

Correction

Correction: Wang et al. Low-Complexity Channel Estimation for Electromagnetic Wave Propagation Across the Seawater-Air Interface: A FRLS Approach. *J. Mar. Sci. Eng.* 2026, 14, 231

Honglei Wang^{1,2}, Yulong Wei^{1,2}, Jinbo Song^{1,2}, Yingda Ren^{3,*} and Lichao Ding⁴

¹ The School of Marine Science and Technology, Northwestern Polytechnical University, Xi'an 710072, China; wanghonglei@nwpu.edu.cn (H.W.); yu_long_wei@163.com (Y.W.); songjinbo33@mail.nwpu.edu.cn (J.S.)

² The Shaanxi Key Laboratory of Underwater Information Technology, Xi'an 710072, China

³ Hanjiang National Laboratory, Wuhan 430060, China

⁴ Hangzhou Applied Acoustics Research Institute, Hangzhou 310023, China; ding203323@163.com

* Correspondence: yiming@mail.nwpu.edu.cn

Text Correction

In the original publication [1], four minor typographical/notation errors were identified. The corrected parts are highlighted in red.

Corrections have been made to Sections 2.2 and 4.2–4.4.

(1) In Section 2.2 (Derivation of the Complex RLS Algorithm)

The cross-correlation coefficient prediction vector was incorrectly written as $p(n) = x(n)x^H(n)$. This should be corrected to $p(n) = x(n)d^*(n)$. A correction has been made to Section 2.2, Derivation of the Complex RLS Algorithm, Paragraph 1:

For the sake of brevity, this paper defines a unified set of notations for subsequent algorithm derivations, where L denotes the filter order and also represents the channel length in cross-medium channel estimation; n is the time index with $n = 0, 1, 2, \dots, N - 1$, where N stands for the signal length; $y(n)$ is the filter input vector with a dimension of $L \times 1$; $w(n)$ is the filter output with a dimension of $L \times 1$, which denotes both the filter weight coefficient vector and the estimated channel impulse response coefficient vector; $d(n)$ is the reference signal and is scalar; the autocorrelation coefficient prediction matrix $R(n) = x(n)x^H(n)$ and cross-correlation coefficient prediction vector $p(n) = x(n)d^*(n)$ have dimensions of $L \times L$ and $L \times 1$, respectively; $(\cdot)^H$ denotes the Hermitian transpose of a vector or matrix; and $(\cdot)^*$ denotes the conjugate. Usually, $y(n)$ is taken as $y(n) = [y(n), y(n - 1), \dots, y(n - L + 1)]$.

(2) In Section 4.2 (Transmitted Signal Design and Frame Structure)

The total number of bits for the 100×100 binary image was incorrectly written as “ 10^4 bits” and has been corrected to “ 10^4 bits”. A correction has been made to Section 4.2, Transmitted Signal Design and Frame Structure, Paragraph 1:

A binary image with a resolution of 100×100 pixels, as shown in Figure 7, was used as the transmitted information, comprising a total of **10^4 bits**. In the experiment, a 4PSK modulation scheme was employed, and these bits were mapped onto 5×10^3 complex-valued symbols. The key transmission parameters used in the system design are summarized in Table 4. According to the configuration of the transmitter's signal generator, the update rate of the transmitted waveform was set to 192 kHz, with a roll-off factor of 0.25.



Received: 10 February 2026

Accepted: 10 February 2026

Published: 16 March 2026

Copyright: © 2026 by the authors.

Licensee MDPI, Basel, Switzerland.

This article is an open access article distributed under the terms and

conditions of the [Creative Commons](#)

[Attribution \(CC BY\)](#) license.

(3) In Section 4.3 (Receiver Processing and Channel-Estimation Configuration)

The sentence “The receiver processing follows **Figure 1** . . .” should refer to **Figure 2**. A correction has been made to Section 4.3, Receiver Processing and Channel-Estimation Configuration, Paragraph 1:

The receiver processing follows **Figure 2**. The LFM preamble is first detected to locate the frame boundaries and remove blank/guard intervals. Training symbols are then extracted to estimate the discrete-time complex FIR channel. In this work, FRLS (and the baseline estimators) is applied to the training symbols for channel estimation (adaptive filtering), and the obtained channel estimate is subsequently used to build an MMSE equalizer for QPSK data recovery (equalization). The OSNR and BER-distribution metrics reported in Section 4.4 are computed after this consistent pipeline.

(4) In Section 4.4 (Results and Discussion (OSNR, Reconstruction Quality, and BER Distribution))

After the OSNR definition (Equation (57)), the text “As indicated by (52) . . .” should be corrected to “As indicated by (57) . . .”. A correction has been made to Section 4.4, Results and Discussion (OSNR, Reconstruction Quality, and BER Distribution), Paragraph 1:

In addition to characterizing algorithm performance using the bit-error rate (BER), this section introduces the output signal-to-noise ratio (OSNR, unit: dB) as a metric for assessing algorithm accuracy. The OSNR is defined as follows:

$$\text{OSNR} = 10 \log_{10} \frac{\|\mathbf{d}\|_2^2}{\|\hat{\mathbf{d}} - \mathbf{d}\|_2^2} \quad (57)$$

where \mathbf{d} is the transmitted symbol and $\hat{\mathbf{d}}$ is the output symbol of the equalizer. As indicated by (57), a larger OSNR implies the higher accuracy of the channel estimation algorithm. Figure 11 presents a comparison of the OSNRs of different algorithms in the experiment. The horizontal axis represents the length of the intercepted signal, and the vertical axis denotes the average OSNR. It can be observed that the FRLS algorithm outperforms the other algorithms in terms of accuracy, with a relatively high OSNR. The PRLS algorithm follows, exhibiting sub-optimal precision. The LMS algorithm achieves the lowest OSNR, indicating that its accuracy is relatively low under poor SNR conditions.

The authors state that the scientific conclusions are unaffected. This correction was approved by the Academic Editor. The original publication has also been updated.

Reference

1. Wang, H.; Wei, Y.; Song, J.; Ren, Y.; Ding, L. Low-Complexity Channel Estimation for Electromagnetic Wave Propagation Across the Seawater-Air Interface: A FRLS Approach. *J. Mar. Sci. Eng.* **2026**, *14*, 231. [[CrossRef](#)]

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.