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A new approach to the analysis of dissolved gases using passive samplers, with mass spectrometry (miniRUEDI) and gas chromatography techniques.

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The recent development of portable mass spectrometry (e.g., miniRUEDI) allowed relatively easy and cheap access to the determination of gases with unprecedented time resolution, directly in the field, from reservoirs that are constantly renewed (ex: ambient air, water bodies). However, it is not adapted to the analysis of discrete water samples. We address this issue with the presentation of passive samplers (≈ 25 cc of gas) for the sampling of dissolved gases in water and a simple and effective system built to connect the samplers to the miniRUEDI for gas analysis. The samplers are let to equilibrate under water for a few days, then retrieved and locked when the equilibration between the inside of the sampler and the water is attained, before being analysed by combining miniRUEDI and gas chromatography-electron capture detector (GC-ECD) techniques back in the lab. This new method enables quick and accurate determination of major (N_2, O_2), noble (here, He, Ar and Kr) and transient gas species for age dating (SF_6, CFC-12, CFC-113, etc.) from one single sample. This approach has the potential to be used to facilitate the use of transient anthropic gas tracers for the determination of young (< 70 years) groundwater age information. In addition, the analysis of multiple gases in a single sampler as well as the easy installation of multiple samplers in groundwater and surface waters allow for cost-effective mapping of gas tracer plumes during artificial tracer release experiments.