Supporting Information for:

Timing Matters: The Overlooked Issue of Response Time Mismatch in pH-Dependent Analyte Sensing using Multiple Sensors

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1. RESPONSE TIME OF COMMERCIAL SENSORS

Table S1. Response times of commercially available optical and electrochemical sensors for pH, NH_4^+, NH_3 and H_2S.

Analyte	Type	Response time /s	Supplier
pH	Optical	<60	Pyroscience[1]
	Optical	<120	Presens[2]
	Potentiometric	1-60	Krohne[3]
	Potentiometric	<10	Unisense[4]
	Potentiometric	<45	MetrOhm[5]
NH_4^+	ISE	<180	Hach[6]
NH_3	Severinghaus-type	<60	Fisher[7]
	Severinghaus-type	<600	MetrOhm[8]
H_2S	Amperometric	<10	Unisense[9]
	Amperometric	<25	Sulfilogger[10]

2. ADDITIONAL EXPERIMENTAL RESULTS

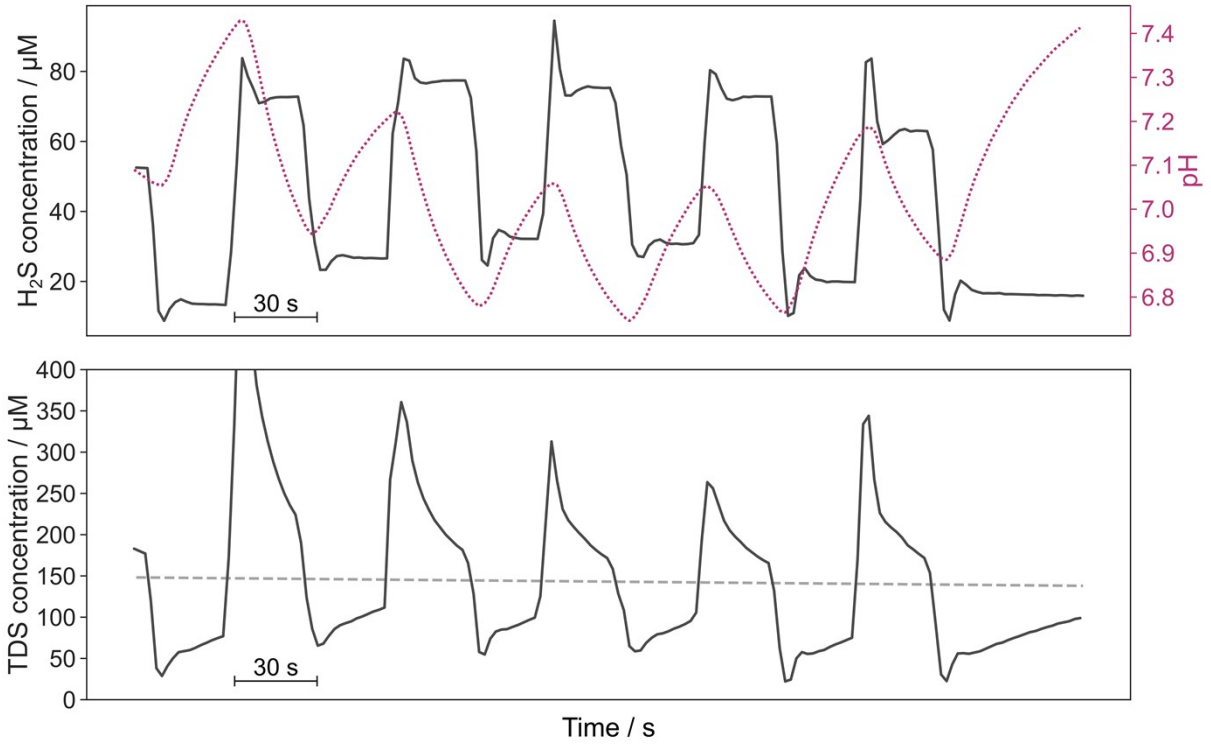

Figure S1. Calculation of TDS from measured H_2S and pH at fixed TDS concentration while varying the sample pH in the range of 6-8. H_2S was measured using a fast amperometric microsensor (t_{90} < 10 s) while pH was simultaneously measured with an optical sensor (t_{90} < 60 s). The sample pH was modified by additions of defined amounts of HCl or NaOH in time intervals of 30 s.

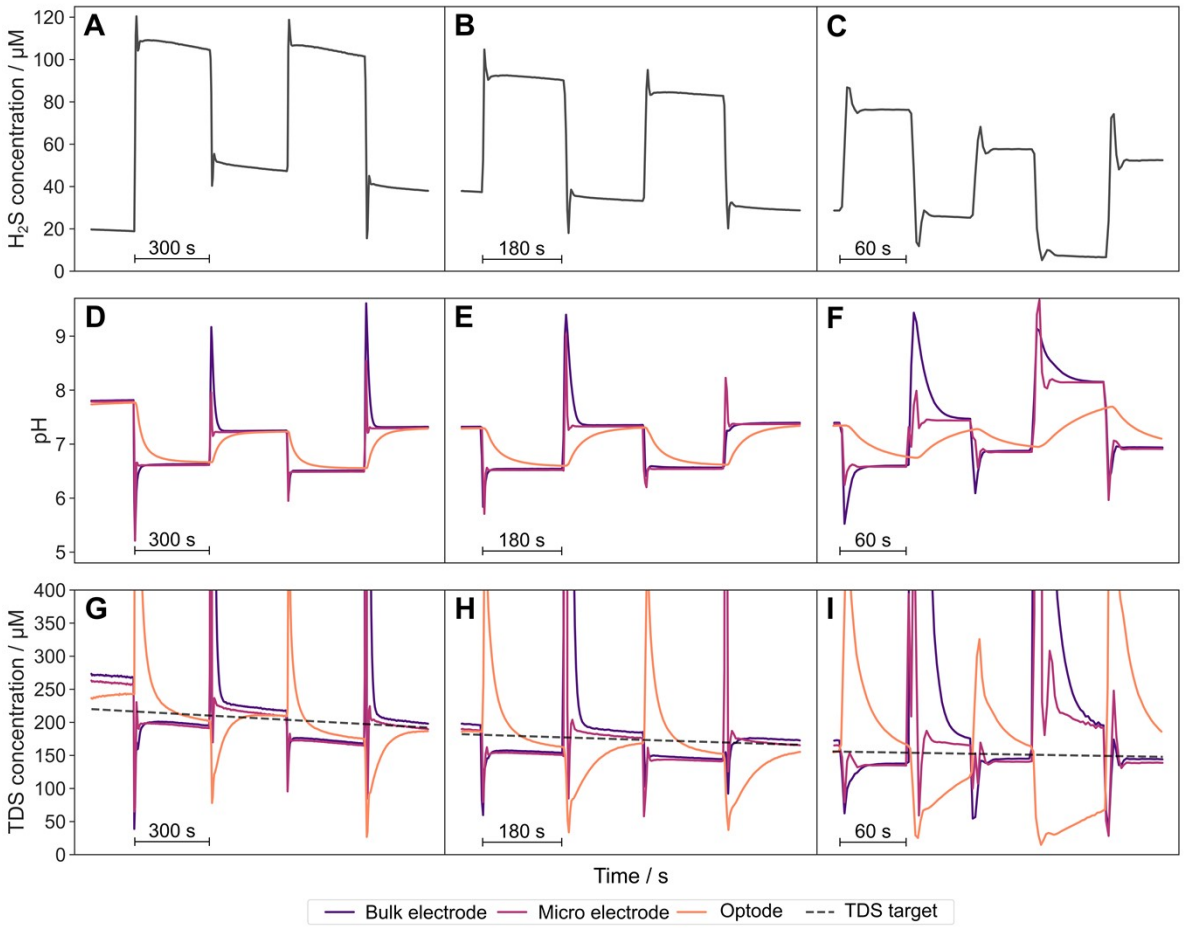

Figure S2. Calculation of TDS from measured H_2S and pH at fixed TDS concentration while varying the sample pH in the range of 6-8. H_2S was measured using a fast amperometric microsensor (t_{90} < 10 s) while pH was simultaneously measured with three different methods: bulk electrode, micro electrode and optode (response time: micro electrode < bulk electrode < optode). The sample pH was modified by additions of defined amounts of HCl or NaOH in time intervals of 5 min **(A, D, G)**, 3 min **(B, E, H)** and 1 min **(C, F, I)**.

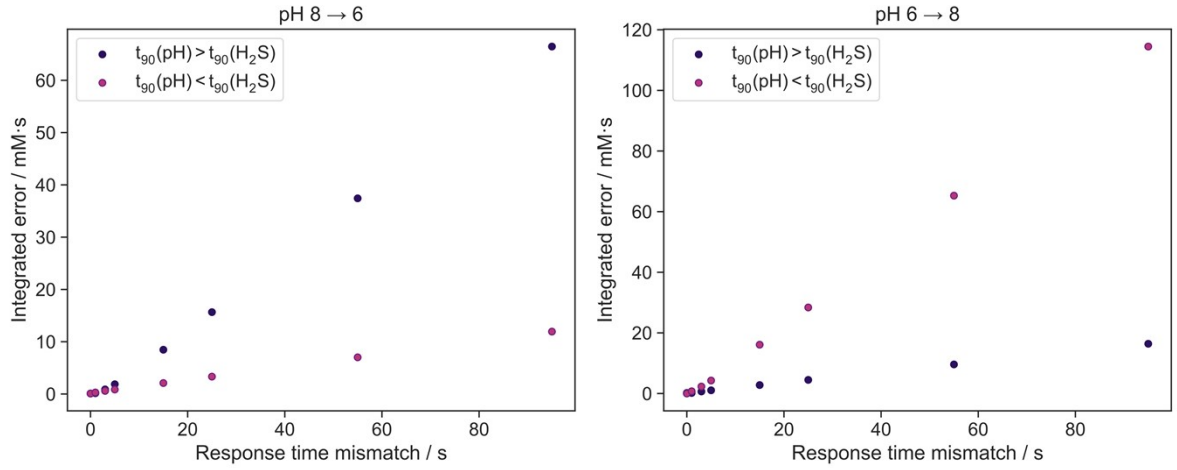

Figure S3. Integrated error at different response time mismatches, varying either the response time of the pH or H_2S sensor. Results are shown for a decrease (**left**) and an increase of 2 pH units (**right**). Target TDS concentration = 200 µM; pK_a = 7.

3. REFERENCES

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