Visual Tsunami:
A versatile, user-friendly radiation hydrodynamics design code

C.S. Debonnel[1, 2, *], T. Wang[1, 2], E. Garcia[1], M. Suzuki[1], and P.F. Peterson[1]

[1]*University of California, Berkeley, CA, debonnel@nuc.berkeley.edu*
[2]*Lawrence Berkeley National Laboratory, Berkeley, CA*

Gas dynamics phenomena in thick-liquid protected inertial fusion target chambers have been explored since the early 1990's with the help of a series of simulation codes known as TSUNAMI. The code has recently been entirely rewritten to make use of modern programming techniques and languages, refine its ability to model thick-liquid protected chambers, expand its capability to a larger variety of systems, and improve its user-friendliness.

The hydrodynamics core model---Euler equations for compressible flows---is retained from previous versions of TSUNAMI. The numerical scheme is upgraded to a faster and more robust scheme. Efficient models for open, reflective and condensing/evaporating boundaries are developed and implemented. For the first time, a two-temperature radiation diffusion model is incorporated into a two-dimensional version of TSUNAMI. Initial condition models are revisited and, in particular, the traditional instantaneous cohesive energy ablation model is upgraded [1]. Each model is benchmarked individually, while the overall set of assumptions is validated with the help of an original gas dynamics experiment discussed in a companion paper [2].

Emphasis has been put on the user-friendliness of the code. The input file builder is now graphics-based, with a highly versatile mesh generator. The geometry, the initial and boundary conditions can be specified through any standard CAD software package. The output processor is an order of magnitude faster than its predecessor. A graphical user interface makes processing output data intuitive and straightforward. The new code is called “Visual Tsunami” to emphasize the programming language of its core, Fortran 95, as well as its graphics-based input file builder and output processor. It is aimed at providing a user-friendly design tool for systems for which transient gas dynamics phenomena play a key role.

[1] C.S. Debonnel et al., “Revisited ablation modeling for IFE chamber design,” these proceedings
[2] C.S. Debonnel et al., “Validation of the Tsunami code through the Condensation Debris Experiment,” these proceedings.