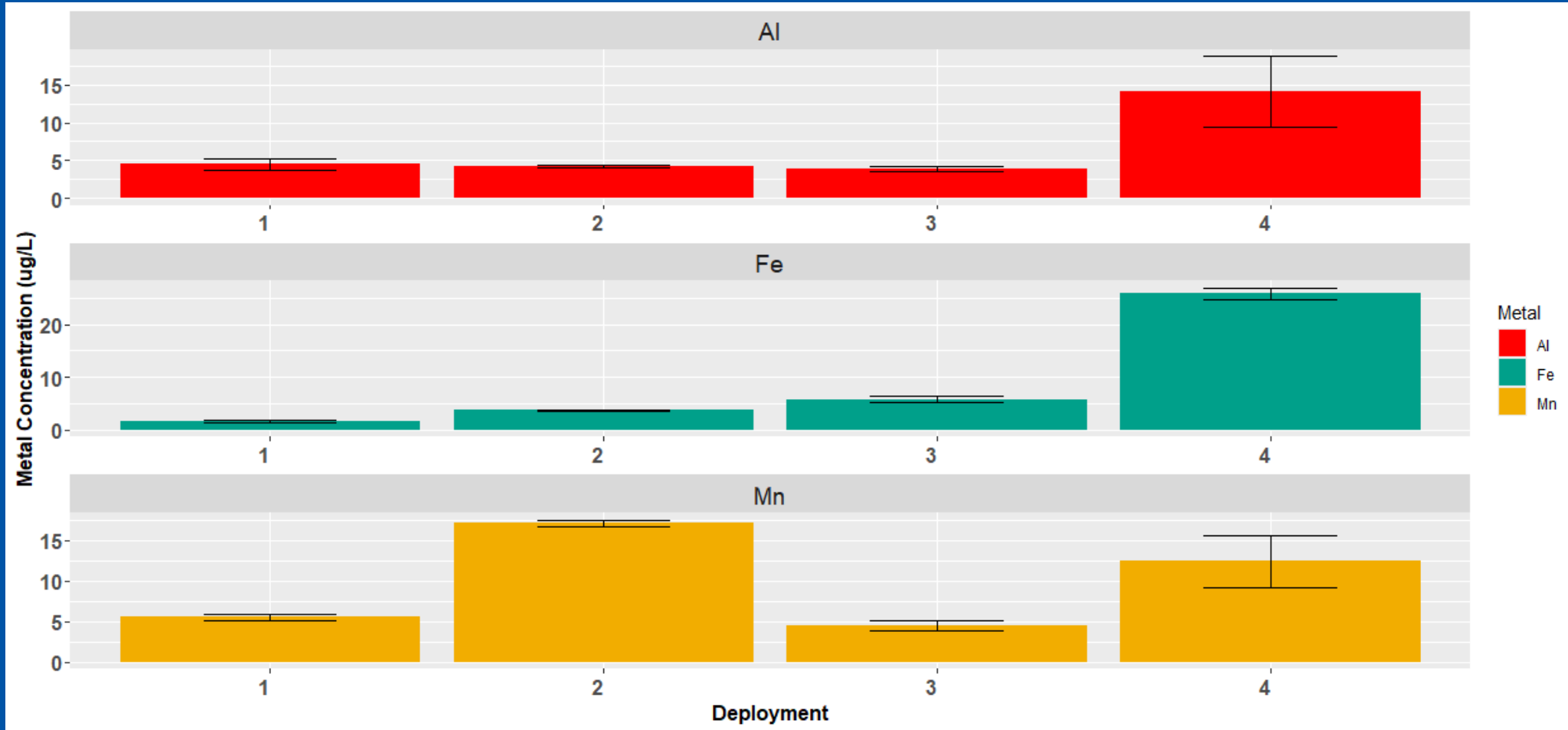
~300 ug/L

300 ug/L

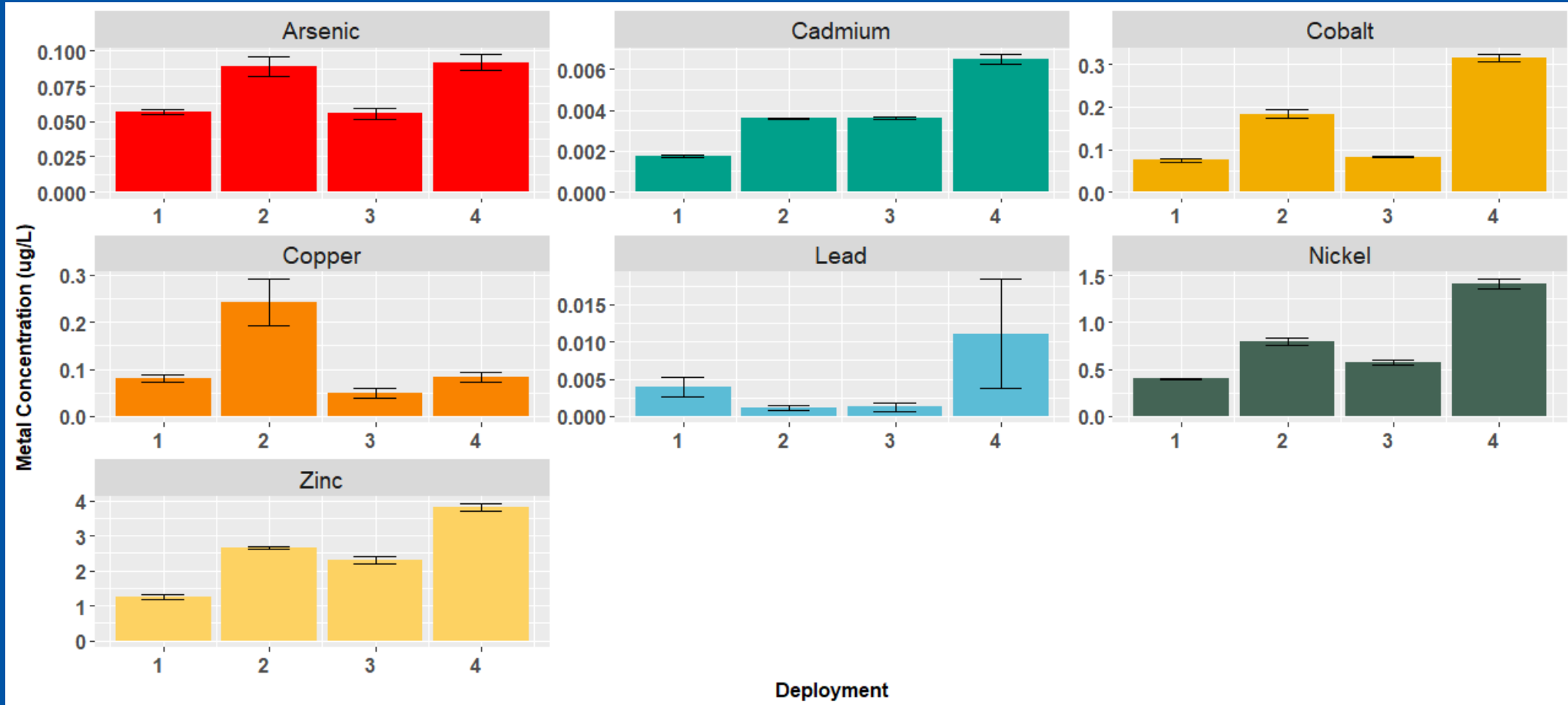
1900 ug/L

100 ug/L

Metal DGT Results



Additional Metal DGT results



Kedumba discussion

Aluminum

- Al exceeds ANZG guidelines at Kedumba regularly for total Al but no signs of aquatic toxicity at site
 - Moderated by circumneutral pH, moderate Ca, organic matter
- Passives are closer to representing biologically active proportion of Al in stream

Kedumba – Looking forward

- **Disparity in results of total and filtered metals vs DGT measures**
 - DGTs both lower and higher than grab detections; Mn particularly labile
 - Grab samples not indicative of “available” metals in waters especially those whose toxicity is modified by other parameters (Zn, Ni, Al)
 - Work remains to address gaps in interpreting passive sampler data against regulatory guidelines
- **Trends for metals still developing but disparity between grabs and passives potentially related to stream conditions (rainfall, pH, temperature, etc)**
 - Passives informed by “whole picture” including events
 - Passives not great at capturing quick changes in system
- **Nitrate data showing similar trends between grabs and DGTs but matching it to in-situ sensor data requires additional considerations**

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Questions?