



Corrigendum



Corrigendum to: Spatial Interpolation of Hydrographic Vertical References in the Gulf of Guinea: Hierarchical Ranking of Geostatistical and Deterministic Methods by LOO Cross-validation

Michel Mfeze*

National Advanced School of Engineering, University of Yaounde I, Yaounde, Cameroon

Corrigendum to: *Journal of Water Resources and Ocean Science* 2026, Vol. 15, No. 3, pp. 106-142<https://doi.org/10.11648/j.wros.20261503.15>

The authors would like to correct an error in the original publication.

1. The Error

In the released version of the LSUHydroTide software, the routine populating the interpolation-variance term returned a geometric proxy, $0.1 \times \bar{d}$, where $\bar{d}$ is the mean great-circle distance in kilometres from the target site to the retained stations. A distance in kilometres therefore entered the budget as a variance in square metres. The published values are reproduced exactly by that proxy: at Dibamba-Yassa (6 stations) $\bar{d} = 44.617$ km gives 4.4617 m² against 4.4610 published, and at Betika (12 stations) $\bar{d} = 60.825$ km gives 6.0825 m² against 6.0827 .

Two consequences follow. The published σ_i^2 depended on network geometry alone and not on the method or the observations, which is why the σ_i column of Tables 6, 10 and 14 varied by less than 5 mm across six methods of very different accuracy. And the row labelled σ_d^2 in Tables 8 and 12 in fact held the squared cross-validated error of each method, which is the quantity that should have been reported as σ_i^2 . The software has been corrected and the geometric fallback removed.

2. Corrected Model and Nomenclature

Equation (29) is retained, $\sigma_i^2 = \sigma_i^2 + \sigma_d^2 + \sigma_m^2$, with the components defined as follows.

σ_i^2 is the *empirical predictive variance* estimated by leave-one-out cross-validation, $\sigma_i^2 = (1/n_{cv}) \sum e_i^2$ over the retained neighbourhood of $k+1$ stations. It is not an interpolation or kriging variance in the sense of Chilès and Delfiner, which would follow from the kriging system and the fitted variogram and would apply only where Kriging is the retained method, the case at none of the three test sites. It also differs in general from the RMSE of the comparison tables, computed over the whole reference network.

σ_d^2 is the largest declared source uncertainty among the retained neighbours: 0.0025 m² at all three sites, whose neighbourhoods contain Admiralty Tide Tables stations only.

σ_m^2 is the dispersion of the $M = 6$ method predictions evaluated at the target site, $\sigma_m^2 = (1/(M-1)) \sum_j [\Delta_j(s_0) - \Delta(s_0)]^2$, which is why it vanishes at Batanga where all methods return the same value.

The three components are treated as approximately independent and covariance terms are neglected; since the leave-one-out residuals already embed part of the source-data and model-specification errors, the sum is mildly conservative. CI_{95} denotes a 95 % prediction interval, that is an expanded uncertainty at approximately 95 % coverage, and is named as such in place of “confidence interval”; the Student-*t* factor of footnote 5 replaces 1.960 wherever the residuals are few.

*Correspondence: Michel Mfeze (mfeze@yahoo.fr)



3. Corrected Values

Table 1. Tables 8, 12, 15 and 18 are replaced by the following budgets.

Component	Betika (IDW, k=9, v=8)	Dibamba-Yassa (Trend, k=4, v=3)	Batanga (NN, n=2, v=1)
σ_i^2 (m ²)	0.0731 (89.2 %)	0.0150 (64.4 %)	0.1024 (97.6 %)
σ^{d2} (m ²)	0.0025 (3.0 %)	0.0025 (10.7 %)	0.0025 (2.4 %)
σ_m^2 (m ²)	0.0064 (7.8 %)	0.0058 (24.9 %)	0.0000 (0 %)
σ_i (m)	±0.286	±0.153	±0.326
CI ₉₅ , k = 1.960 (m)	±0.561	±0.299	±0.635
CI ₉₅ , Student- <i>t</i> (m)	±0.660	±0.486	±4.115

For the dedicated 4-station validation at Dibamba-Yassa, $\sigma_i^2 = 0.0230$ m², $\sigma_i = \pm 0.184$ m and CI₉₅ = ± 0.360 m (± 0.584 m under the Student-*t* convention). At Batanga the Student-*t* interval is the honest figure: the estimate remains unusable because two stations provide no degrees of freedom, not because the interpolation variance is of the order of 5 m². Section 3.3.4 now adds that the leave-one-out residual sample is insufficient for a defensible estimation of predictive uncertainty and that the Batanga value is indicative only.

σ_i column of Tables 6, 10 and 14. Betika: ± 0.270 (IDW), ± 0.296 (Kriging), ± 0.275 (TIN), ± 0.459 (Trend Surface), ± 0.391 (NN), ± 0.419 (Spline). Dibamba-Yassa: ± 0.153 (Trend Surface), ± 0.170 (Kriging), ± 0.322 (NN), ± 0.182 (TIN), ± 0.197 (Spline), ± 0.200 (IDW). Batanga: ± 0.326 for all methods.

Composite scores and performance labels. Under the erroneous σ_i the uncertainty term of Equation (28) saturated identically for every method and contributed no discrimination. With the corrected term the scores become 0.586, 0.580, 0.492, 0.403, 0.287 and 0.284 at Betika and 0.750, 0.692, 0.679, 0.645, 0.587 and 0.576 at Dibamba-Yassa, in the published order: the ranking is unchanged at both sites. The labels change: Nearest Neighbour and Spline are Unusable rather than Limited at Betika; at Dibamba-Yassa only Trend Surface remains Acceptable, and the reliability of the site in Tables 16 and 19 reads Acceptable rather than Good.

Tables 16, 19 and 20. σ_i / CI₉₅ read ± 0.184 / ± 0.360 at Dibamba-Yassa, ± 0.286 / ± 0.561 at Betika and ± 0.326 / ± 0.635 at Batanga. The conservative vertical margin for Betika becomes $\approx \pm 0.56$ m in place of $\approx \pm 4.9$ m, and the operational CI₉₅ of Table 20 reads ± 0.56 m for the ≥ 5 -7 station class and ± 0.36 m for the 2-6 station class.

Text and figures. In the Abstract, Sections 3.1.4, 3.1.5, 3.2.4, 3.2.5, 3.3.3, 3.4, 3.5 and the Conclusion, every statement that σ_i^2 exceeds 95 % of the budget at all sites and every interval

of ± 3.6 m to ± 4.9 m is replaced by the values above: the share of σ_i^2 rises with network sparsity from 64 % at Dibamba-Yassa to 89 % at Betika and 98 % at Batanga, and the model-specification term, at 8 % to 25 % at the two usable sites, is no longer negligible. In Section 3.5 the corrected intervals are of the same order as the IHO S-44 Order 1a total vertical uncertainty allowance in shallow water, so the interpolated offset consumes a large fraction of the vertical error budget rather than exceeding it by an order of magnitude. Figures 13, 27 and 37 are replaced by charts of the corrected budgets.

4. Items Not Affected

The 115-port database (Table 1), the site characterisations (Tables 2, 5, 9, 13), all cross-validation metrics (MAE, RMSE, R², bias), all optimal neighbour counts, the correlation matrices (Tables 7, 11), the convergence analyses and the 5-7 station requirement, and the three MSL-LAT offsets of 1.147 m at Betika, 1.571 m at Dibamba-Yassa and 1.00 m at Batanga.

The principal finding of the paper, that interpolation quality is governed primarily by the density and geometric configuration of the tide-gauge network and that densification is the primary operational lever ahead of algorithm selection, is unaffected and is better supported by the corrected budget, in which the share of σ_i^2 rises monotonically as station density falls.

5. Statement

The author regrets the error. Users who applied the published confidence intervals to survey planning are advised that those intervals were substantially over-conservative and that the values of Section 3 should be used.

The original article has been corrected.