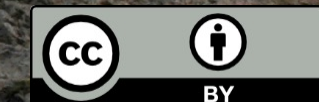


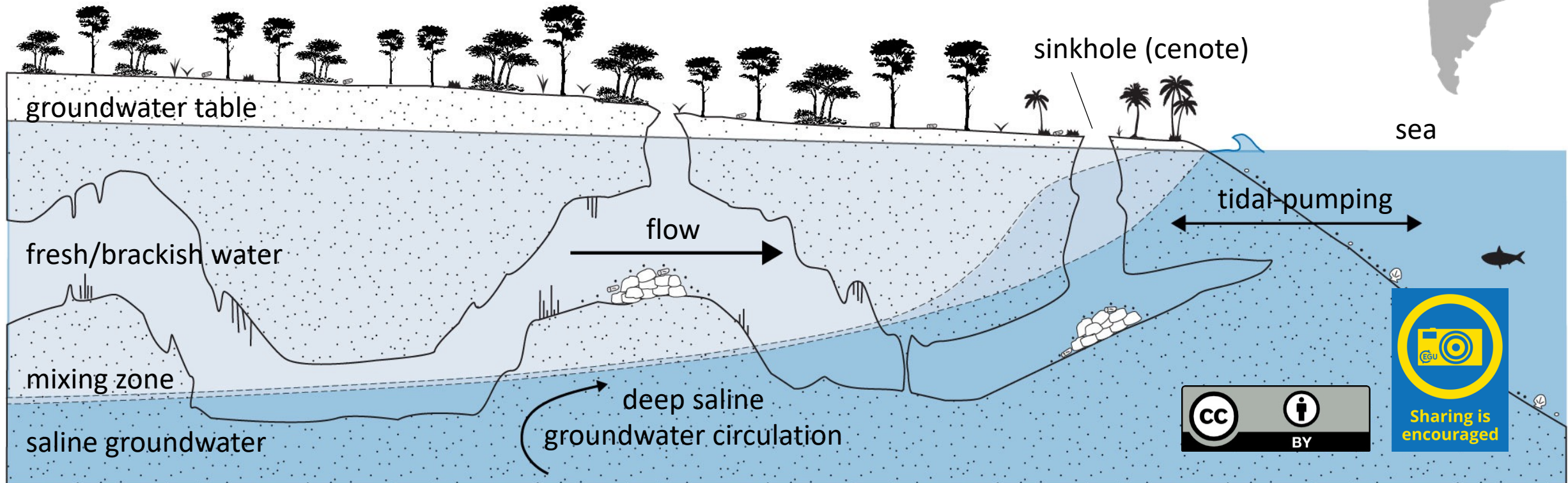
Oxygenation of a karst subterranean estuary during Tropical Storm Hanna in the Yucatan Peninsula: Mechanisms and implications for methane turnover

David Brankovits
John Pohlman
Laura Lapham



Coastal caves: windows into the karst subterranean estuary

- Methanotrophy in subterranean estuaries controls CH_4 export to sea (Schutte et al., 2016)
- Seasonal precipitation affects carbon turnover and CH_4 accumulation in a karst subterranean estuary (Brankovits et al., 2018)



Tropical storm and hurricane tracks in the Atlantic Ocean

Extreme weather events impact:

- Groundwater resources
- Carbon cycling
- Ecosystem functioning

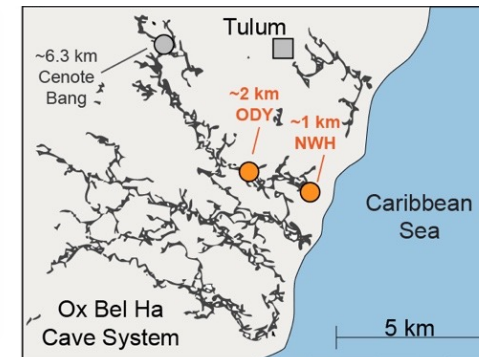
But mechanisms are poorly understood!

study region

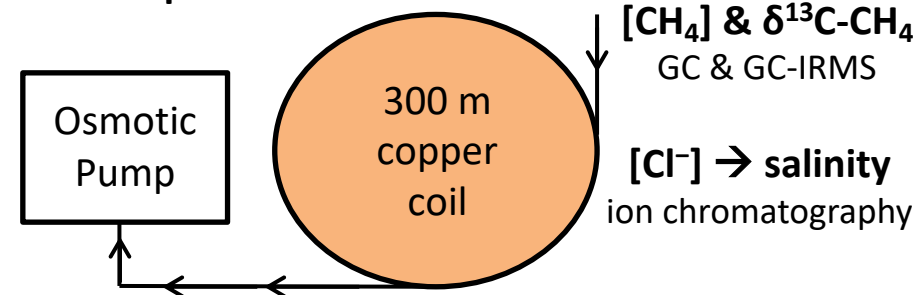


Goals

Determine the impact of extreme weather events (e.g., tropical storms and hurricanes) on subsurface carbon cycling linked to coastal karst landscapes



OsmoSampler



Data Loggers



Dissolved Oxygen (DO) U-26



Tilt Current Meter TCM-1



water level U-20

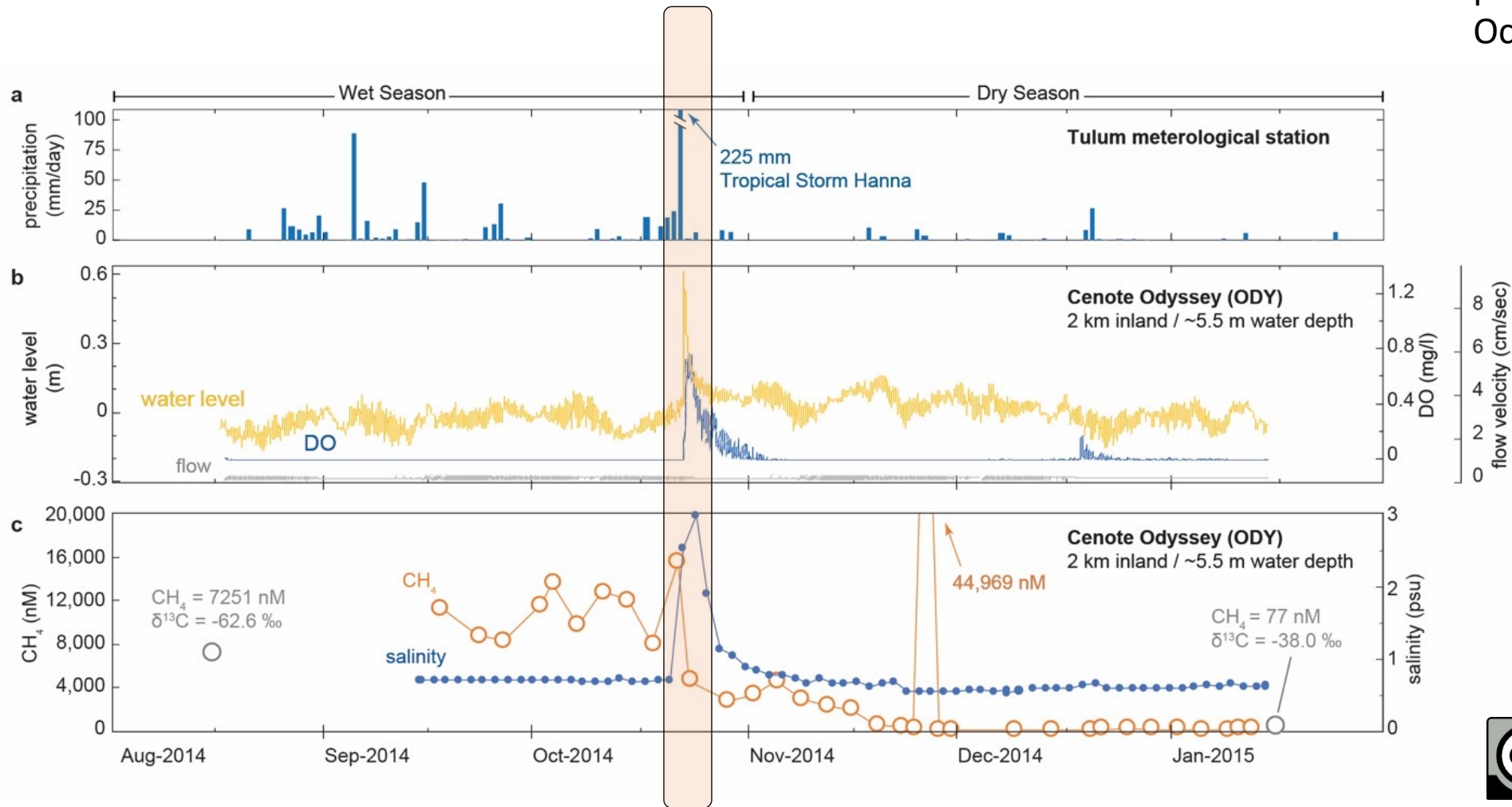


rain gauge RG-3



Effects of Tropical Storm Hanna: biogeochemical changes linked to storm-induced hydrologic processes

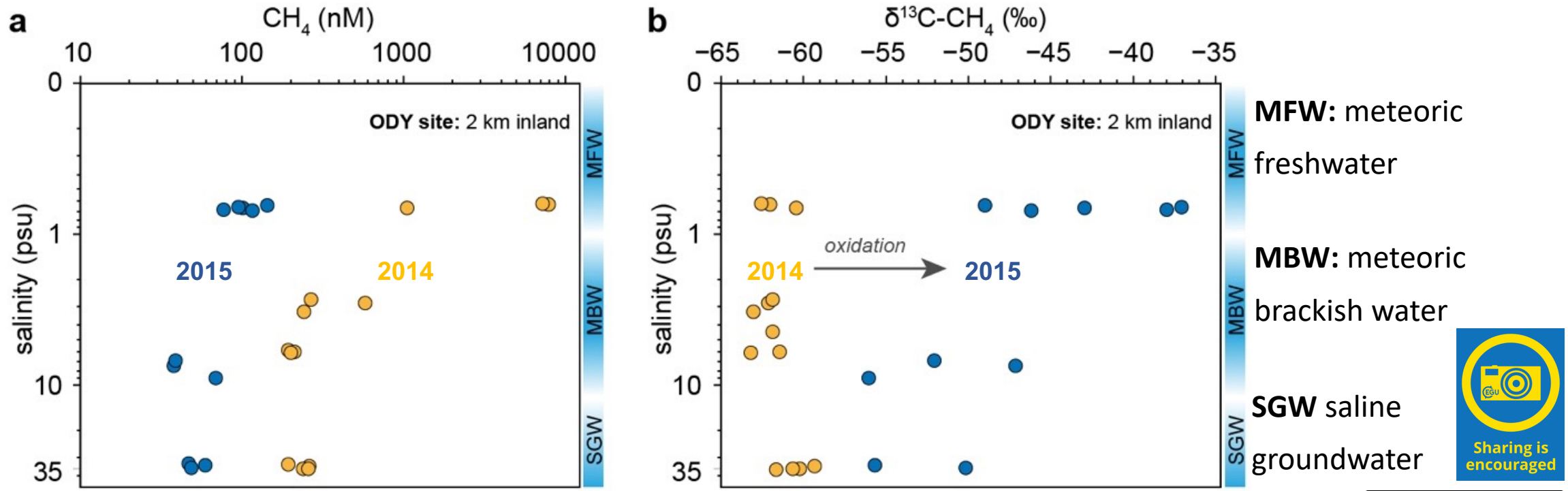
Tropical Storm Hanna tracked from west to east on the southern part of the Yucatan in Oct. 2014 (Cangialosi, 2014)



- Storm-induced hydrologic processes increase dissolved oxygen conc.
- Storm enhances methane oxidation
- Compared to seasonal changes, outsized biogeochemical effect

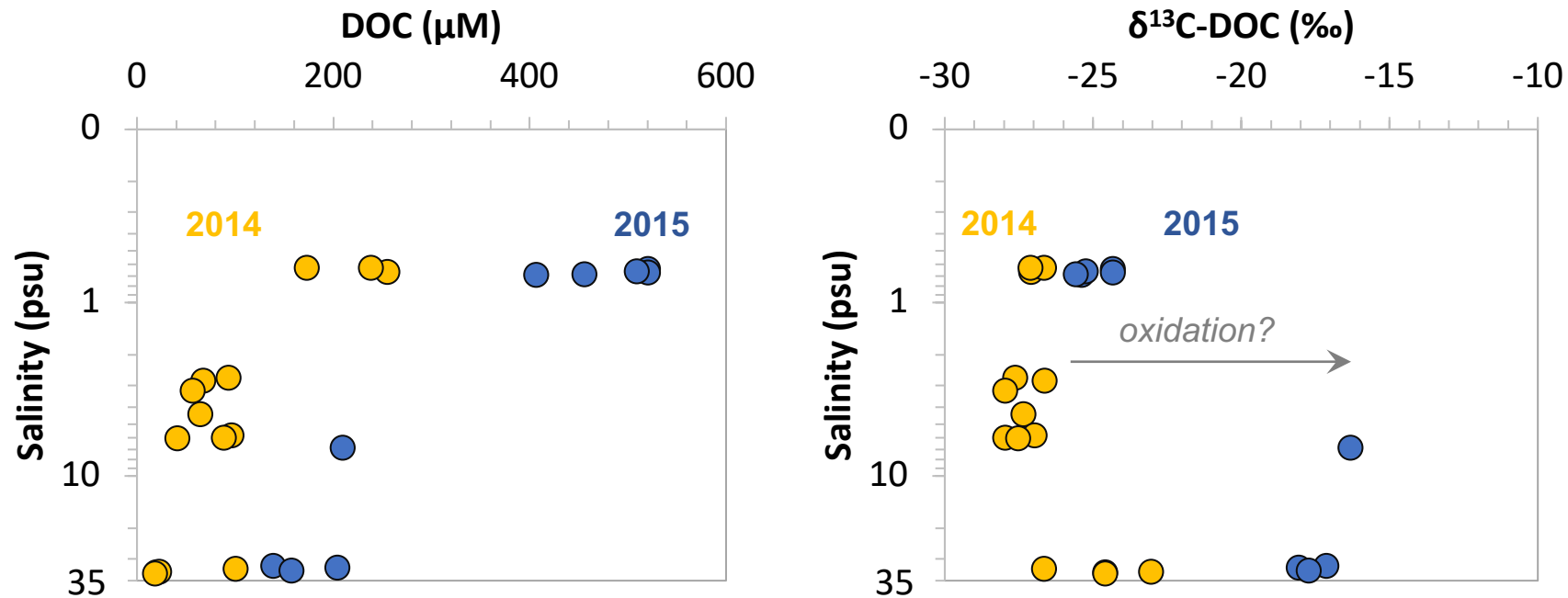
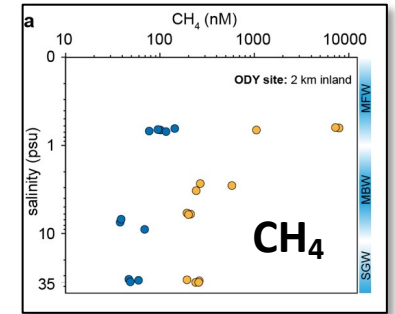


Dissolved methane in the stratified water column before & after Tropical Storm Hanna



Samples collected in January **2015** (dark blue) and August **2014** (orange).

Dissolved organic carbon (DOC) in the stratified water column before & after Tropical Storm H.



- Storm-induced hydrologic processes enhance oxidation and transfer large amounts of DOC into the aquifer

Samples collected in January **2015** (dark blue) and August **2014** (orange).



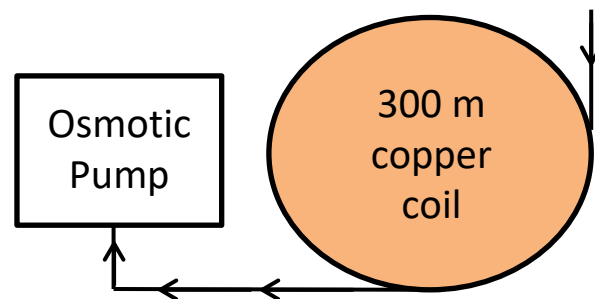
Interested in more on methane biogeochemistry in coastal karst landscapes?

david.brankovits@irsa.cnr.it

- Brankovits, D. & Pohlman, J.W. Methane oxidation dynamics in a karst subterranean estuary. *Geochimica et Cosmochimica Acta* **277**, 320-333 (2020)
- Brankovits, D., Pohlman, J., Ganju, N.K., Iliffe, T., Lowell, N., Roth, E., Sylva, S., Emmert, J., Lapham, L. Hydrologic controls of methane dynamics in karst subterranean estuaries. *Global Biogeochemical Cycles* **32**, 1759-1775 (2018)
- Brankovits, D., Pohlman, J.W., Niemann, H., Leigh, M.B. et al. Methane- and dissolved organic carbon-fueled microbial loop supports a tropical subterranean estuary ecosystem. *Nature Communications* **8**, 1835 (2017)



Method: OsmoSampler



sectioning

