

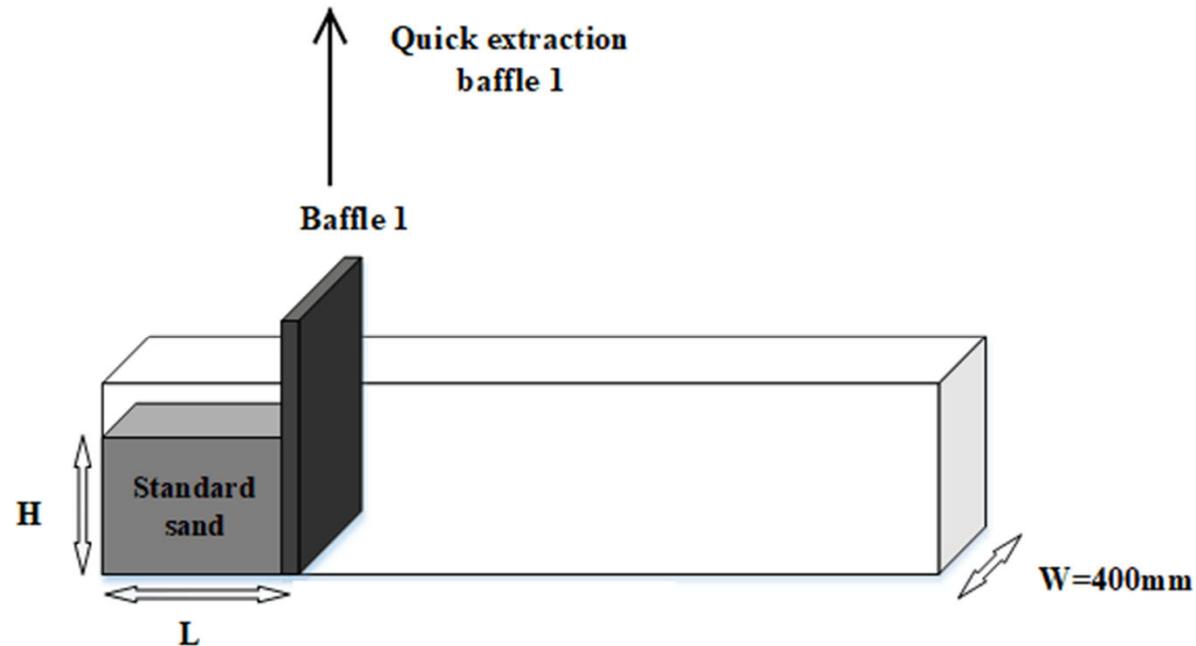
International Numerical Modeling Contest of Rock Mechanics and Engineering (INCR)-2021-Problem B

1. Test purpose and schematic diagram

Test purpose: The geometric characteristics of stable accumulation caused by rapid release of particle column are studied. By designing cubic standard sand stacks with different horizontal and vertical ratios, the height and moving distance of standard sand stacks are studied after fast extraction of baffle 1 (test 1). The above experimental results are used to calibrate the microscopic parameters of particles. On this basis, the stacking height of standard sand after encountering baffle 2 during the movement will be predicted and compared with experimental results during review process (test 2).

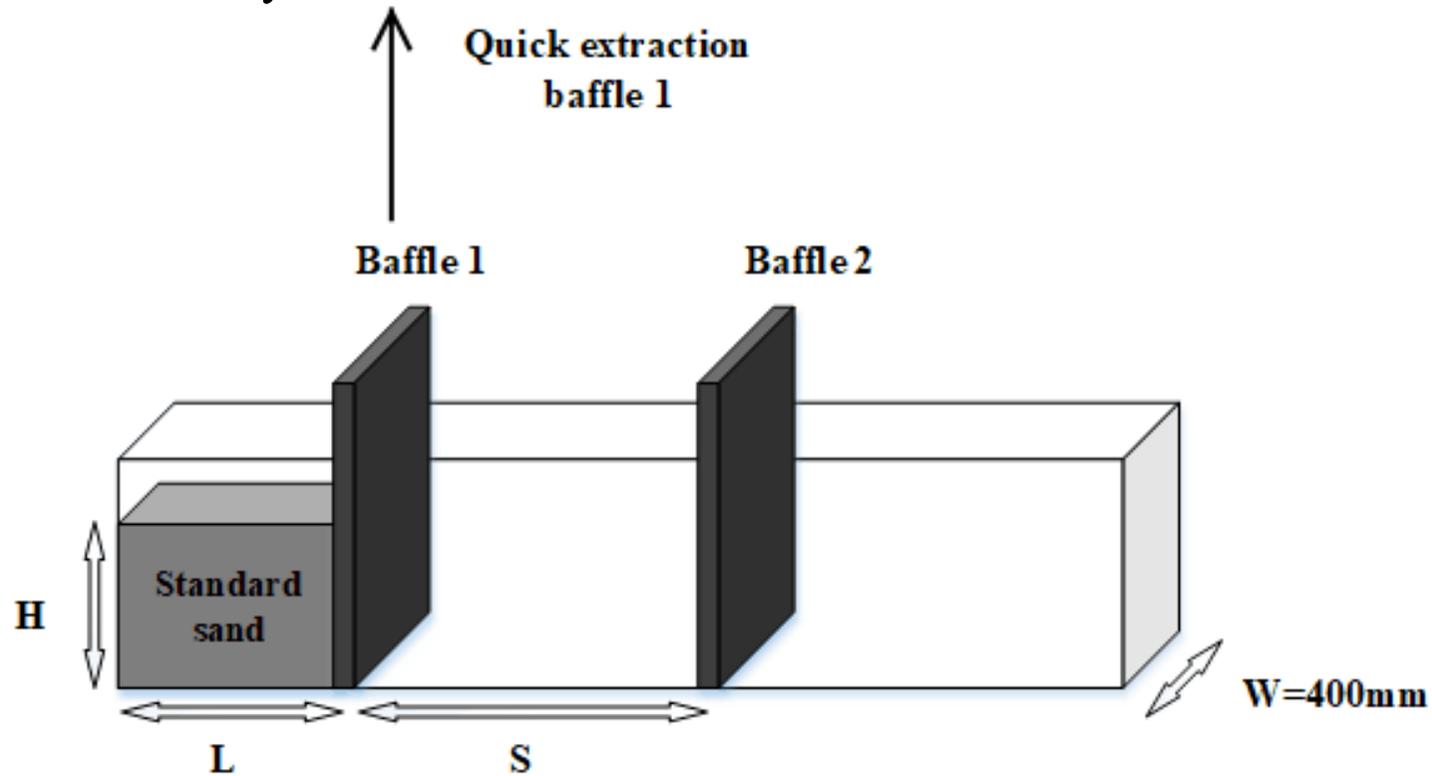
The Schematic diagram of test 1

The Schematic diagram for test 1 is shown below. After the designed sand is stacked into the mold, the baffle 1 is quickly pulled away and the deposition length, deposition height and inclinations of the sand pile are recorded. The purpose of test 1 is to calibrate the microscopic parameters in the simulation.



The Schematic diagram of test 2

The Schematic diagram for test 2 is shown below. After the designed sand is stacked into the mold, the baffle 1 is quickly pulled away, and then record the height and bottom angle of the sand pile at baffle 2. The purpose of test 2 is to verify the correctness of the numerical results.



2. The test results

The results of **test 1** are shown in the following table.

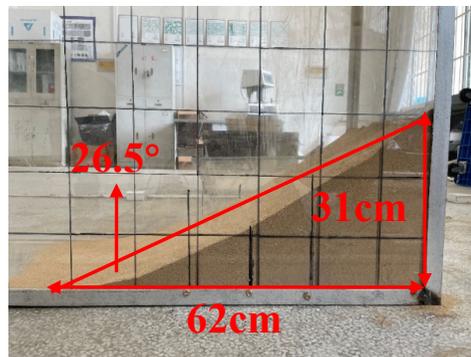
Test number	The initial height (H)	The initial length (L)	a=H/L	Final deposit height (Hi)	Final deposit length (Li)	Inclinations/°
1	20cm	20cm	1	20cm	42cm	29.5
2	40cm	20cm	2	31cm	62cm	26.5
3	60cm	20cm	3	38cm	92cm	22
4	20cm	40cm	0.5	20cm	65cm	27

2. The test results

The results for test number 1 and test number 2 are shown below



The results of test number 1



The results of test number 2

2. The test results

The results for test number 3 and test number 4 are shown below



The results of test number 3

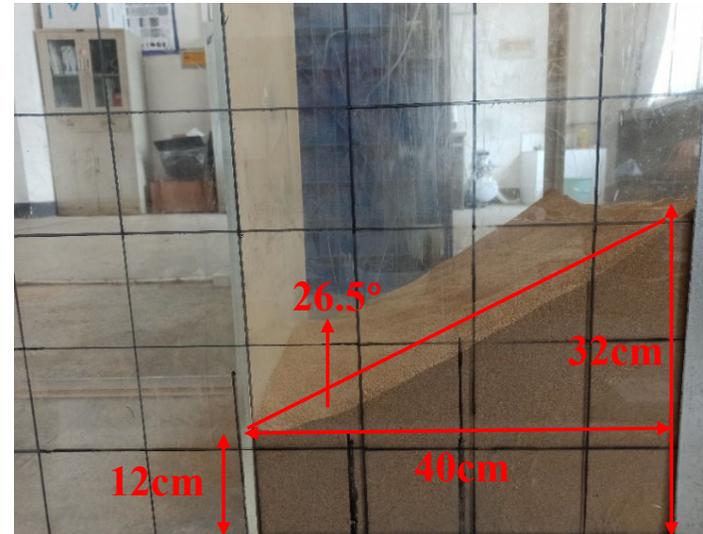


The results of test number 4

2. The test results

The results of **test 2** are shown in the following table and figure.

Test number	The initial height (H)	The initial length (L)	Distance between baffle 2 and baffle 1(S)	Height of sand at baffle 2	Inclinations/°
5	40cm	20cm	20cm	12cm	26.5



The results of test number 5

3. Number of participants and units

There are 8 teams participating in this International Numerical Modeling Contest of Rock Mechanics and Engineering. The following units participate in the numerical modeling contest: **China university of Geosciences (Wuhan), Sun Yat-Sen University, Nanjing University, Hebei University of Technology, Tianjin University and Xi an University of Science and Technology.**

Participating units

China university of Geosciences (Wuhan),

Sun Yat-Sen University

Nanjing University

Hebei University of Technology

Tianjin University

Xi an University of Science and Technology

4. Scoring Rules

The calibration results and the prediction results have equal weighting to constitute the total score, and the specific scoring formula is as follows:

$$S_{Total} = (S_{C1} + S_{C2} + S_{C3} + S_{C4}) * w_C + S_P * w_P$$

where S_{C_i} ($i = 1, 2, 3, 4$) is the scores of calibration results, S_P is the scores of prediction results.

w_C and w_P are the weight values.

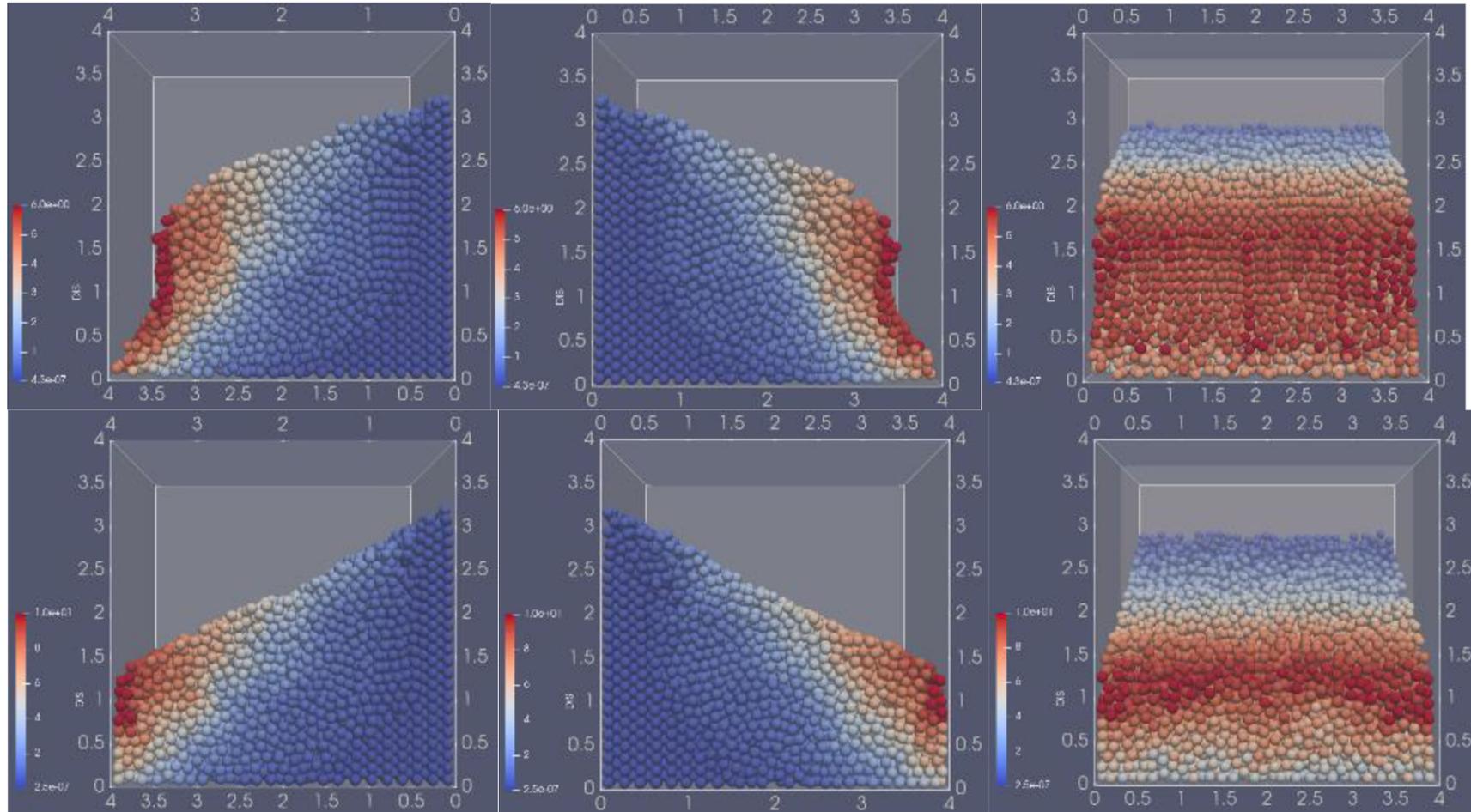
The S_{C_i} and S_P is determined from

$$\text{Score}_i = \left(1 - \frac{(\text{Result}_N - \text{Result}_E)}{\text{Result}_E} \right) * 100\%$$

where Result_N and Result_E are the corresponding results of experiments and simulations.

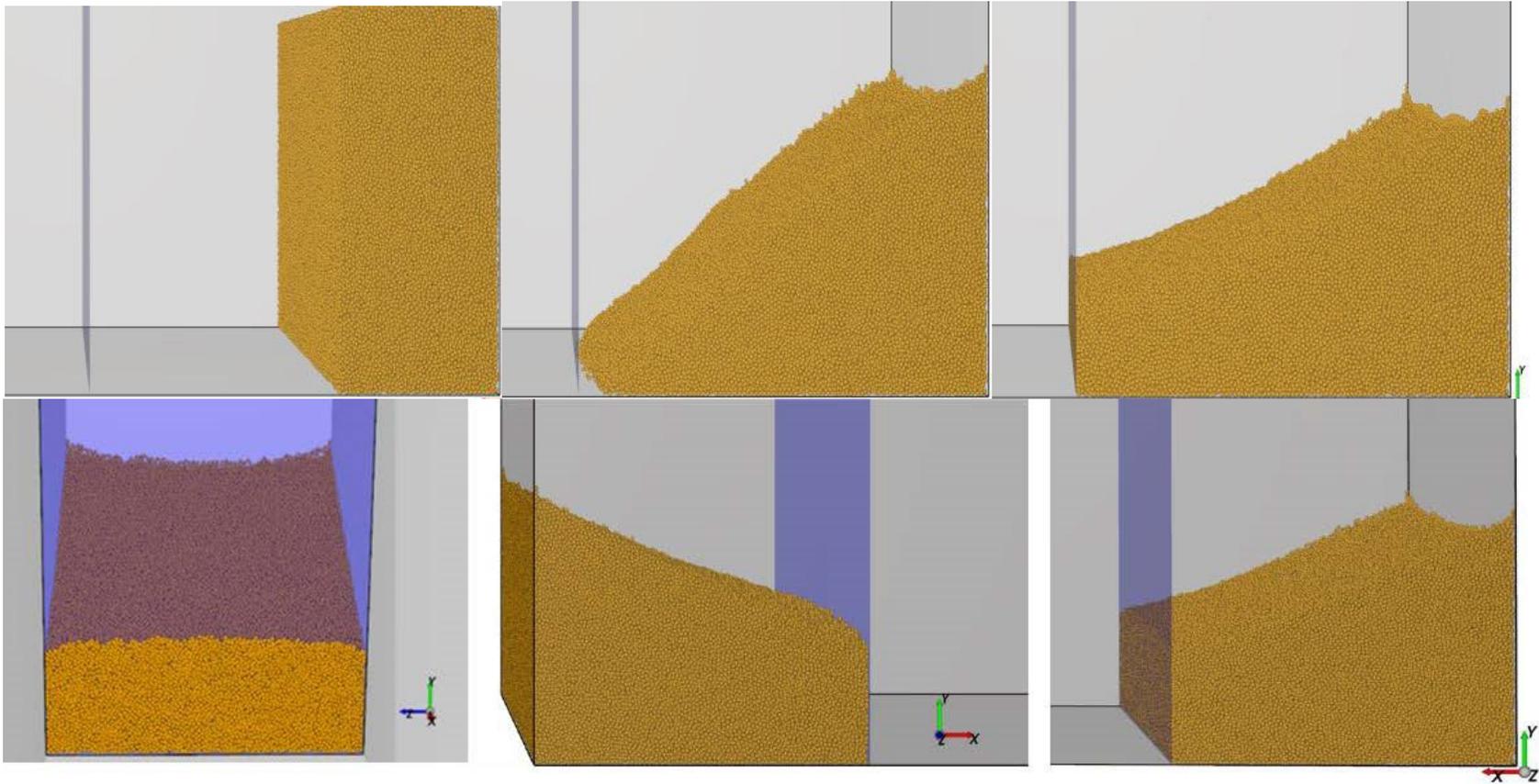
5. Final Results of Modeling Contest

Team **TB00**'s final score is **95.70**.



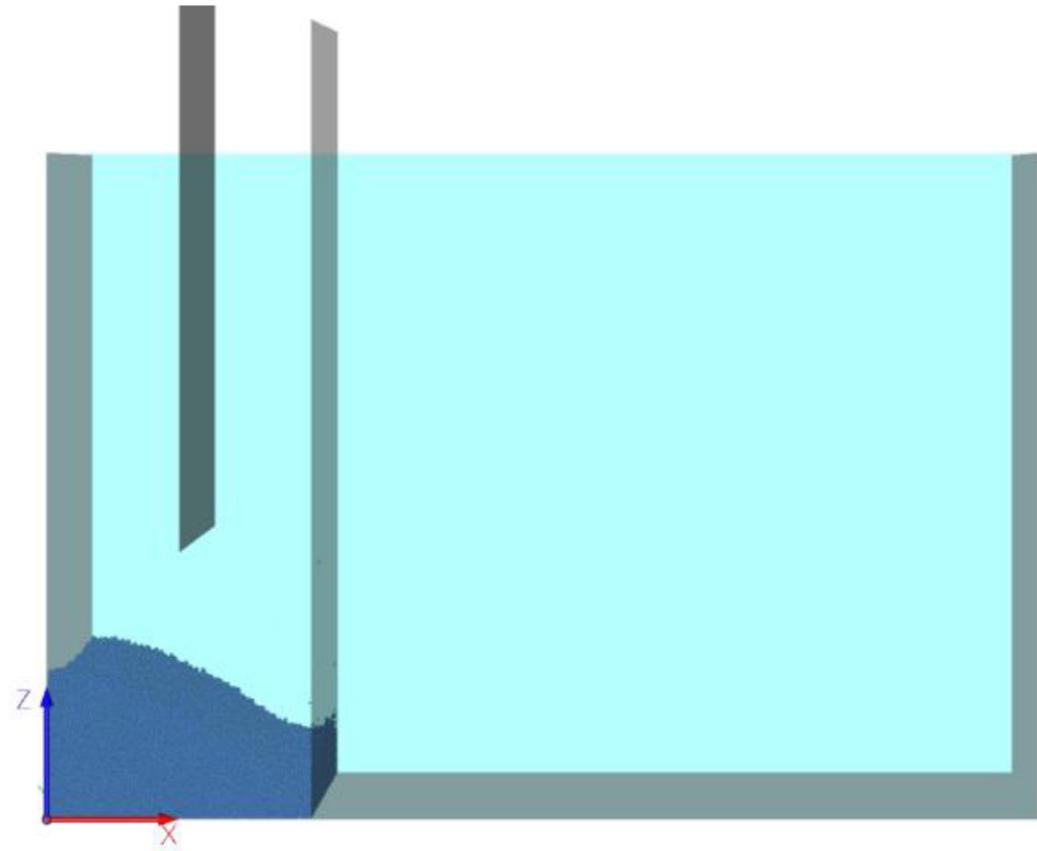
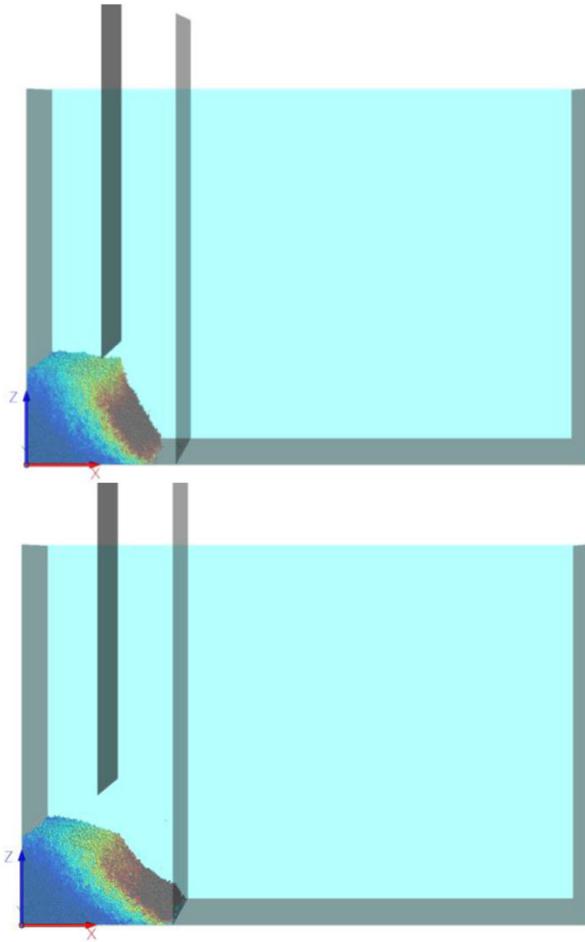
5. Final Results of Modeling Contest

Team **TB01**'s final score is **86.43**.



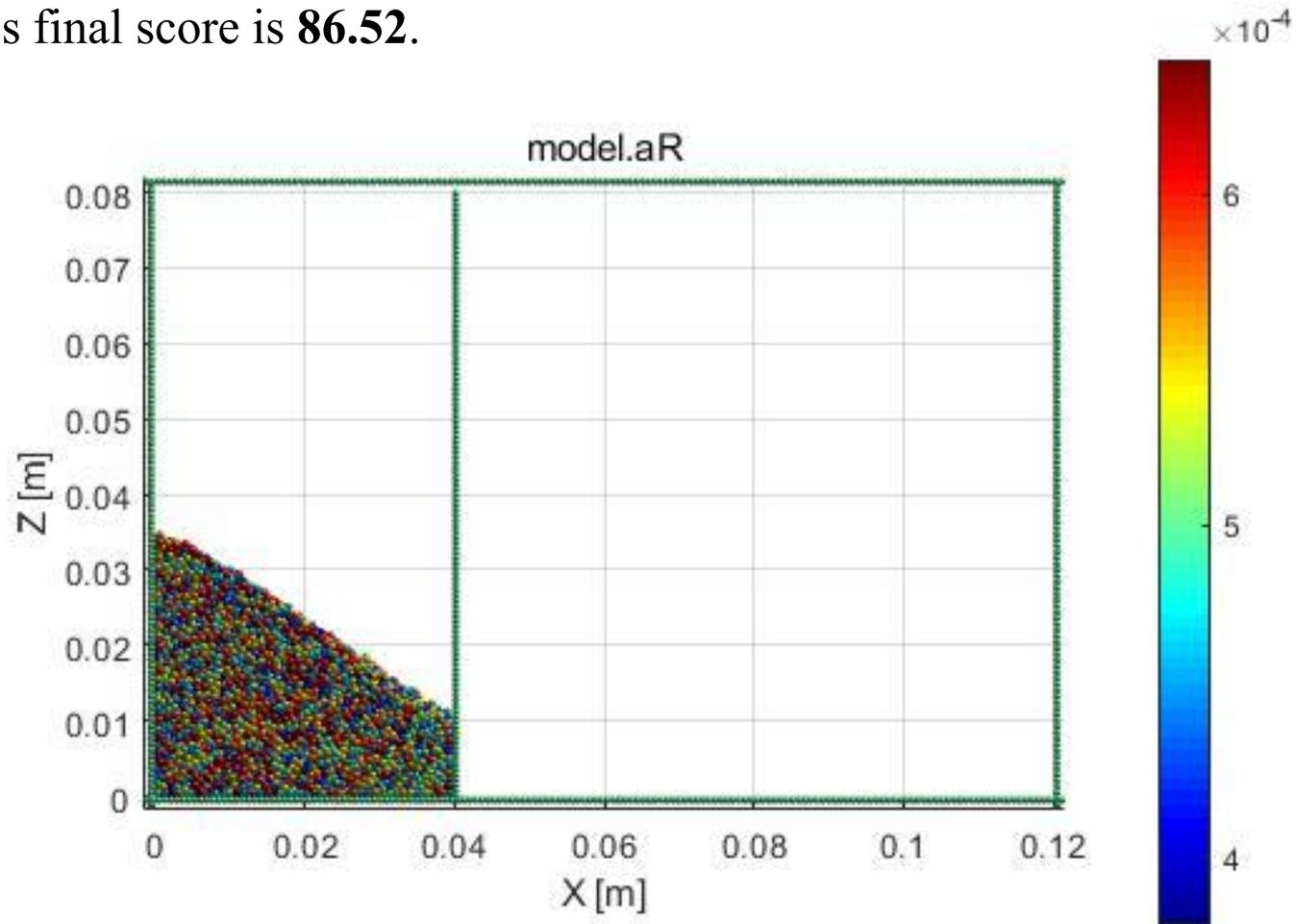
5. Final Results of Modeling Contest

Team **TB02**'s final score is **71.29**.



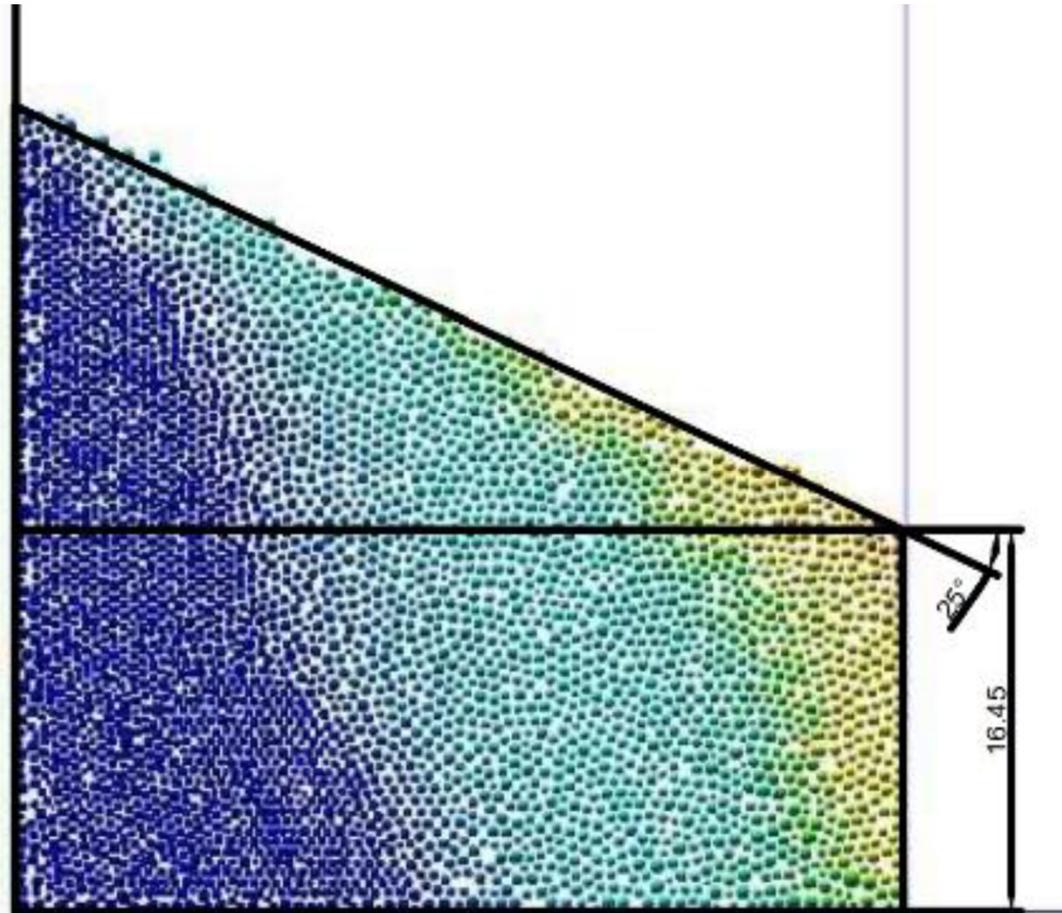
5. Final Results of Modeling Contest

Team **TB03**'s final score is **86.52**.



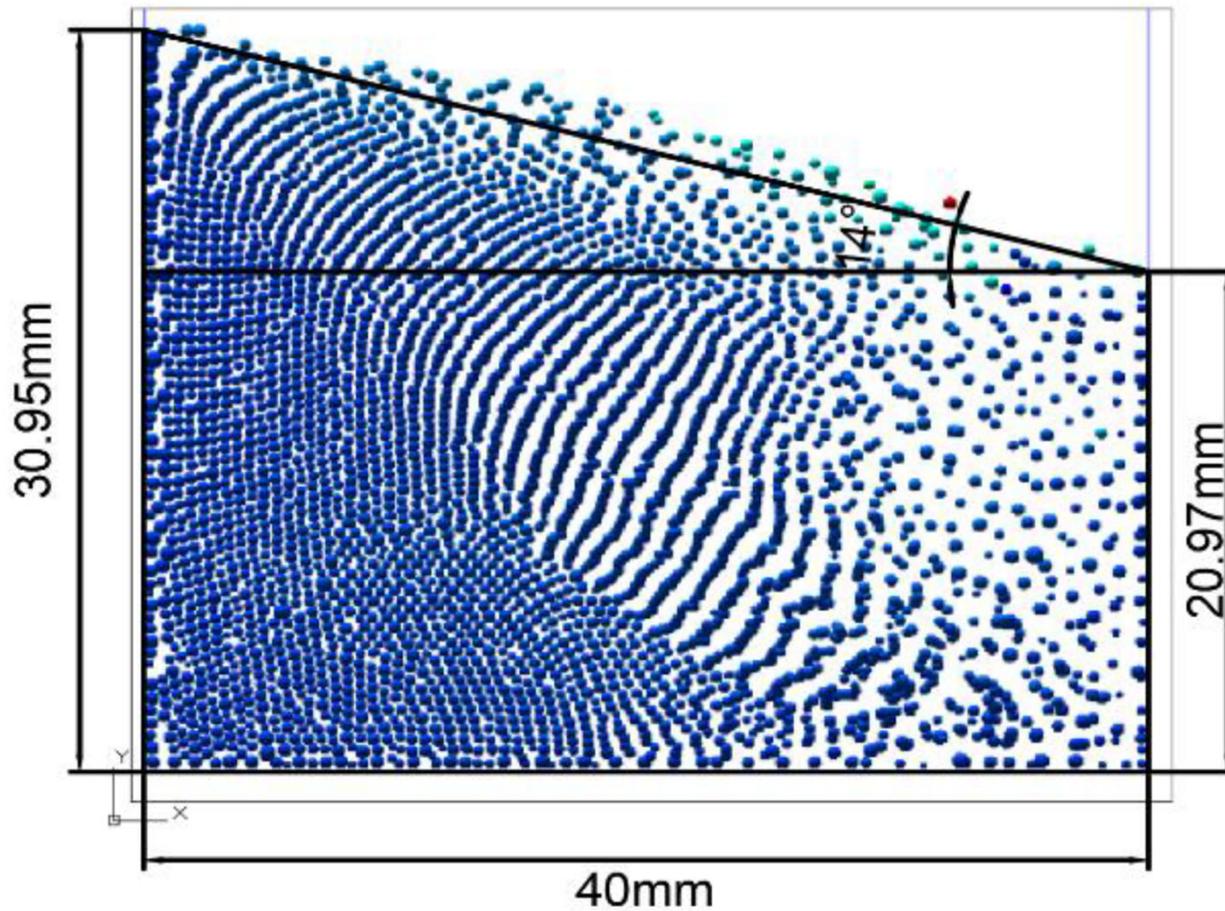
5. Final Results of Modeling Contest

Team **TB04-1**'s final score is **60.79**.



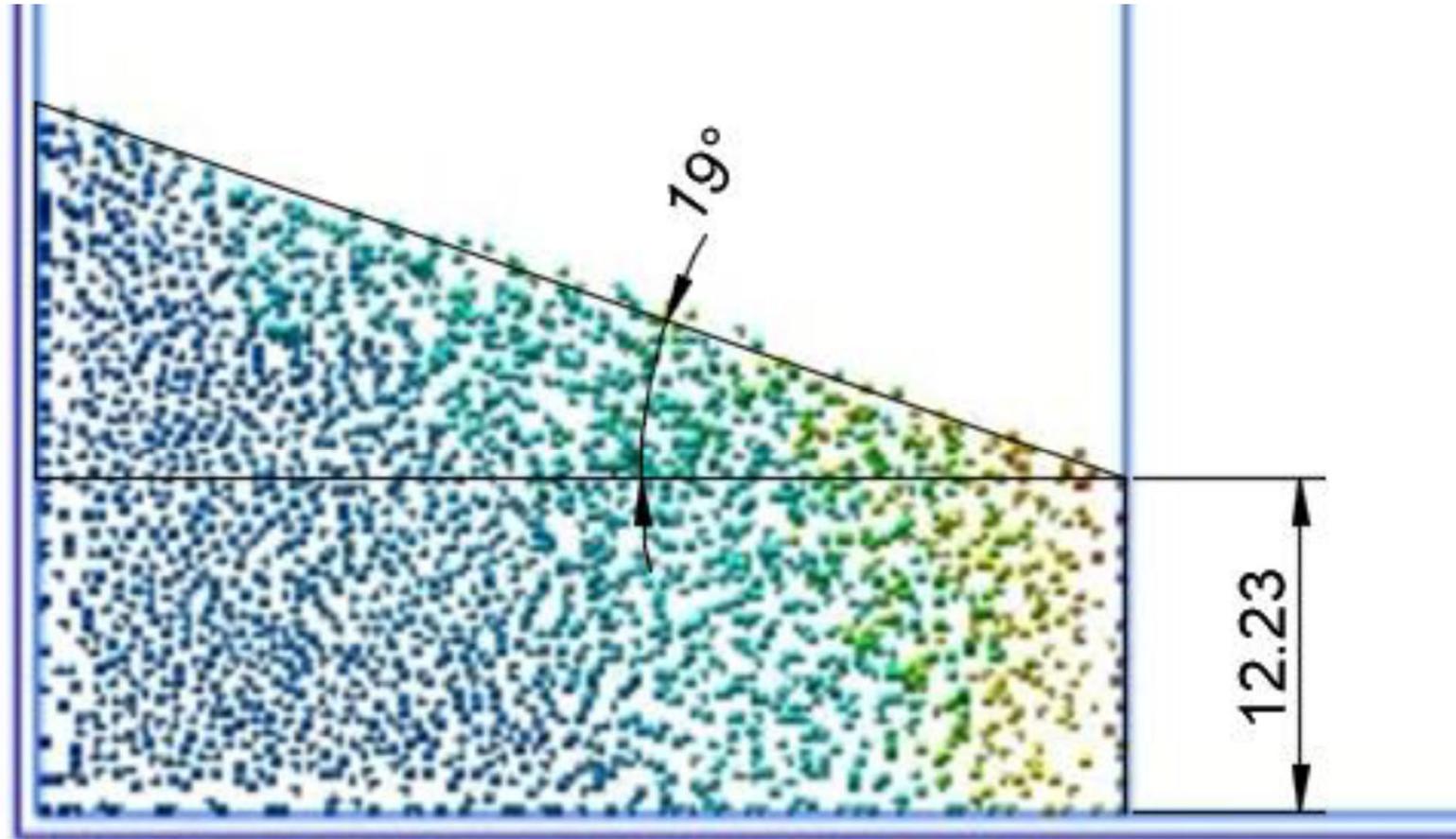
5. Final Results of Modeling Contest

Team **TB04-2**'s final score is **43.06**.



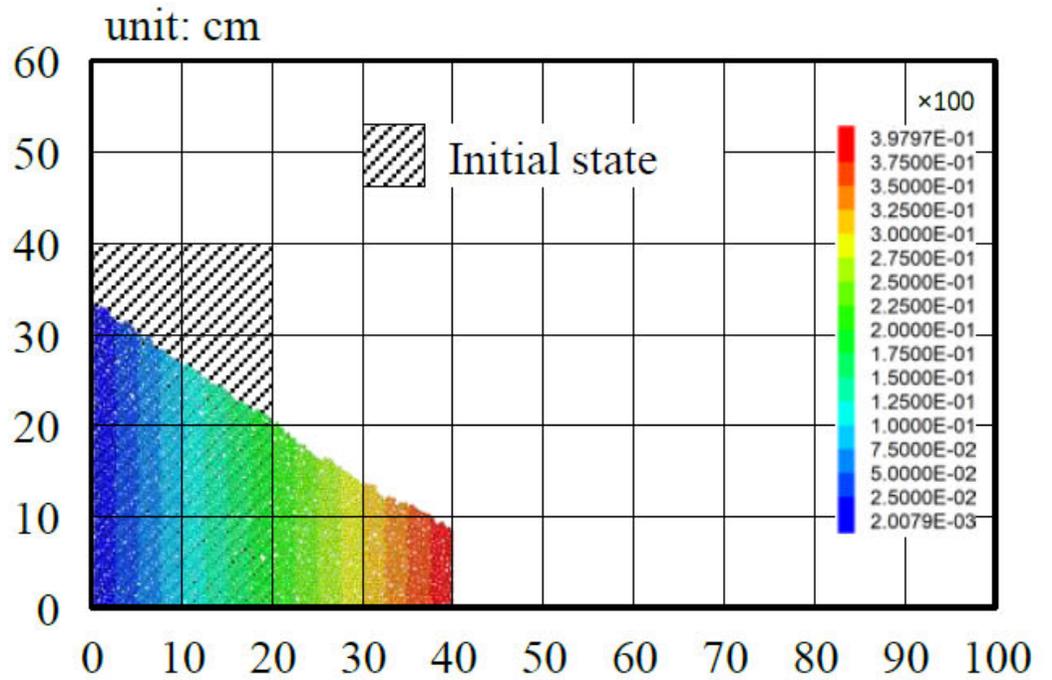
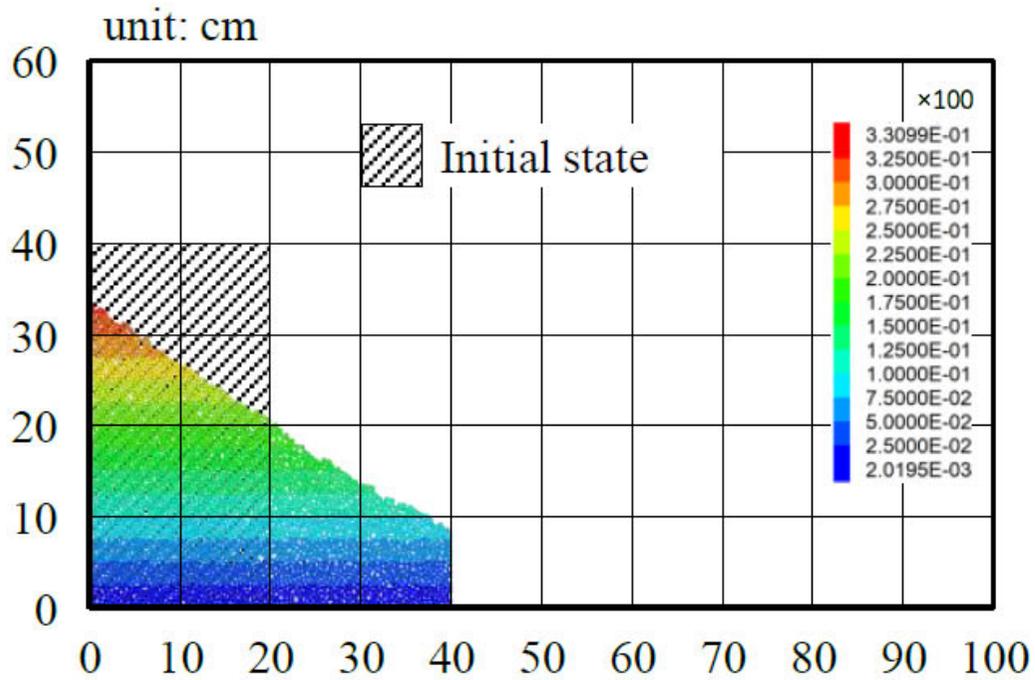
5. Final Results of Modeling Contest

Team TB04-3's final score is **62.45**.



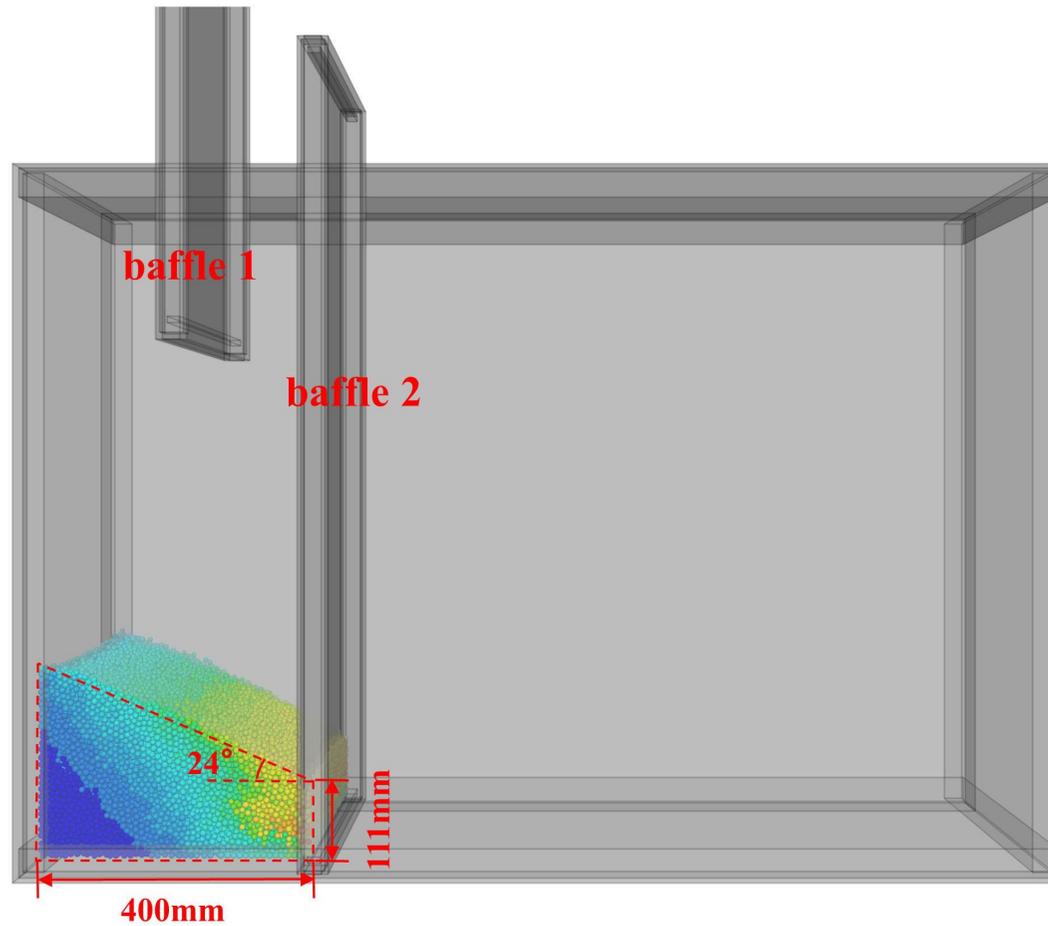
5. Final Results of Modeling Contest

Team **TB05**'s final score is **85.84**.



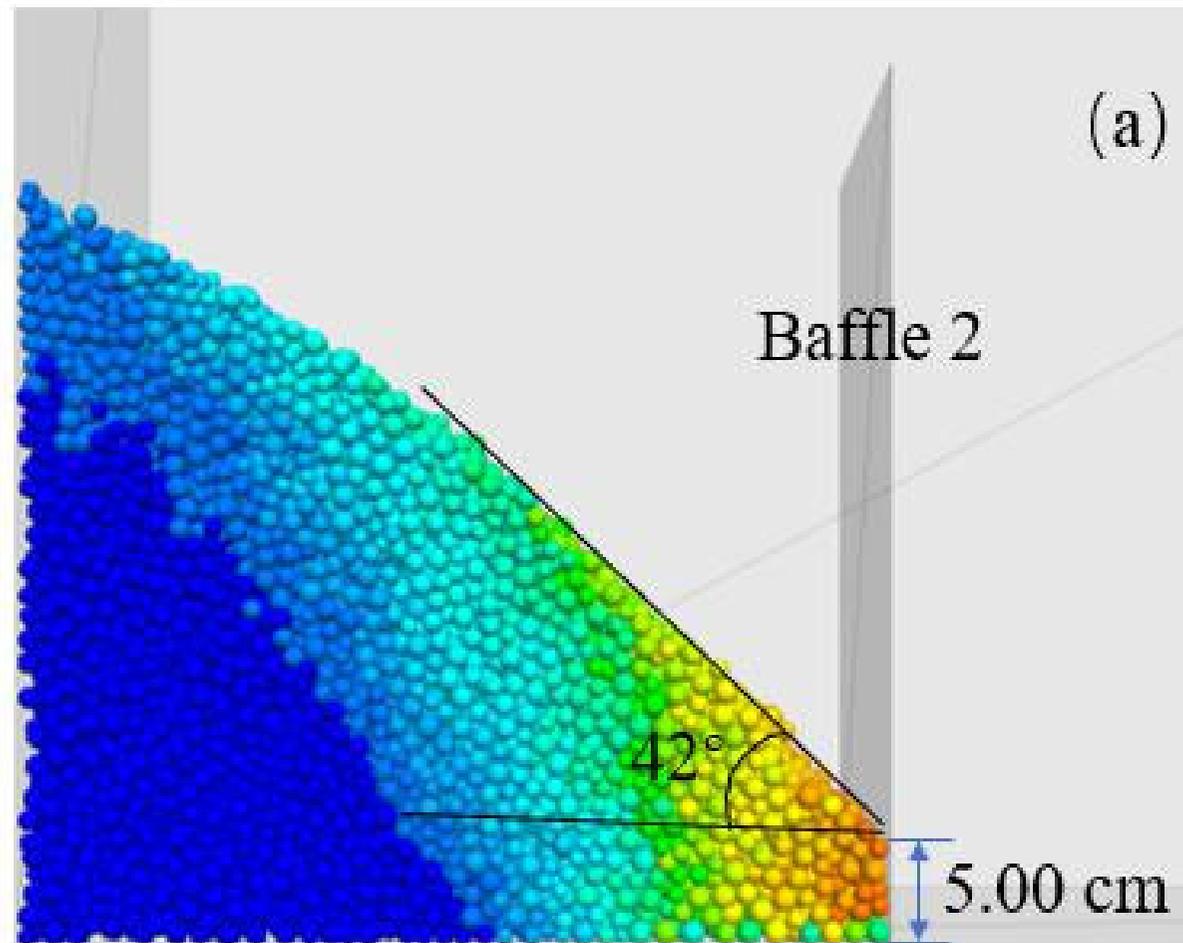
5. Final Results of Modeling Contest

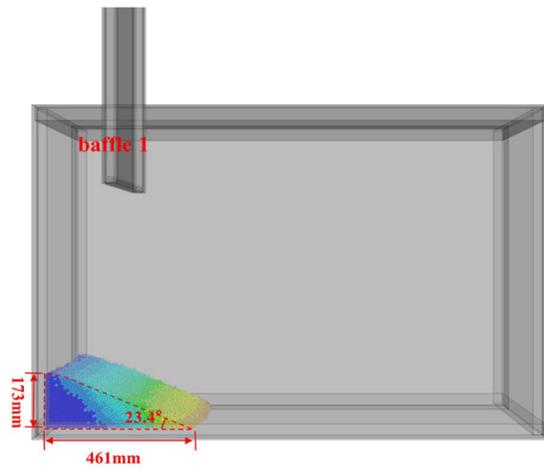
Team **TB06**'s final score is **92.04**.



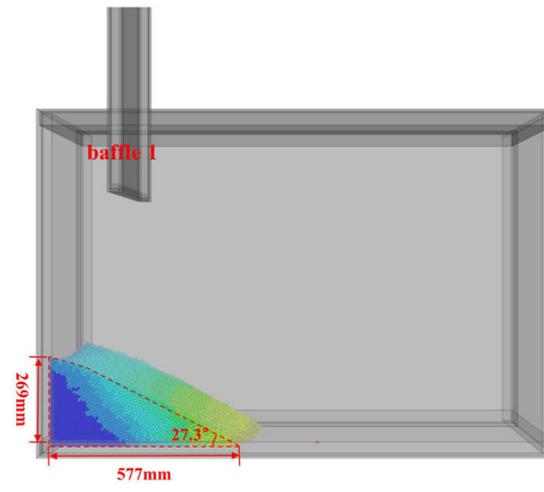
5. Final Results of Modeling Contest

Team **TB07**'s final score is **69.78**.

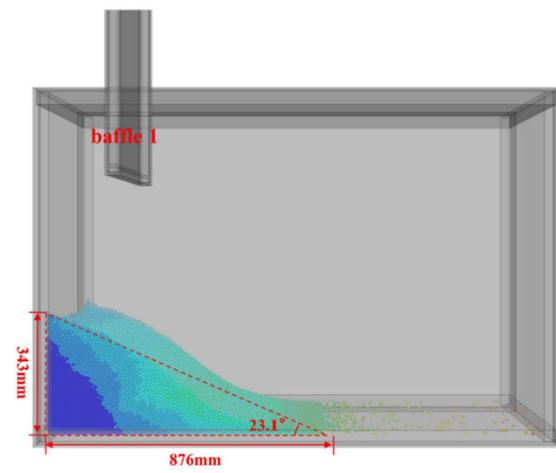




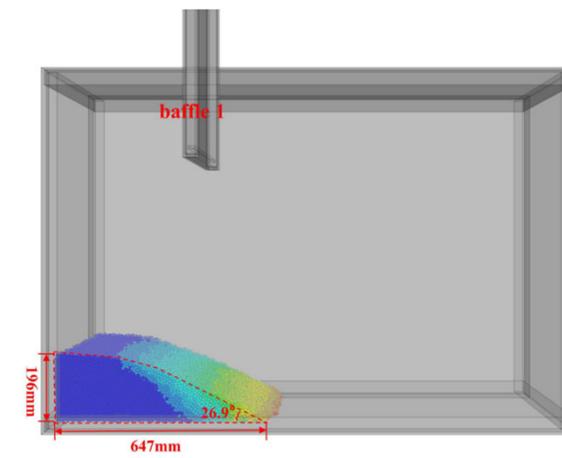
(a) $H/L=1$



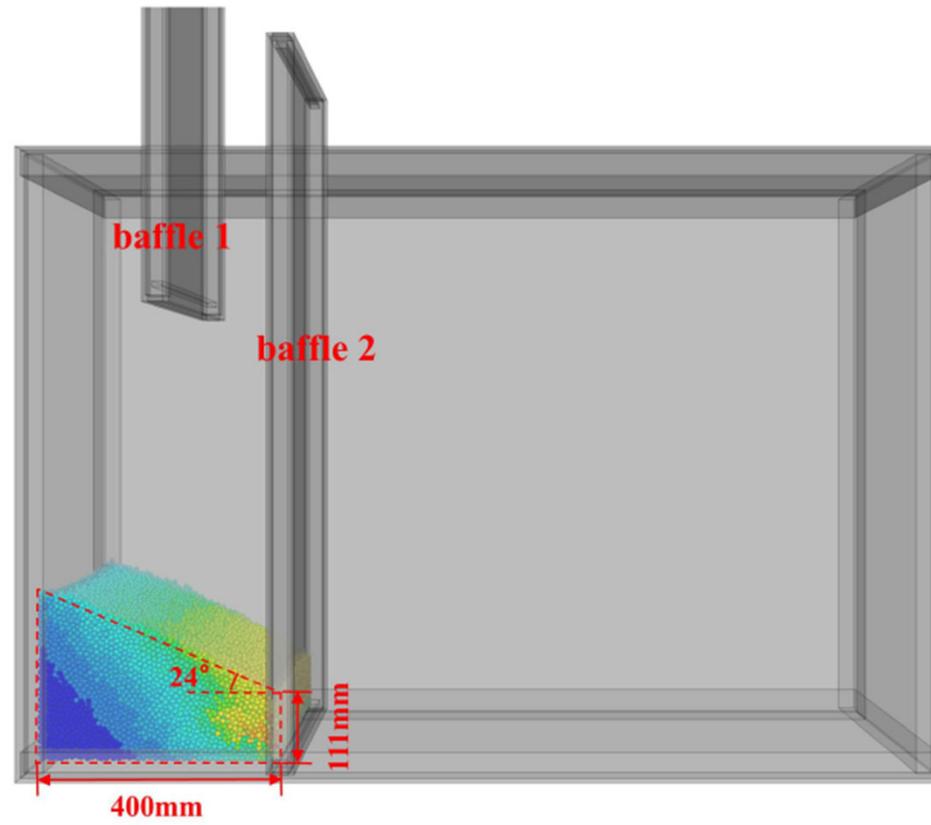
(b) $H/L=2$



(c) $H/L=3$



(d) $H/L=0.5$



(a) $H/L=2$ ($S=200\text{mm}$)

Problem B

