

Comments on Analysis and Presentation of the Gothenburg Workshop'10 Results

The assessment of the quantitative agreement of such a vast number of model tests and computations is a challenging task. Quantification of the accuracy of CFD results is even more difficult, and one has to select criteria that make the comparison insightful.

It appears us, that the way in which the results are compared in the paper "Analysis of G2010 results for test cases 1.4a,b,c, 2.4, 3.5 and 3.6" by Fred Stern, Shanti Bhushan, Hamid Sadat-Hosseini and Maysam Mousaviraad can and should be improved.

First, the term "error" used for the difference between computations and measurements is misleading unless model test results are accurate. Examples of model test data on pages 15 and 16 show that this is not always so.

Second, we do not see use in averaging differences between computations and measurements over different test cases: summing and averaging relative differences related to such dissimilar quantities as motion phases and motion amplitudes produces a highly disturbed picture. It seems us more useful to show the differences between measurements and computations separately between different quantities.

Further, using relative deviations between measurements and computations is misleading in cases where measured and computed quantities are small. For example, differences between measurements and computations for the average sinkage for 1.4b, Case 1, shown on page 13, range from 60% to 1400%. One should however keep in mind that in this case the wave amplitude was 6.1 mm and the measured average sinkage was only -0.13 mm. This value appears to be beyond the measurement accuracy; even if it were not so, using this figure for the calculation of relative error completely deteriorates comparison and leads to a large overall error of 43.88% averaged over all quantities and all CFD codes in all test runs.

Another example of the vulnerability of the used analysis technique is found on page 14. The average sinkage computed with Comet by Germanischer Lloyd and University Duisburg-Essen for Case 3 is said to have a relative error of 810%. We assume that there is an erroneous number in the CFD result excel sheet. Check of the time series data, ftp://gothenburg2010.ihr.uiowa.edu/KVLCC2/Case1-4c/GL&UDE/GL&UDE_Comet_heave_T-his_C3_1.4c.jpg shows that there is almost no difference between measurements and computations. The average sinkage estimated from CFD time series was $-0.31878 \cdot 10^{-2}$ m. However, this single difference affects the whole analysis: using a correct relative error of 14% for this case leads to the reduction of the overall relative error from 36.88% to approximately 20%.

Finally, time series data of measured and computed resistance coefficients on page 33 indicates large differences. However, relative errors listed on page 25 contain a relative error of only 85% for the 1st order amplitude, which seems to be significantly less than what is seen in the figure. Note that the time series computed with other codes show similar significant deviations from experiments, see for reference <ftp://gothenburg2010.ihr.uiowa.edu/Preliminary%20Preprints%2020101104/KCS.zip>. It seems us that the observed large discrepancy between the experimental and numerical results (of five different codes) should be analysed before drawing conclusions on the quality of CFD results.