

Arbitrary alterations

With great interest, I read the September 1996 "Innovation" column entitled "International Terrestrial Reference Frame," written by Claude Boucher and Zuheir Altamimi.

Although the column is timely and articulate, I disagree with the authors' selection of sign convention to designate the three rotations of the so-called Euclidean similarity seven-parameter transformation. The confusion that could be generated by readers of the magazine if the values presented in Table 1 are indiscriminately implemented is worrisome. In my opinion, the authors should have explicitly stated that the parameters R1, R2, and R3 are consistent with positive "clockwise" rotations and are, thus, contrary to traditional norm. The symbols in their equation [1] reflect this fact, although practitioners not well versed in this type of formalism could introduce undetected biases if the tabulated values are applied directly into their software as displayed.

Additionally, and this is more important, why use a rotation sense that contradicts the

historical record on the subject? Even recent contributions to the "Innovation" column (see Alfred Kleusberg's "Mathematics of Attitude Determination with GPS" in the September 1995 issue) implicitly assumed "counterclockwise" rotations as positive. Boucher and Altamimi are ignoring customary standards, including those previously proposed by the International Earth Rotation Service (IERS) itself, such as in the *IERS Technical Note 13*, edited by D.D. McCarthy in 1992.

While working at the Paris Observatory in 1971, Kurt Lambeck was the first to apply observed satellite data to the transformation of terrestrial frames using matrix equations similar to the one described in the September 1996 "Innovation" column. (Lambeck published an article about his work entitled "The Relation of Some Geodetic Datums to a Global Geocentric Reference System," in *Bulletin G od sique*, 99, pp. 37-53.) Since that time, the rotation sign convention has never been questioned. Research done by geoscientists at the most prestigious agencies and academic institutions have retained the old nomenclature. I invite Boucher and

Altamimi to cite any refereed geodetic reference (except their own) where published transformation parameters are given according to their alternative sign rule.

Changing signs arbitrarily is risky; the practice is prone to create unanticipated errors and ambiguities when the basis for the sign modification is not properly explained. Boucher and Altamimi have failed to show that the sign switch they pursue has any advantages to offset the confusion it fosters.

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The author responds: I want to thank Tom s Soler for his vivid comments on this issue, which we had discussed several years ago. Because he has taken the opportunity to publish his comments in GPS World, I feel compelled to do the same.

I think it is worth noting that Mr. Soler's letter is the only such comment I have received regarding this issue during almost 10 years of International Earth Rotation Service (IERS) activities.

From an academic viewpoint, his comments are not completely accurate. I agree that the majority vote may not always be the best choice, especially if people are duplicating each other's formulas without trying to reestablish them. But, our choice of sign convention for the rotation angles can be justified by their mathematical interpretation. I could provide the relevant references, but this discussion would become very academic and would best be continued outside the columns of this journal.

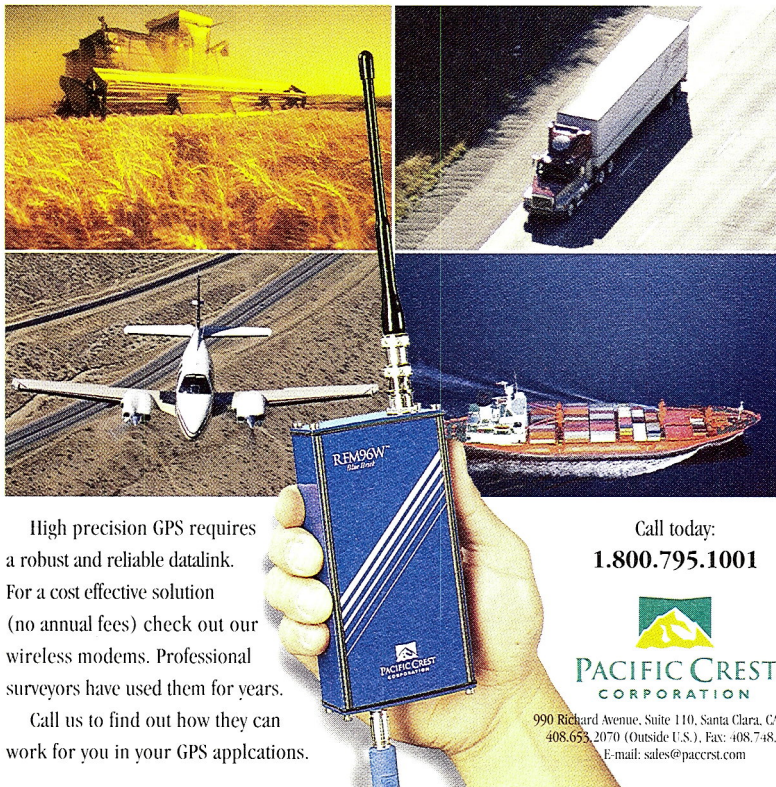
A much stronger criticism is that the formula given for IERS products — although explicitly provided in IERS publications including IERS conventions — can be troublesome if users blindly apply the numbers and put them into their favorite software.

I agree that, as a service, IERS should follow any internationally recognized recommendation. Therefore, I suggest that the International Association of Geodesy's Commission on Global and Regional Geodetic Networks investigate this issue and establish an agreed-on recommendation. The Working Group 1 of this commission is already involved in standardization activities, particularly regarding ISO. Once such recommendations are made, I am certain IERS will gladly follow them.

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