Karlsruhe Institute of Technology

Detailed insights in karst conduit networks from in-cave tracer tests, Blautopf spring, Swabian Alb, Germany

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Blautopf (Blue Pot) spring

Discharge variations:
Minimum: 0.3 m^3 /s
Mean: 2.3 m^3/s
Maximum: 32.5 m^3/s

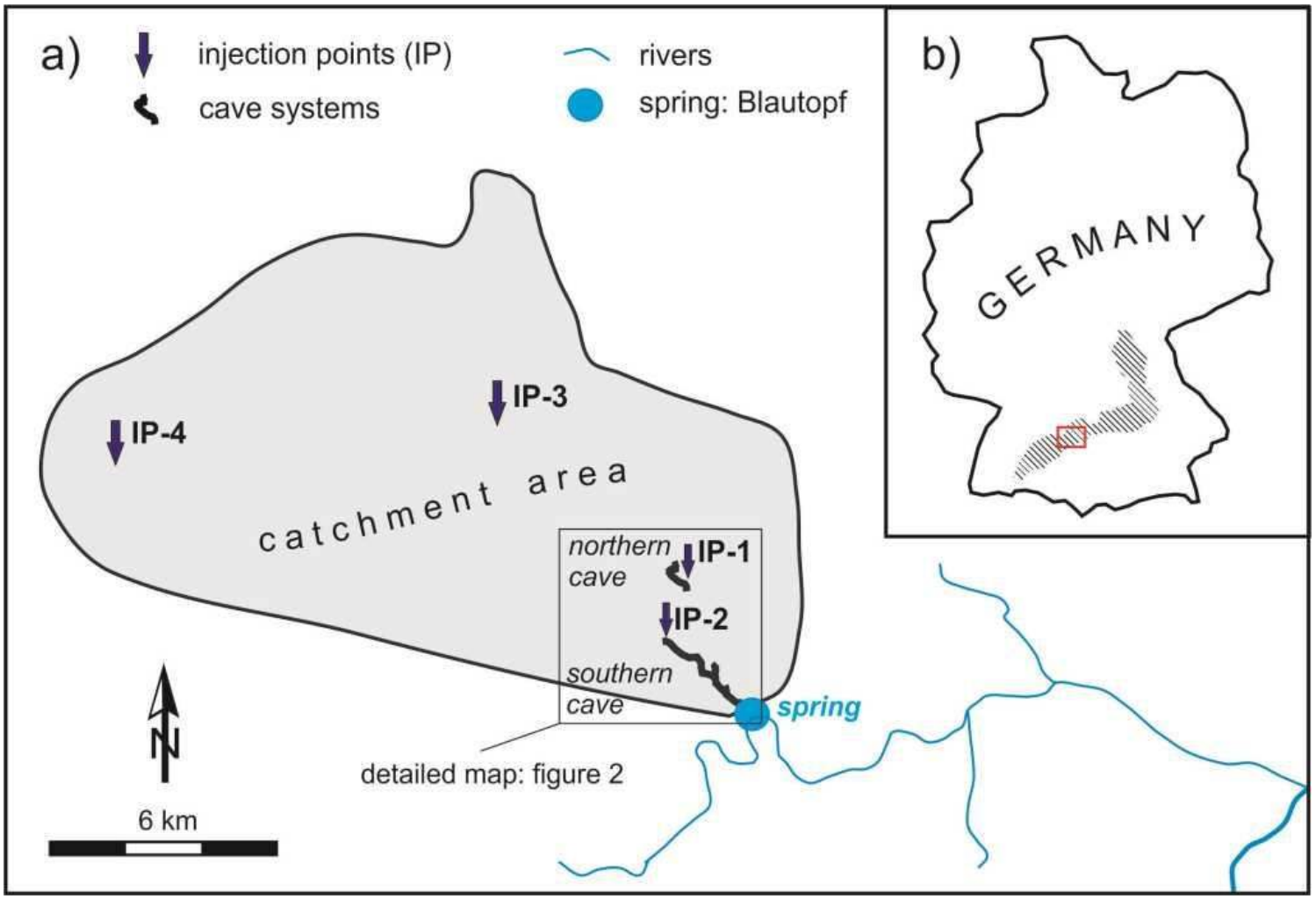
Photo: Reinhard Hagen

Blauhöhle = Blue Cave, 10 km long

Until 2010, the cave was only accessible for divers, via the spring. In 2010, a vertical entrance shaft to the dry cave upstream the underwater cave was drilled.

Photos: Andreas Kücha & Cave Diving Team

Catchment of the Blautopf spring: 165 km²

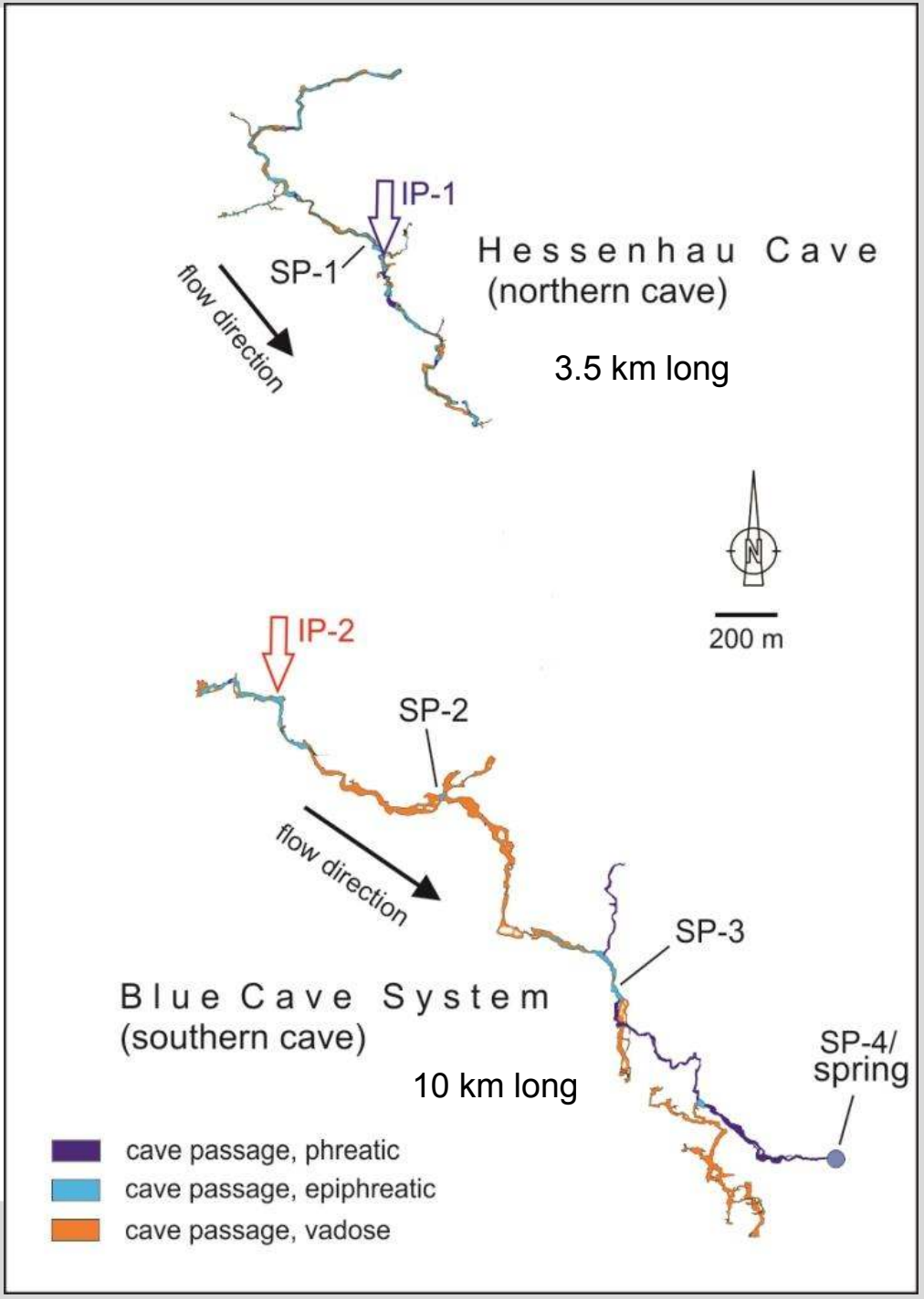


IP: injection points: “Local tracer test” and “Regional tracer test”

Lauber, Ufrecht & Goldscheider, HESS, 2014

Injection and monitoring sites in the two caves

„in-cave dye-tracing“



“Local tracer test” – Injection of 100 g of Uranine at IP-1

Injection of 200 g of Amidorhodamine G at IP-2

SP-2: The “Lost River Hall” in the Blue Cave

Installation of a downhole fluorimeter at SP-2

Local tracer test: injections and monitoring in the cave system

One week later: Regional tracer test, two injections

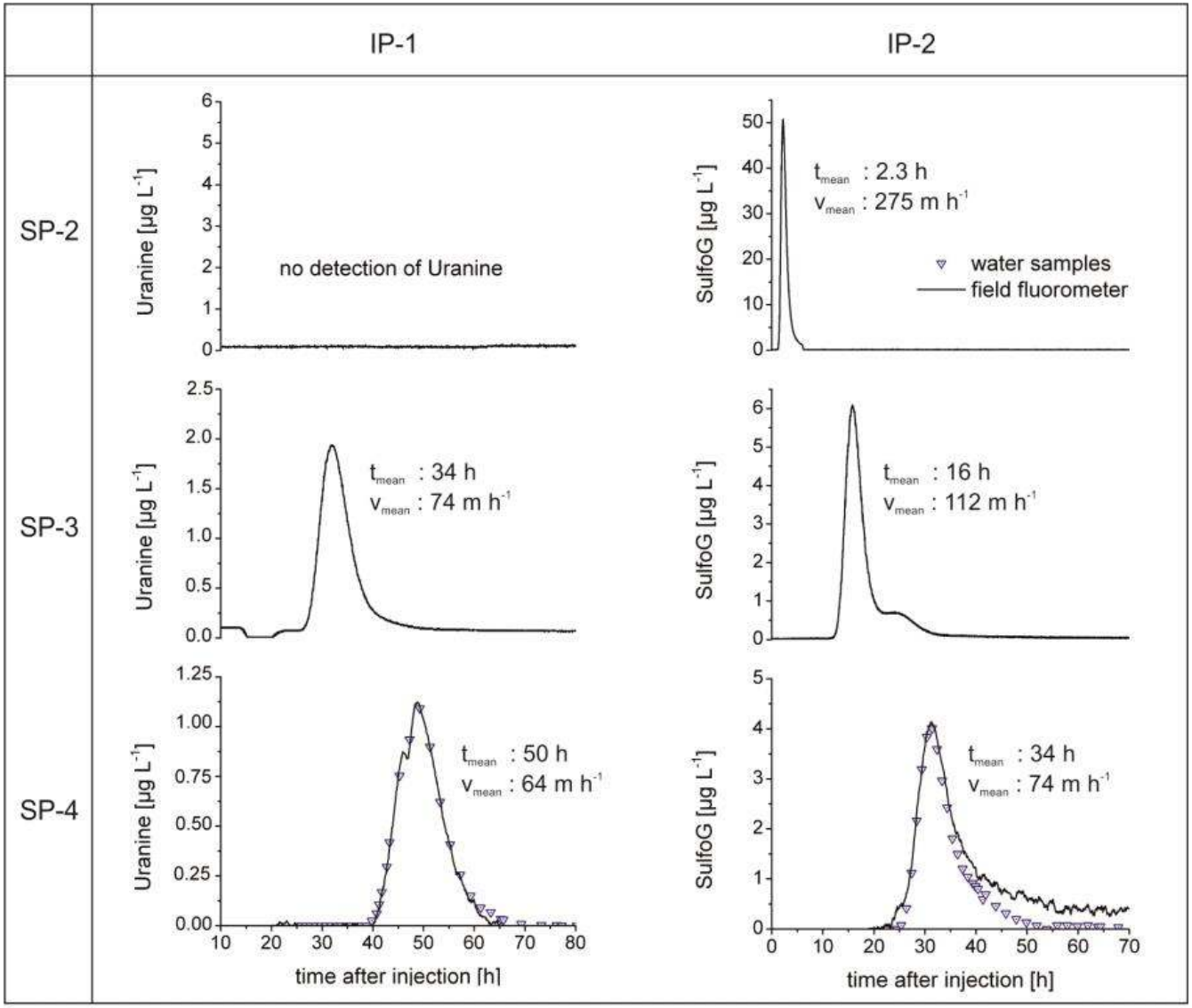
Injections at the land surface

Monitoring in the two caves
and at the Blautopf karst spring

Green water in the Blue Cave

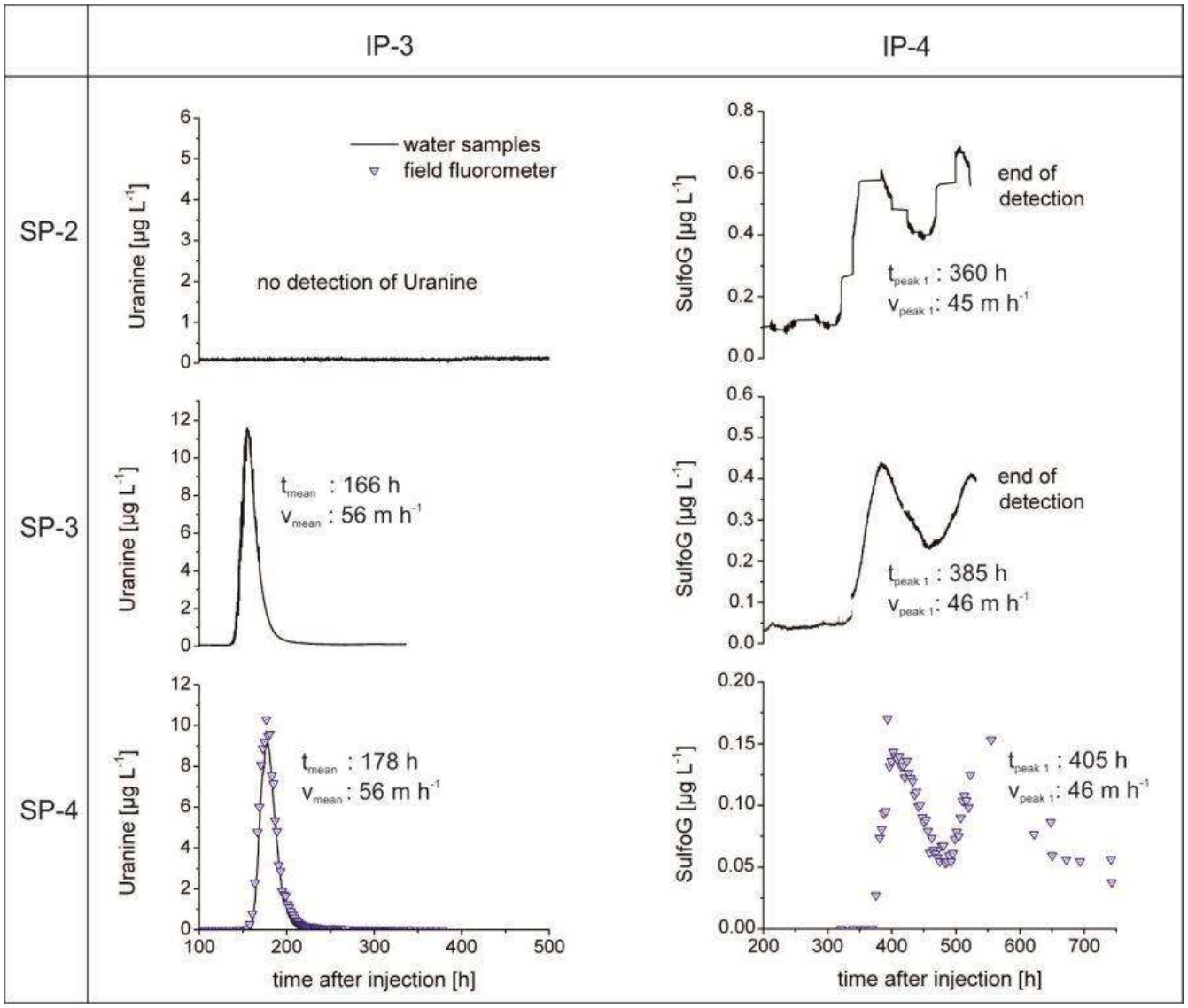
Photo: Andreas Kücha

Results: Local tracer test (in-cave injections)



Lauber, Ufrecht & Goldscheider, HESS, 2014

Results: Regional multi-tracer test



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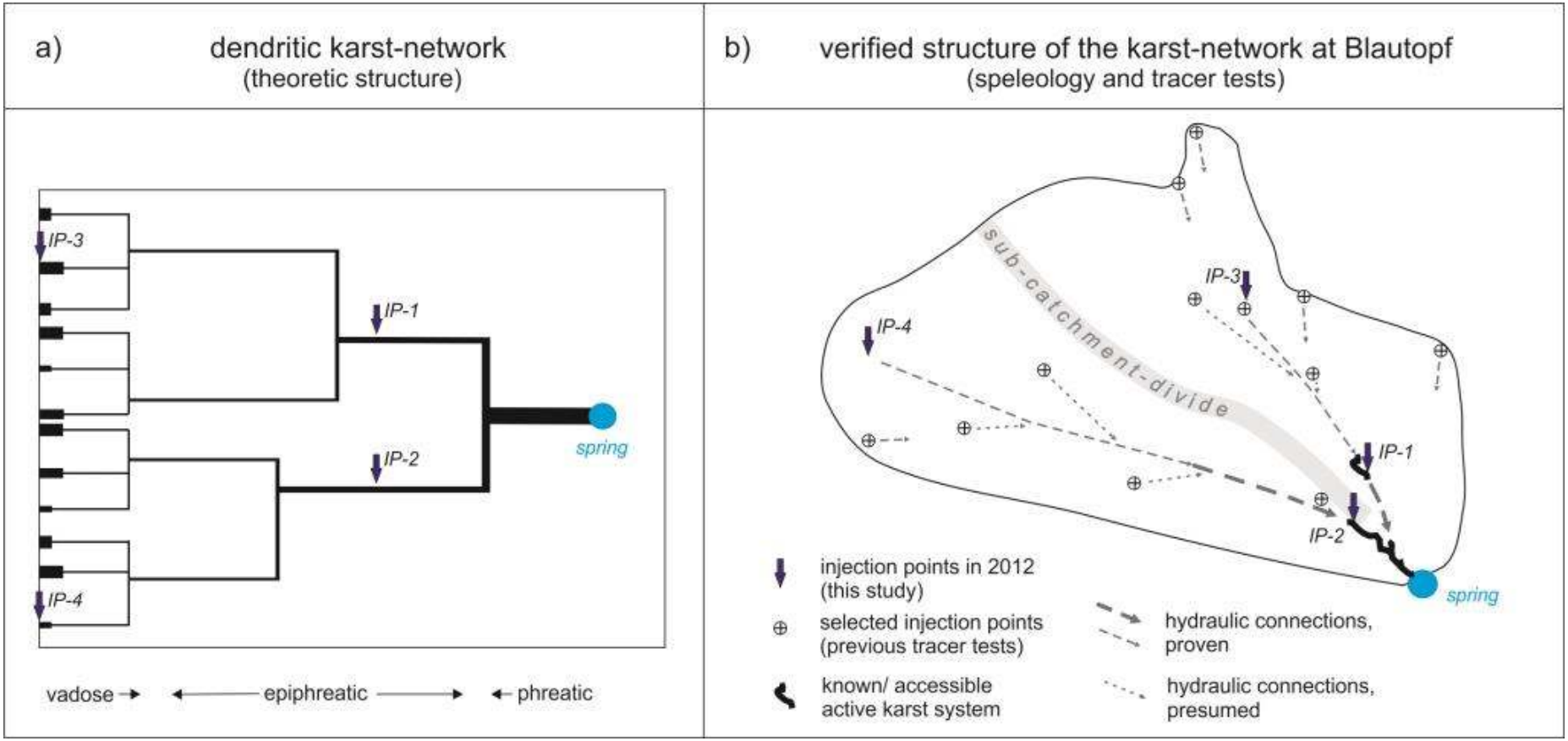
Theoretical and verified dendritic structure



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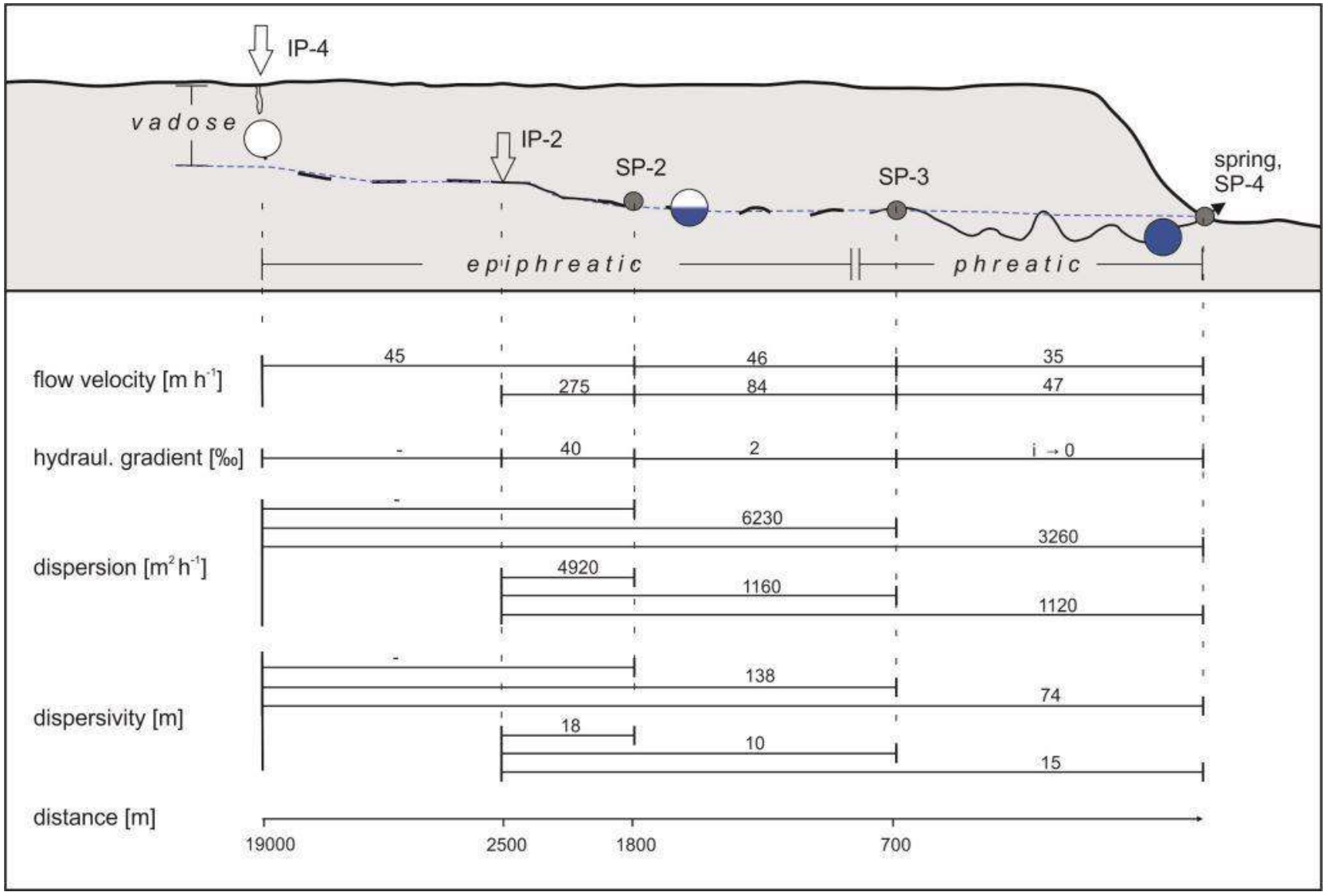
Spatially-resolved results: Southern branch



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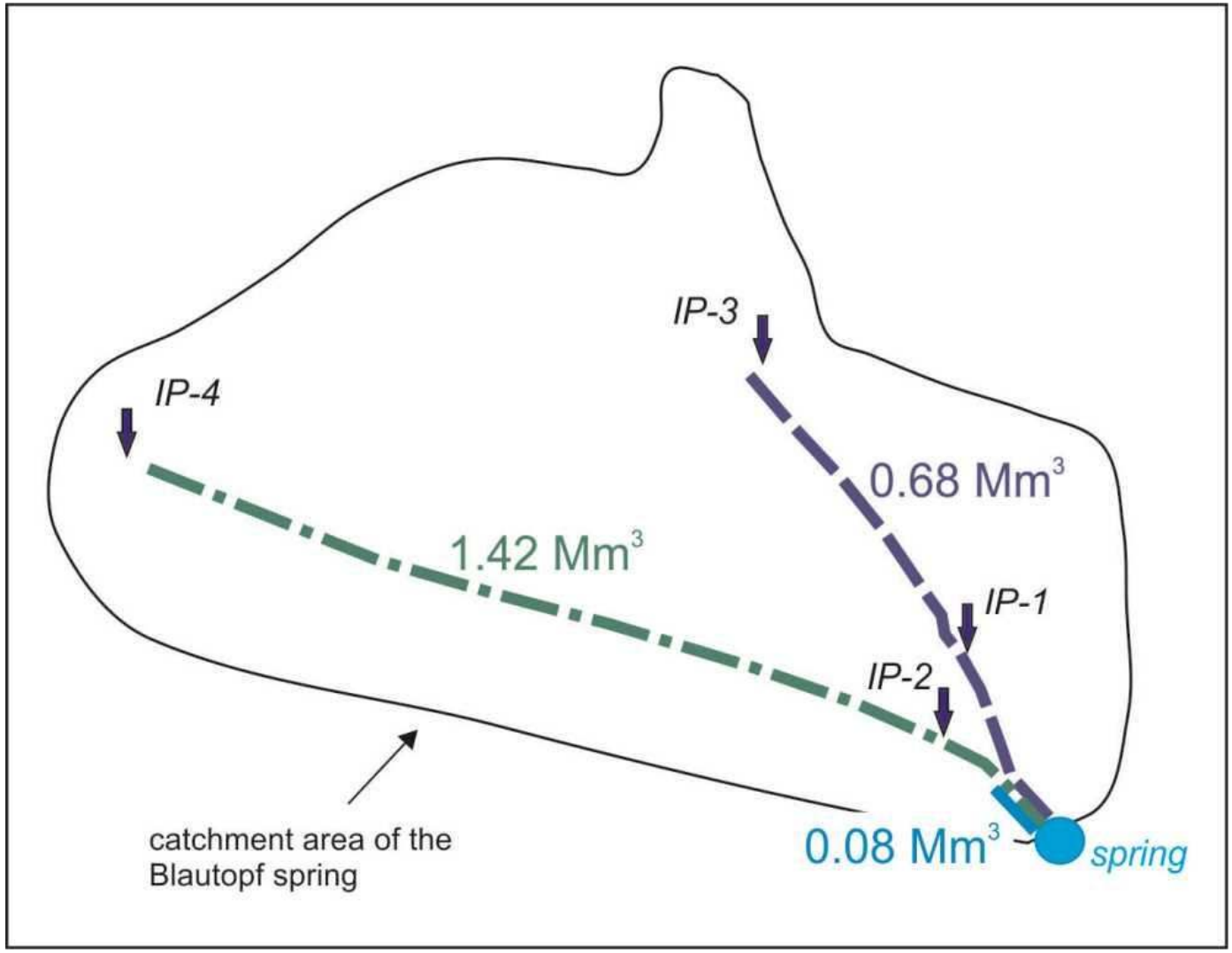
Estimated conduit water volumes from tracer test



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Lauber U, Ufrecht W, Goldscheider N (2014) Spatially resolved information on karst conduit flow from in-cave dye-tracing. Hydrology and Earth System Sciences, 18(2): 435-445.

Acknowledgements