Variable description

Unravelling the contribution of turbulence and bubbles to air-water gas exchange in running waters

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Symbols:

Sc is Schmidt number (dimensionless)

Alpha is the dimensionless Ostwald solubility coefficient (dimensionless)

Q is discharge (L s-1)

U is superficial gas velocity (m d-1)

Temp is water temperature (°C)

a is mean bubble radius (mm)

j is the gas exchange velocity of single bubbles (m d-1)

T is the bubble residence time (s)

T_* is the non-dimensional lifetime of tracer gases in bubbles (bubble residence time divided by bubble equilibration time)

k_i is the modelled interfacial gas exchange velocity (m d-1)

k_b is the modelled bubble-mediated gas exchange velocity (m d-1) according to …

   … LS70 is the model by Lamont and Scott (1970)

   … W97 is the model by Woolf (1997)

   … W93m is the mean bubble lifetime model by Woolf (1993)

   … W93w is a weighted mean bubble lifetime model based on W93m

$k_{observed}$ is the observed gas exchange velocity (m d-1), given as artithmetic mean±standard deviation (SD) accounting for variability of gas concentrations over time

k_{600} is the normalized gas exchange velocity for Sc=600 (m d-1), given as artithmetic mean±standard deviation (SD) accounting for variability of gas concentrations over time

Eps is the turbulent kinetic energy dissipation rate given as bootstrap artithmetic mean±standard deviation (SD) accounting for model uncertainty and variability among measurements within the flume (m2 s-3), given for …

> … u is longitudinal direction

> … v is lateral direction

> … w1 is vertical direction (replicate 1)

> … w2 is vertical direction (replicate 2)

$P_{rms,t}$ is root-mean-square sound pressure at 10−100 Hz (Pa)

$P_{rms,b}$ is root-mean-square sound pressure at 5−10 kHz (Pa)

Abbreviations:

NA is not available.

MIMS is continuous flow membrane-introduction mass spectrometry system described by Chatton et al. (2017)

Picarro is Cavity Ring-down Spectrometer (Picarro G2201-I, Picarro Inc, Santa Clara, CA, USA)

References:

Chatton, E, T Labasque, J de La Bernardie, N Guihéneuf, O Bour, and L Aquilina. 2017. "Field Continuous Measurement of Dissolved Gases with a CF-MIMS: Applications to the Physics and Biogeochemistry of Groundwater Flow." *Environ. Sci. Technol.* 51: 846–54. doi:10.1021/acs.est.6b03706.

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