3D Hg Jet Simulations

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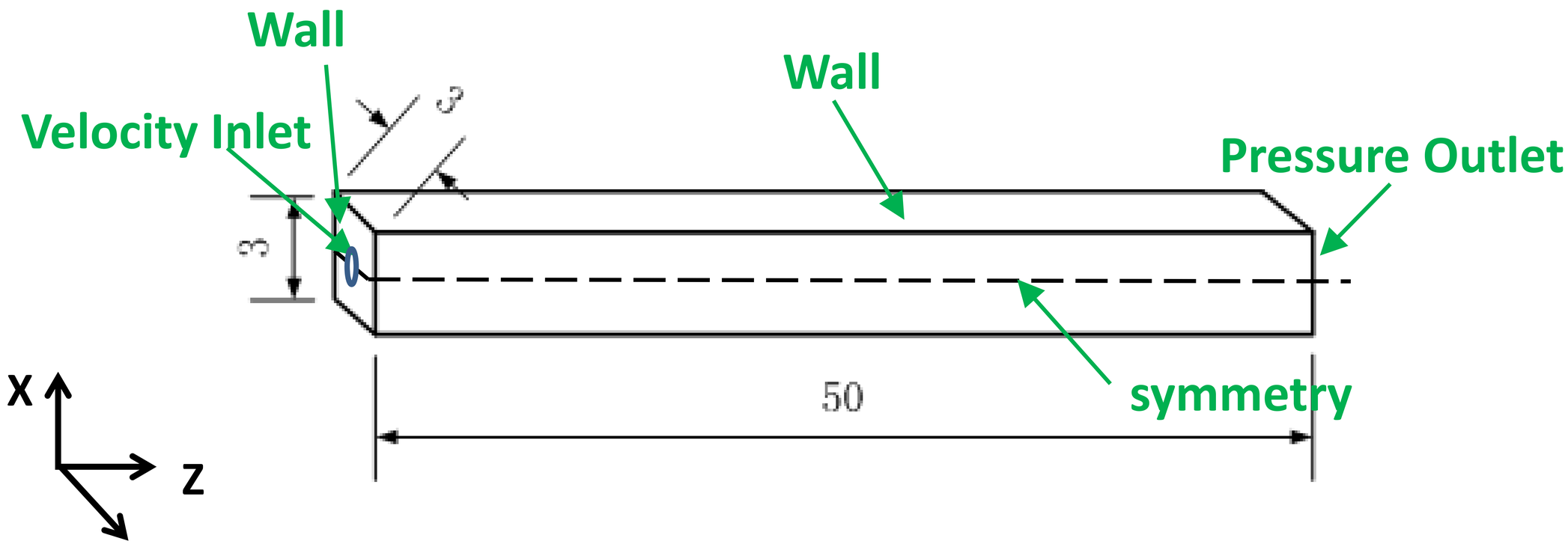
Outline

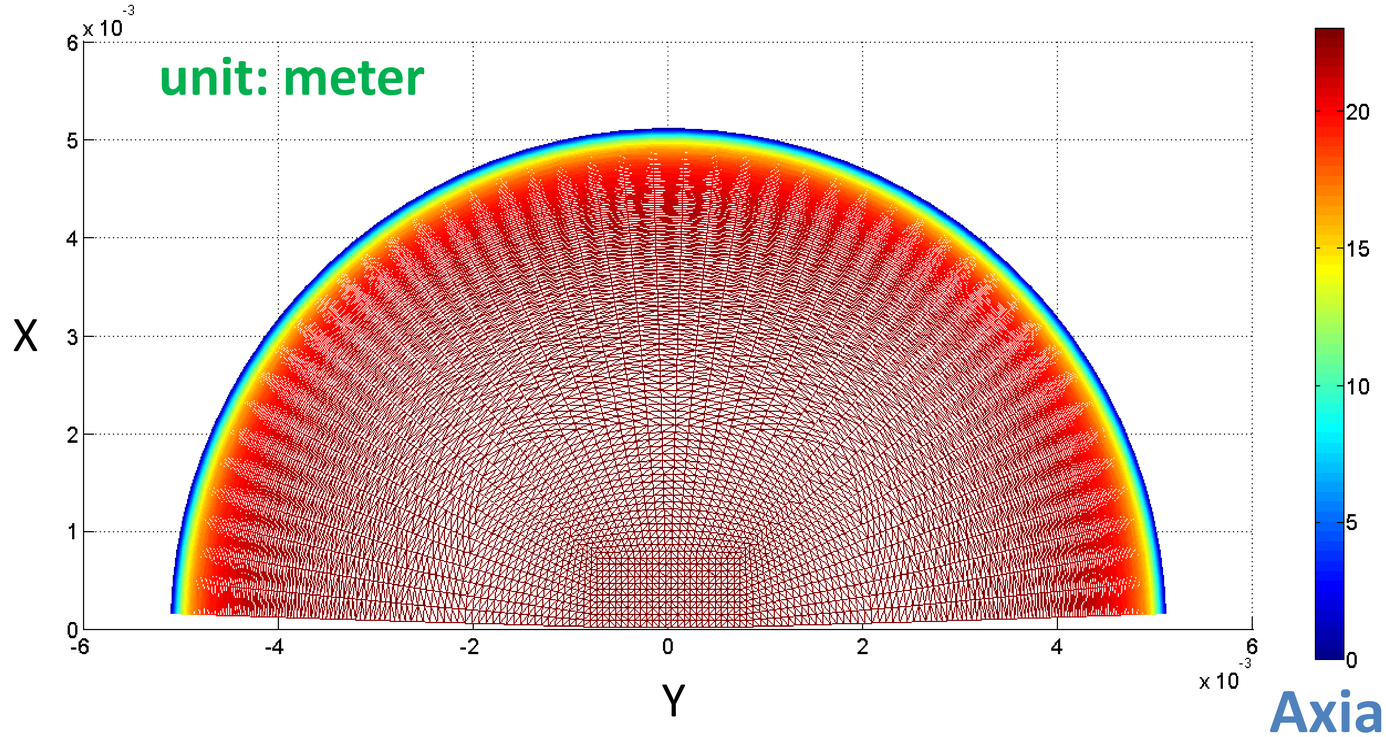
- Hg Jet Inlet Condition
  - Case1: Outlet of the pipe without a bend and a weld
  - Case2: Outlet of the pipe with 90°/90° bend and 30° weld
- Tentative Comparison Between Two 3D Hg Jet Simulations

Case 1: Boundary Conditions



Y

Normalized by $D_{jet\ exit}$,which is 0.01 meter. No gravity in the model.



pipe simulation

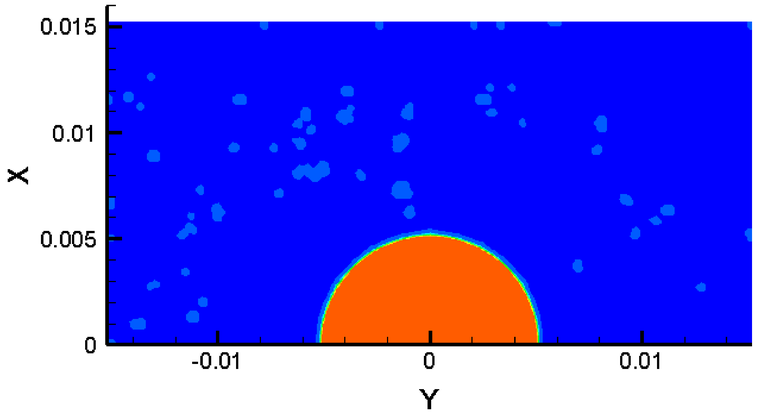
u = **U** + sqrt(2**k**/3),

where **k** = ½((u')^2+(v')^2+(w')^2)

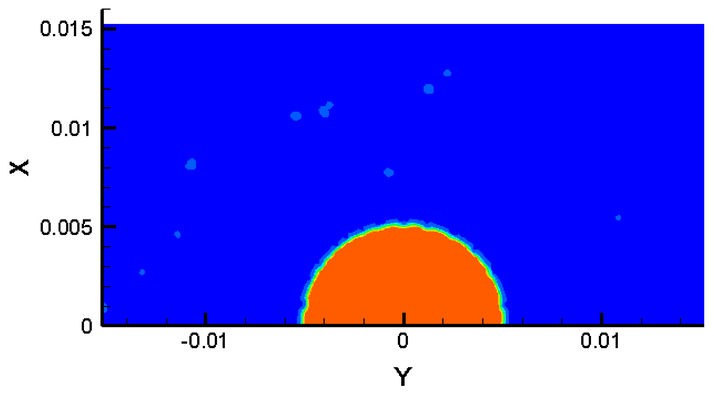
Axial Velocity Contour At The Jet Inlet

Results of α_{Hg} at t = 98.4 ms

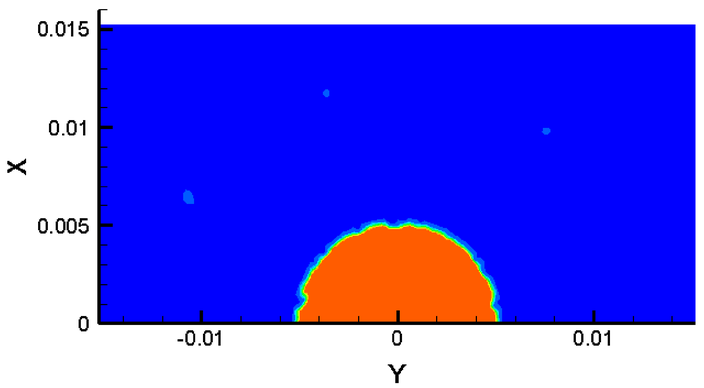
z= 0 cm



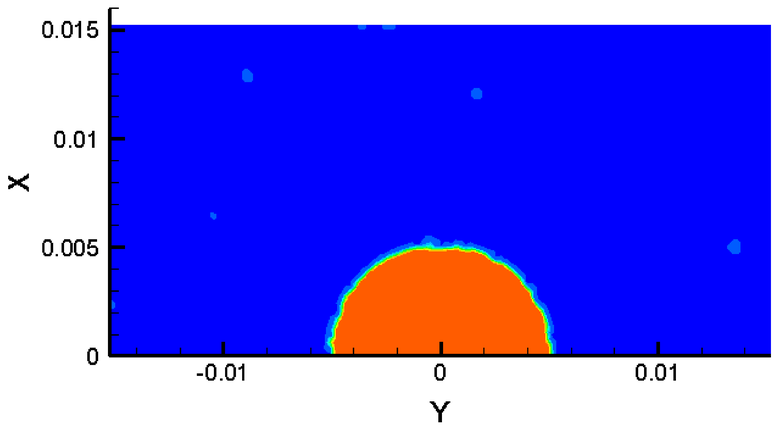
z = 1 cm



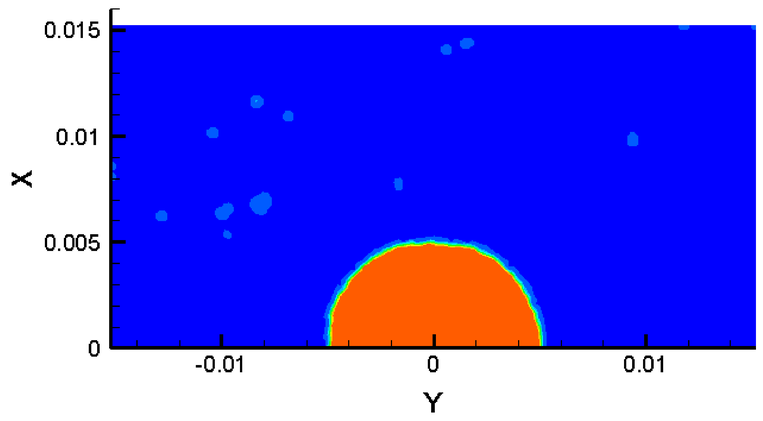
z = 5 cm



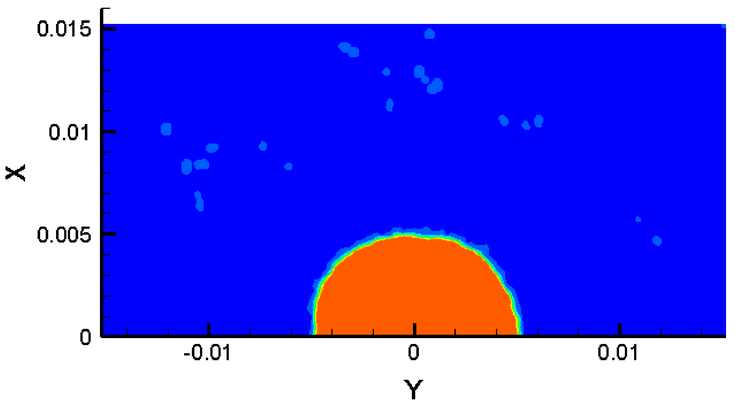
z = 10 cm



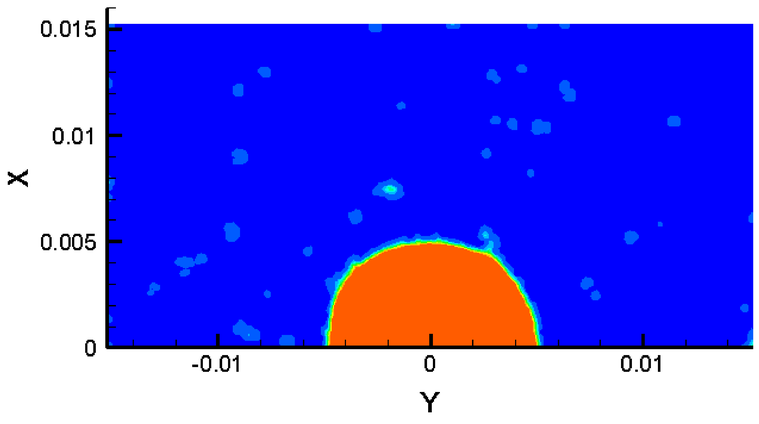
z = 15 cm



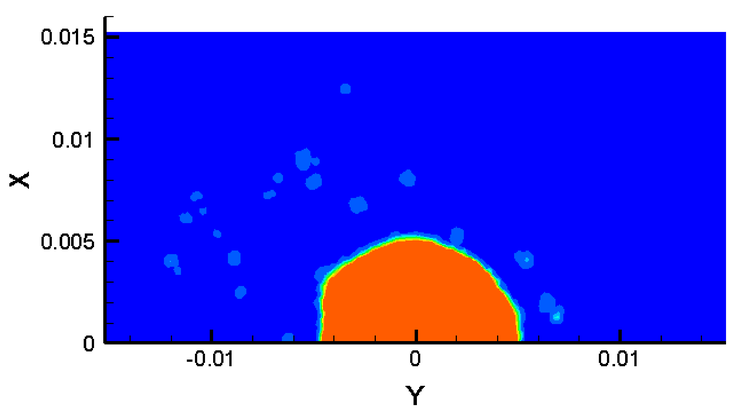
z = 20 cm

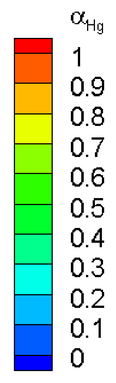


z = 30 cm



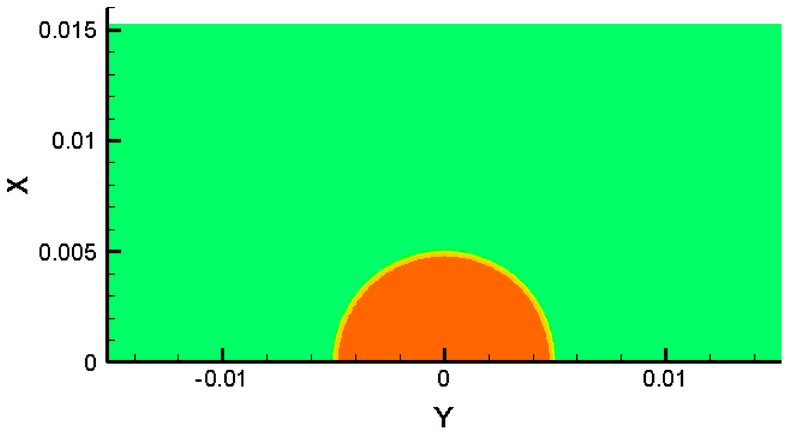
z = 45 cm



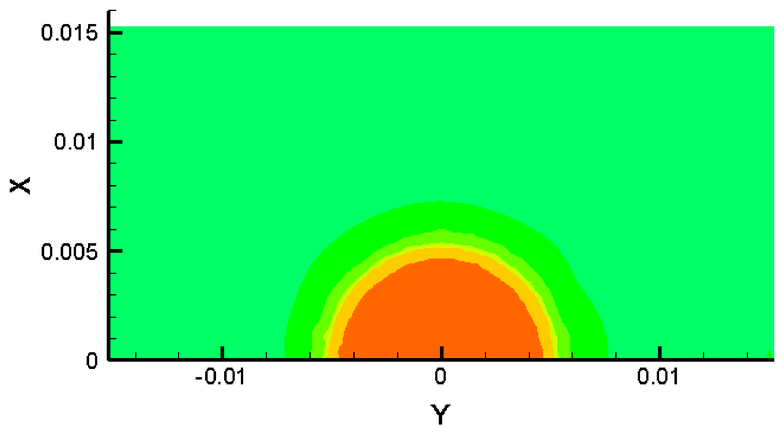


Results of u_z at t = 98.4 ms

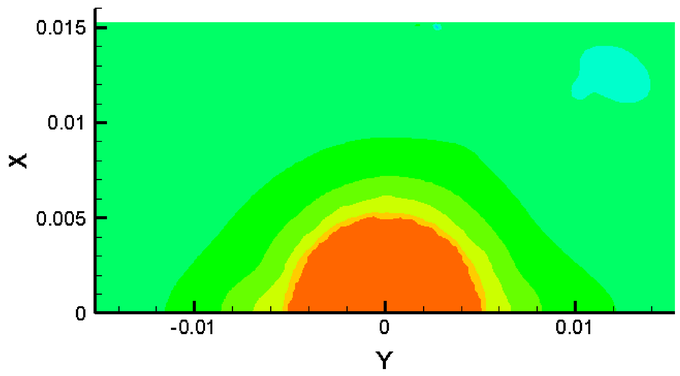
z= 0 cm



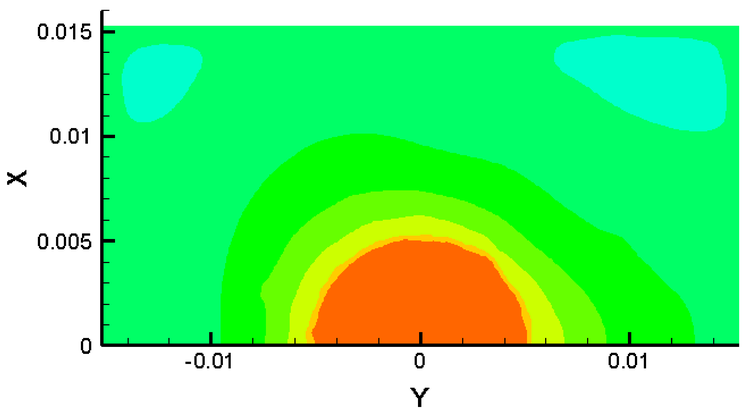
z = 1 cm



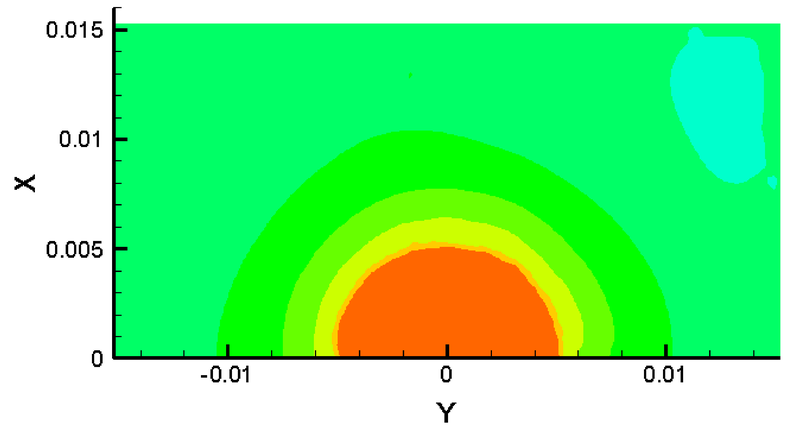
z = 5 cm



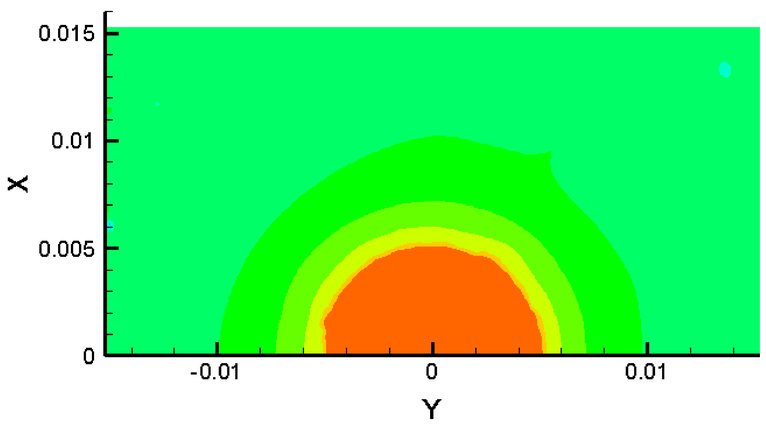
z = 10 cm



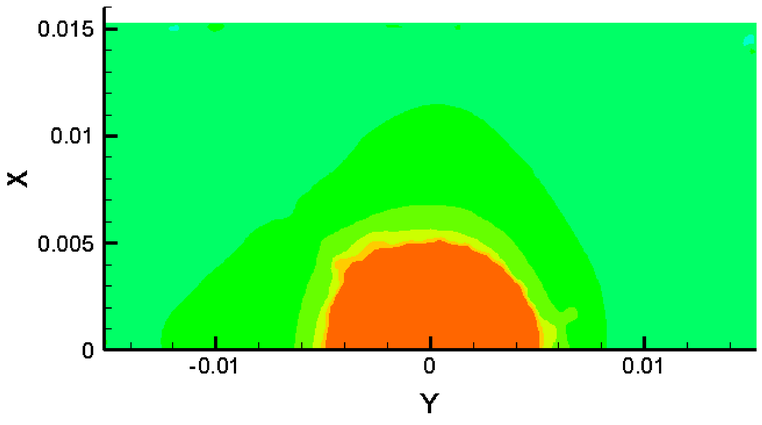
z = 15 cm



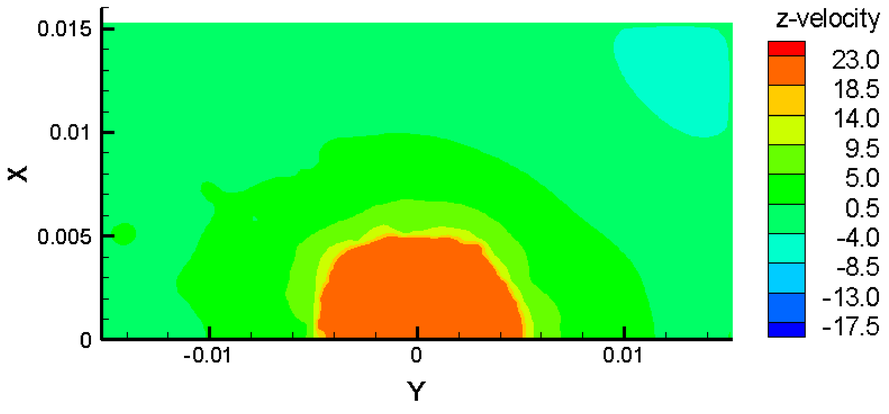
z = 20 cm



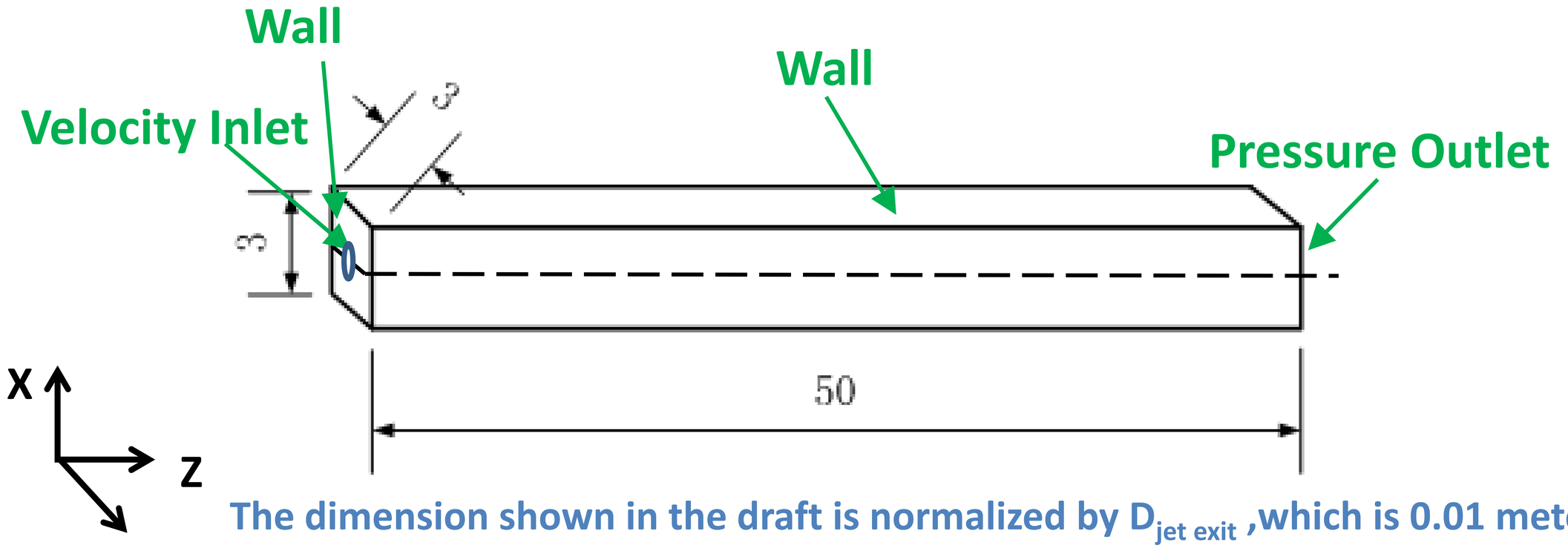
z = 30 cm



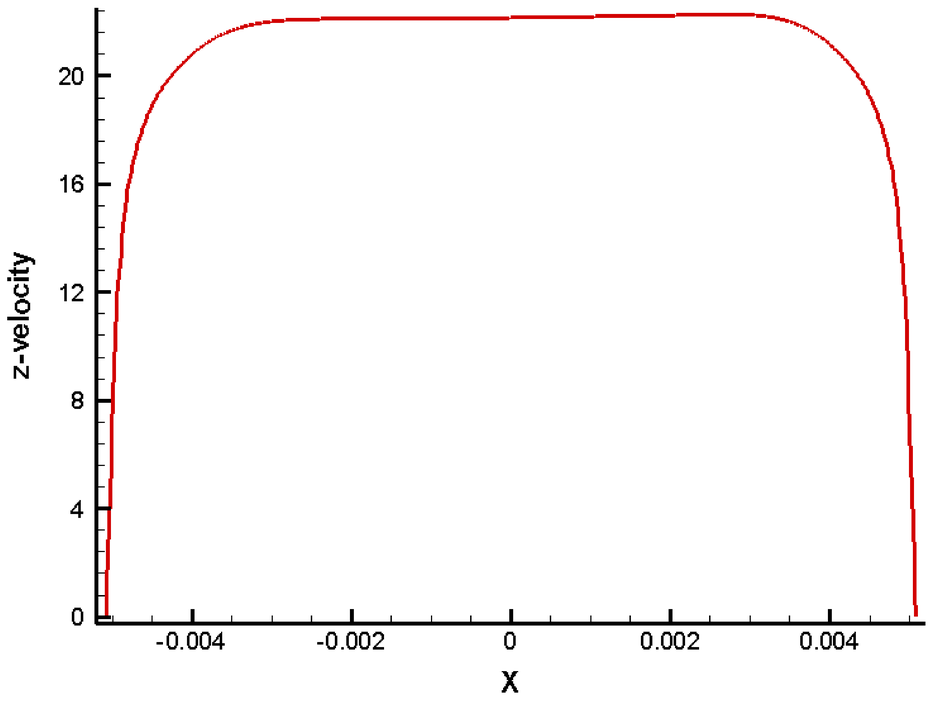
z = 45 cm

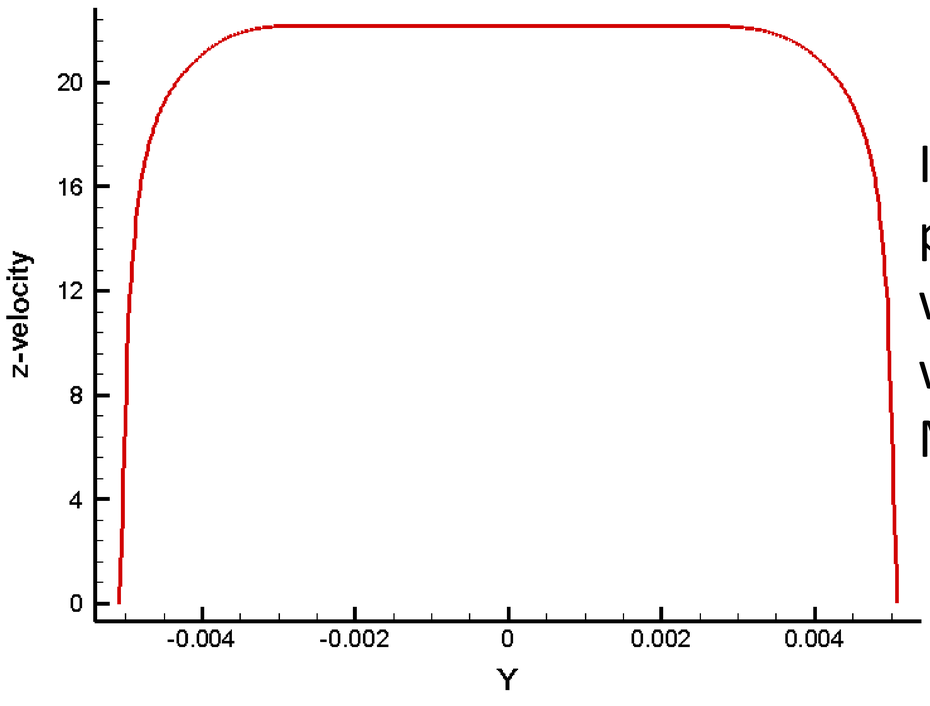


Case 2: Boundary Conditions



The dimension shown in the draft is normalized by $D_{jet\ exit}$,which is 0.01 meter. No gravity in the model.





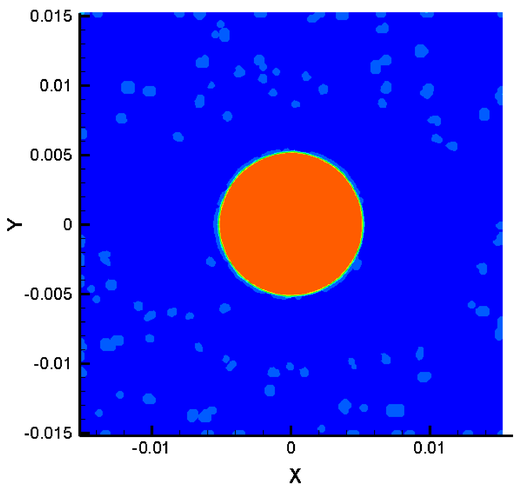
unit: meter

Input at velocity inlet from pipe-flow study with a 30° weld out of bend plan, and with a 90°/90° bend.
Mesh: 15M.

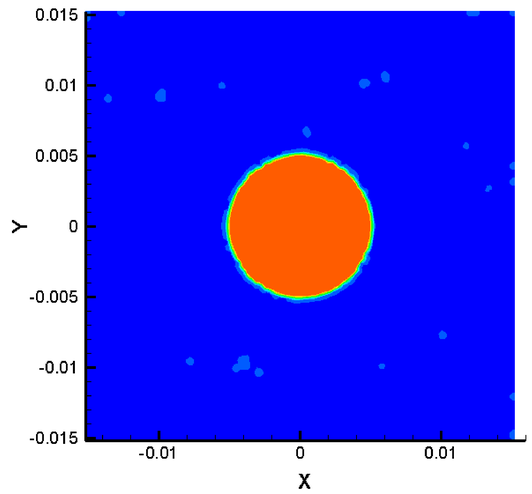
Axial velocity imposed at the jet inlet (a) x line plot (b) y line plot

Case 2: Results of α_{Hg} at t = 60.1 ms

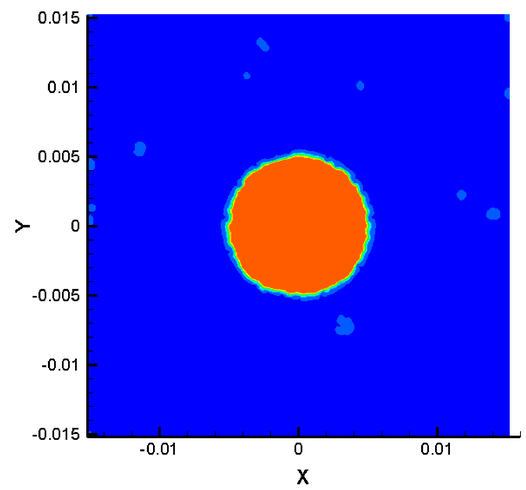
z= 0 cm



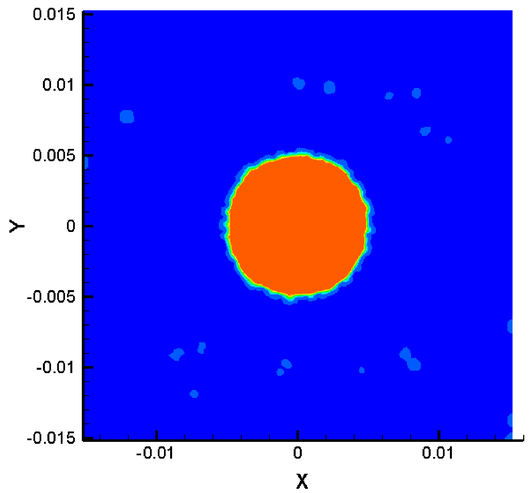
z = 1 cm



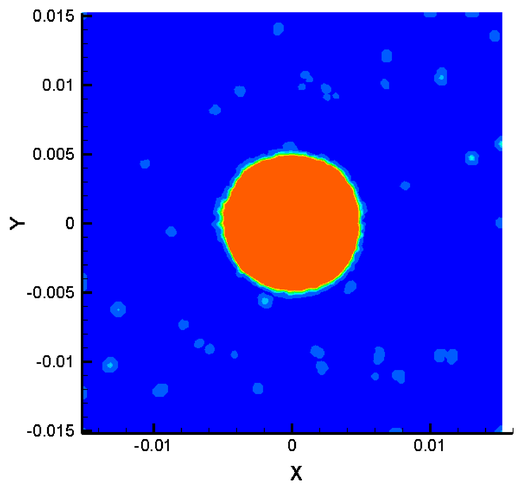
z = 5 cm



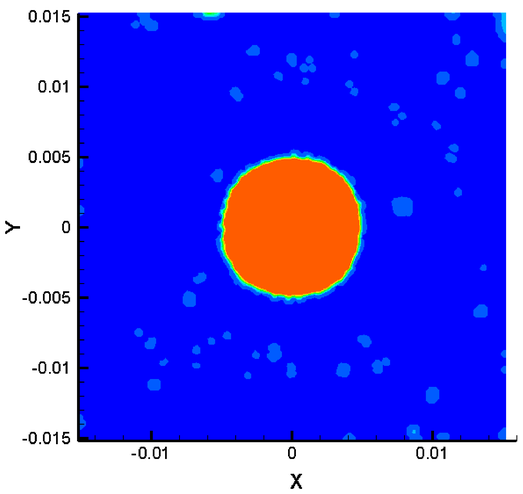
z = 10 cm



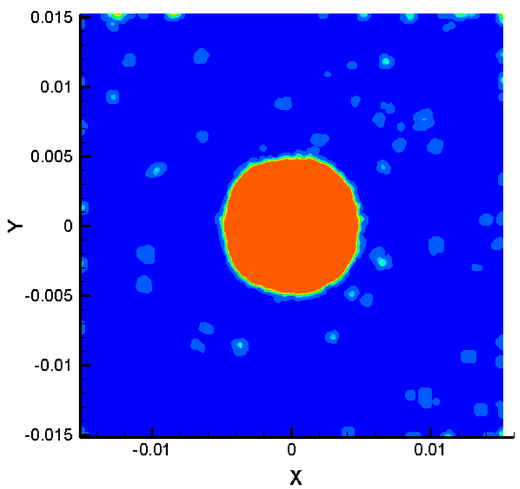
z = 15 cm



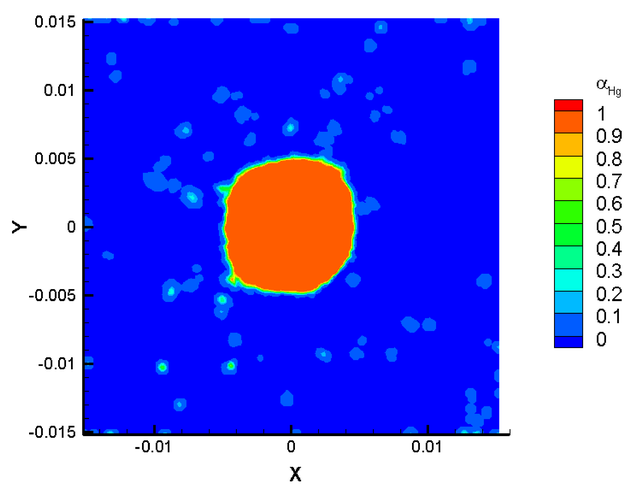
z = 20 cm



z = 30 cm

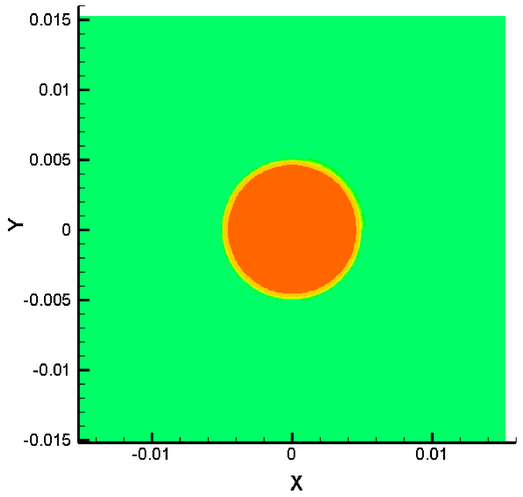


z = 45 cm

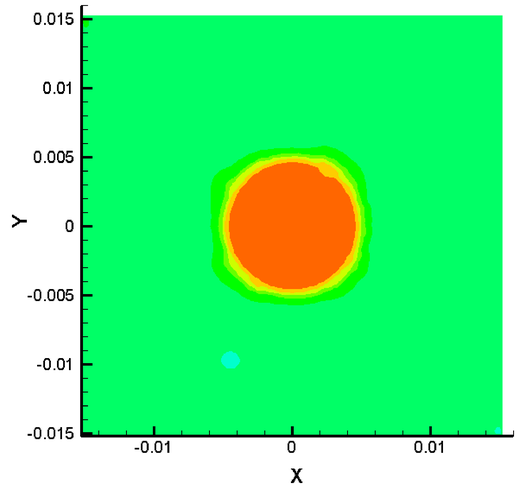


Case 2: Results of u_z at t = 60.1 ms

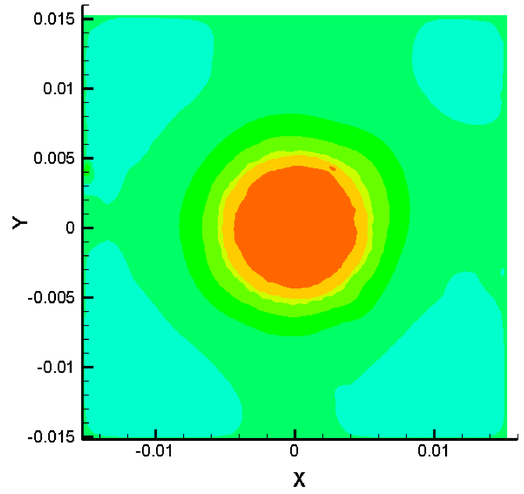
z= 0 cm



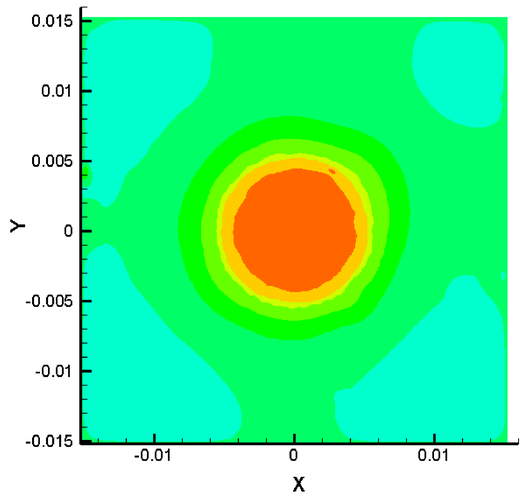
z = 1 cm



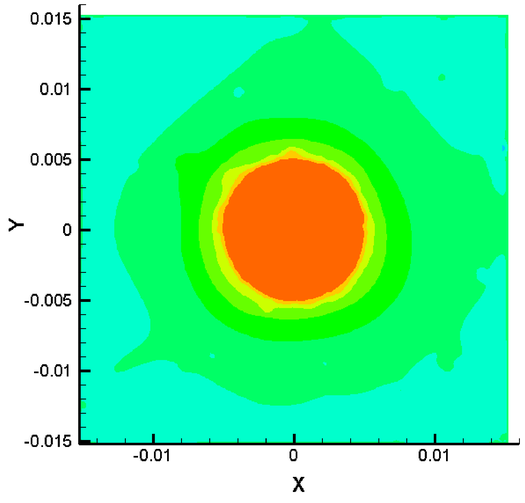
z = 5 cm



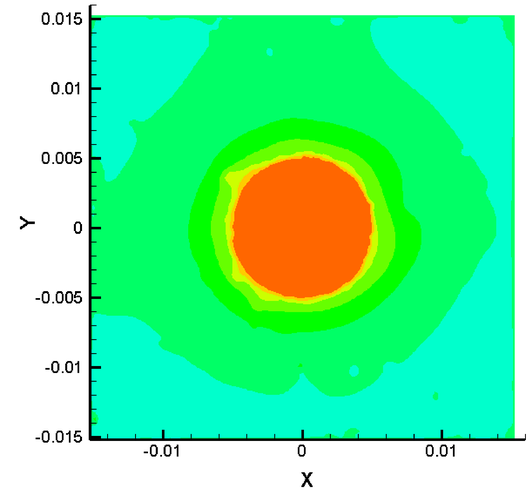
z = 10 cm



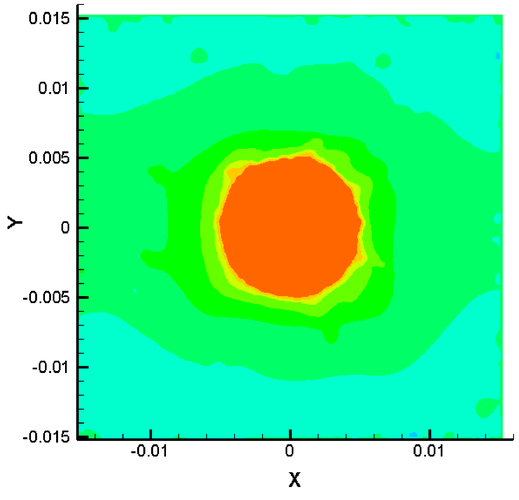
z = 15 cm



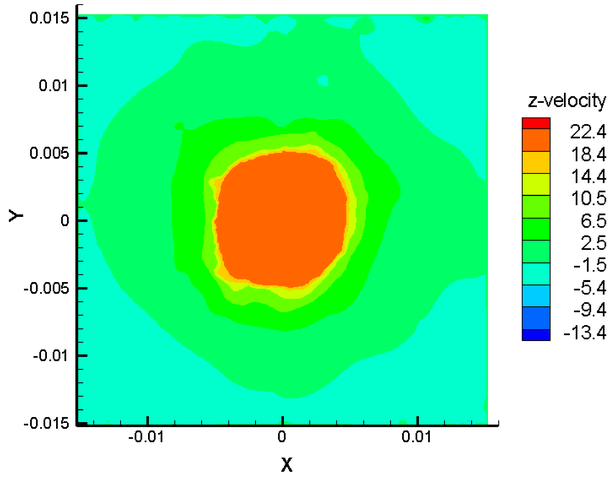
z = 20 cm



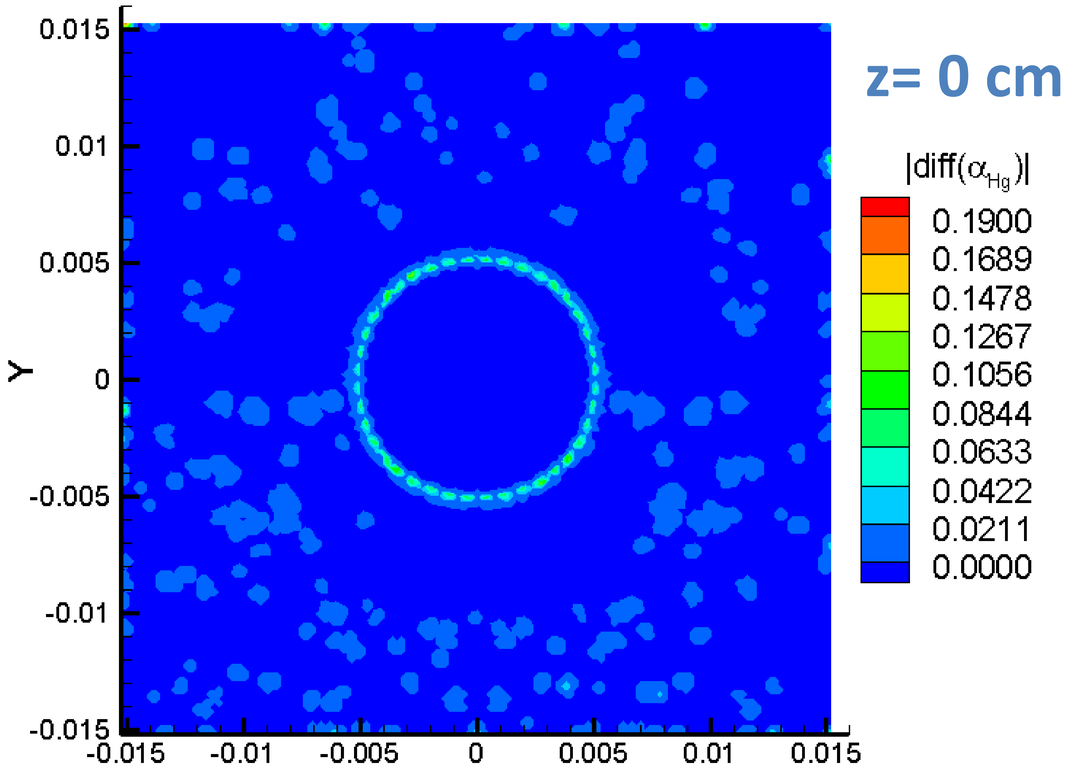
z = 30 cm

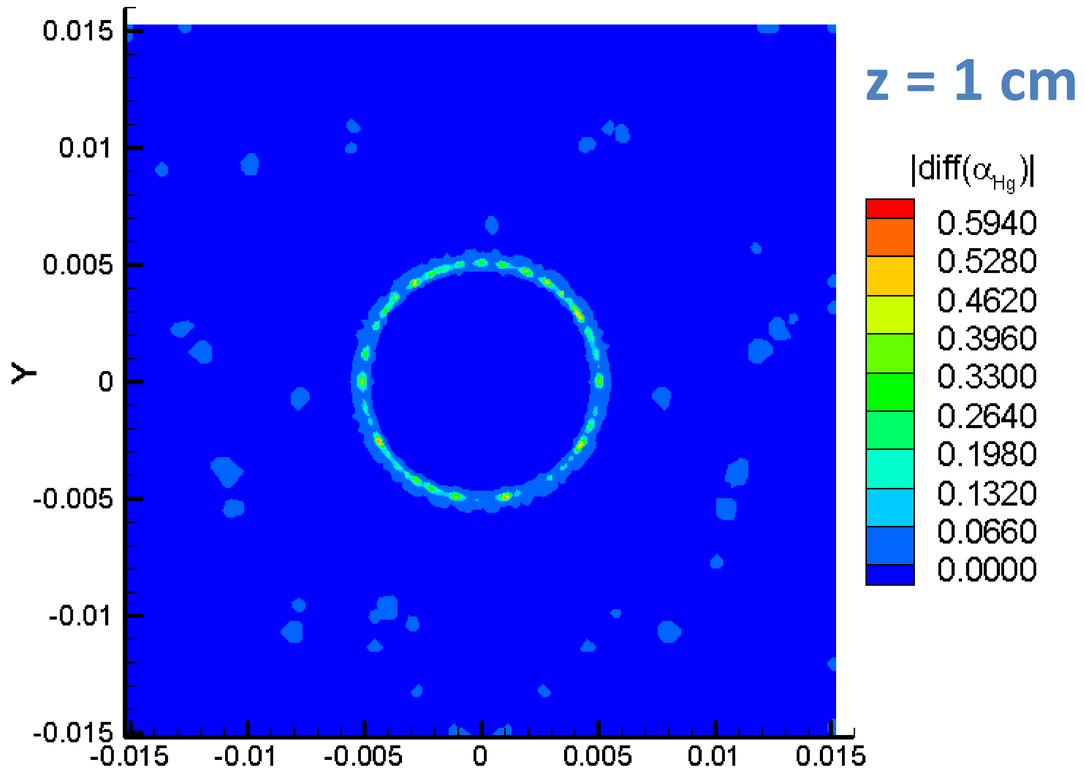


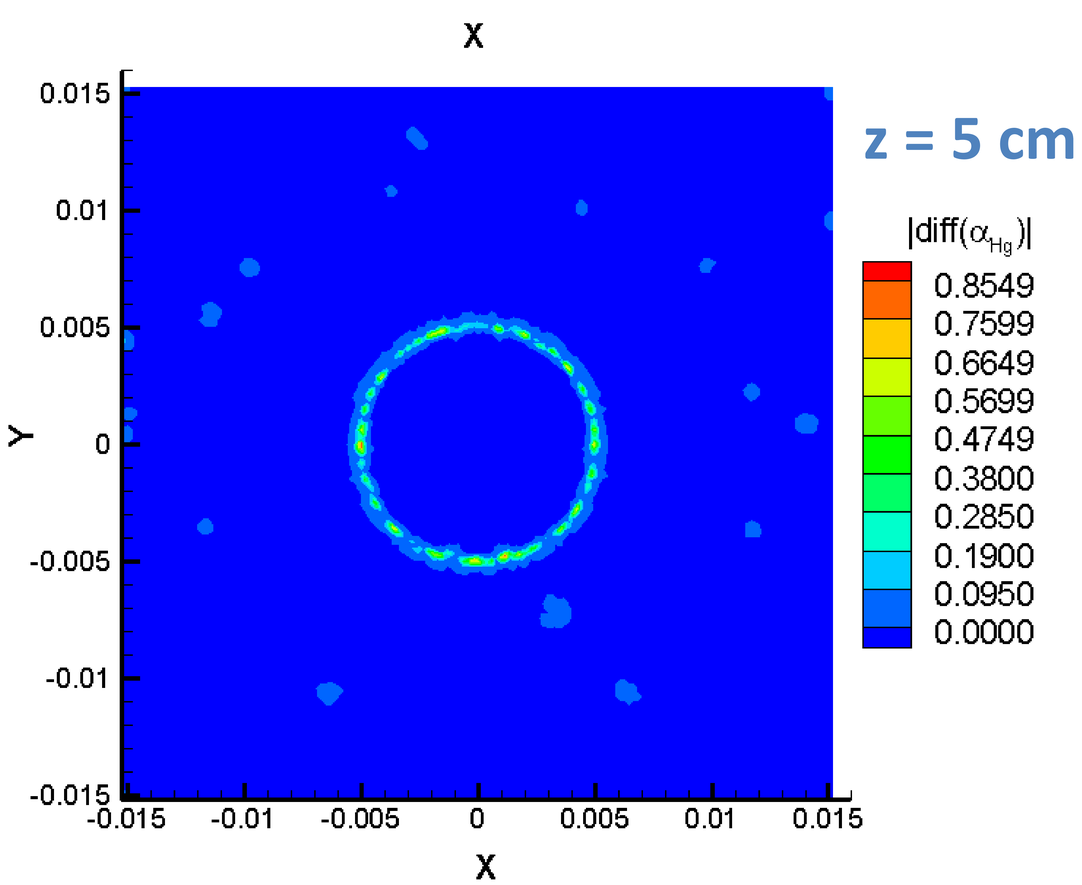
z = 45 cm

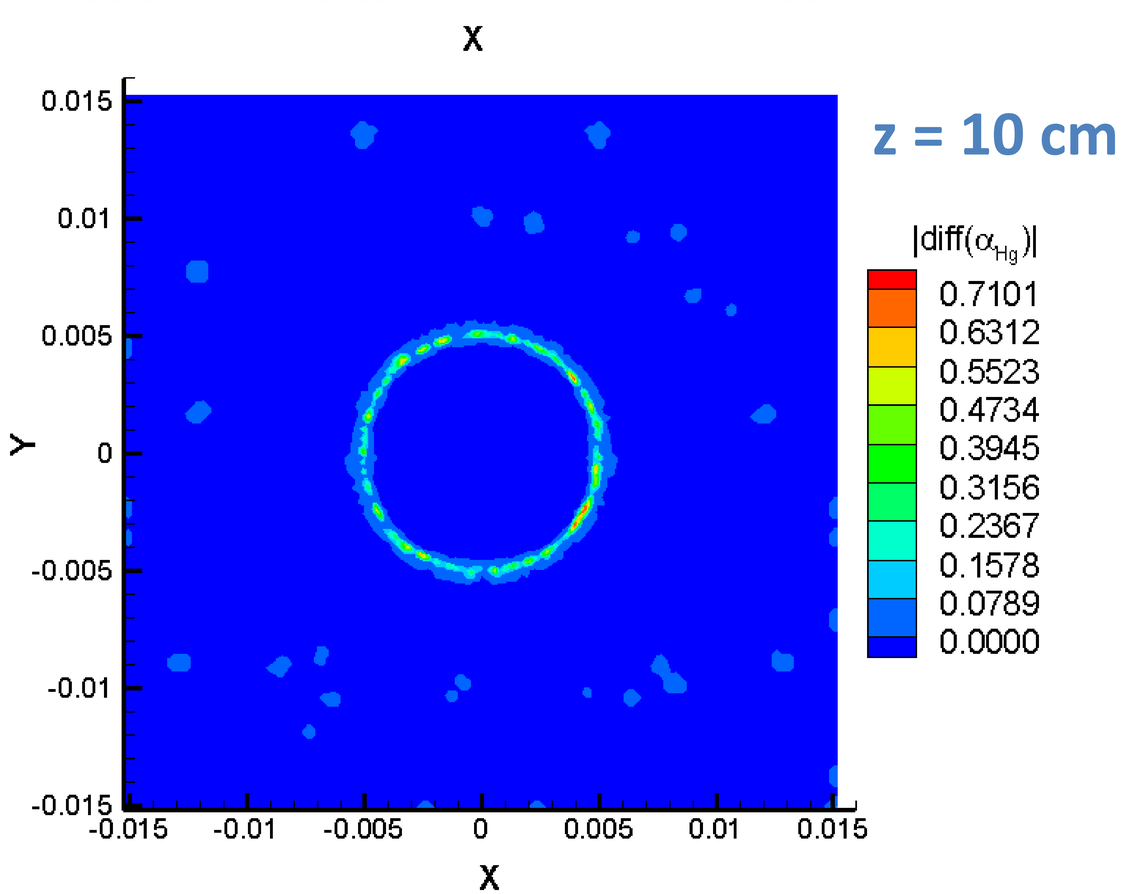


Difference Of α_{Hg} Between Case1 (at = 98.4 ms) and Case2 (at = 60.1 ms)

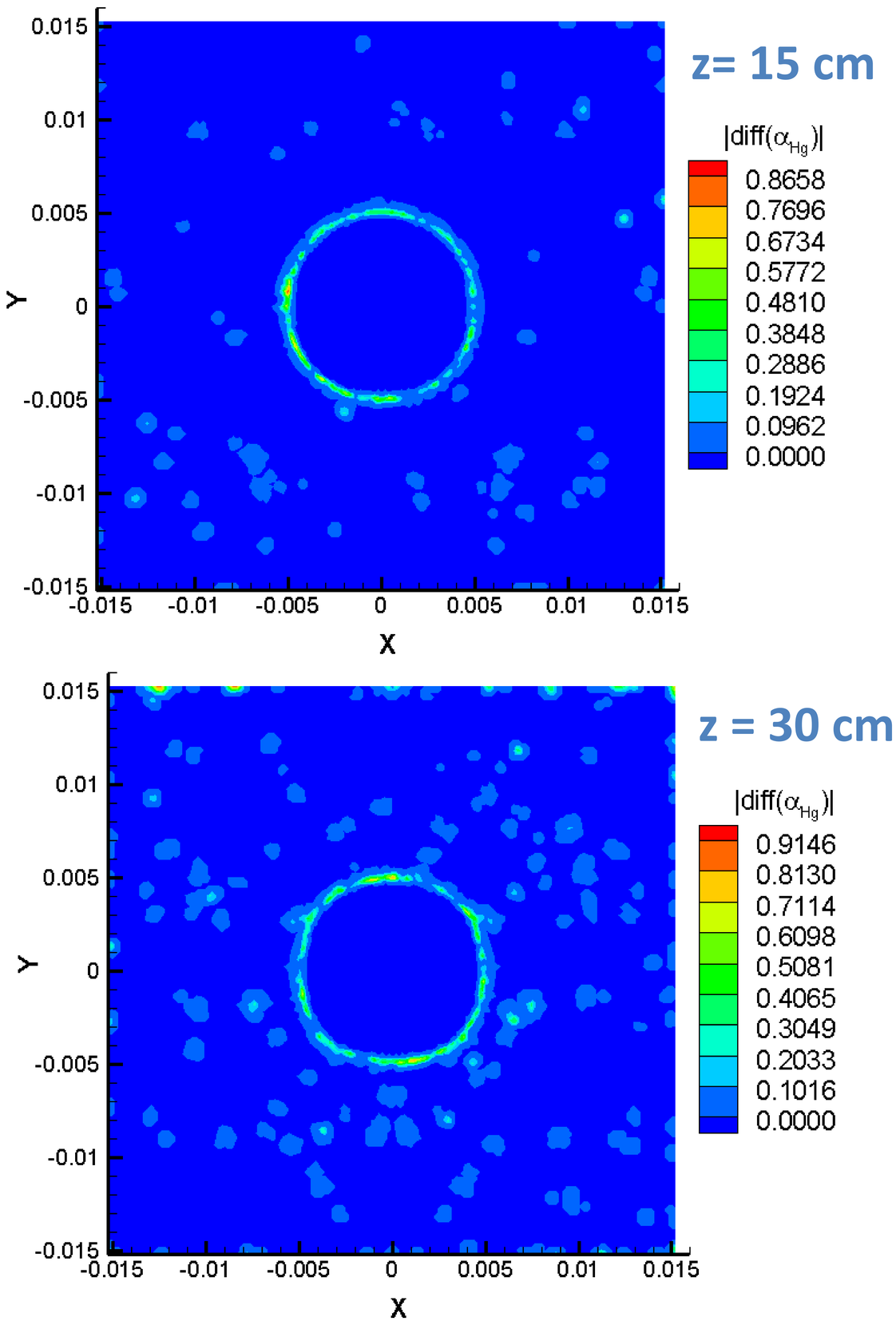


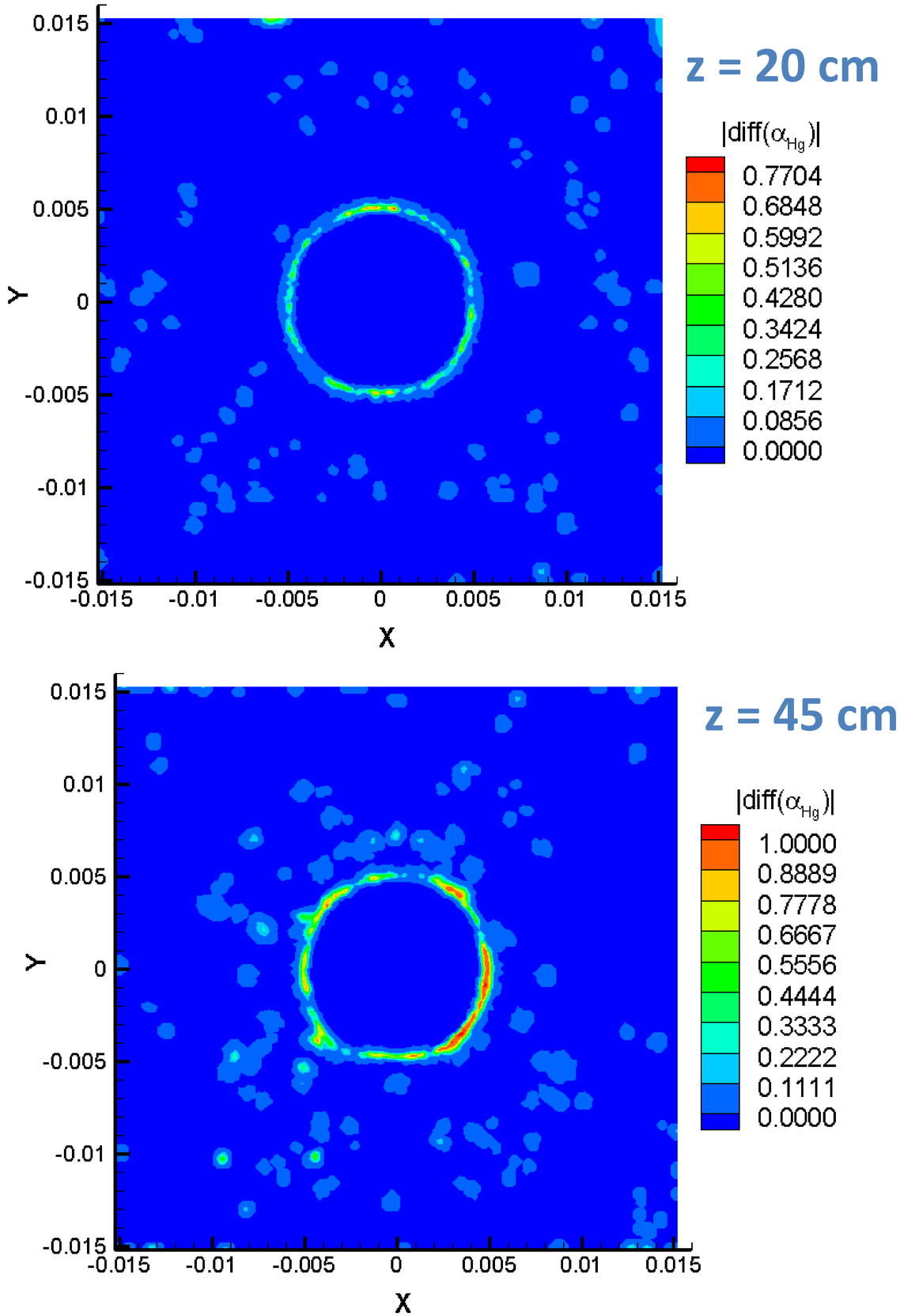






Difference Of α_{Hg} Between Case1 (at = 98.4 ms) and Case2 (at = 60.1 ms)





Difference Of α_{Hg} Between Case1 (at = 98.4 ms) and Case2 (at = 60.1 ms)

Locations (cm)	$\iint \lvert\Delta a_{Hg}\rvert \, dxdy$ (10^{-6})	$\iint \alpha_{Hg} dxdy$ (10^{-6})	$\frac{\iint \lvert\Delta a_{Hg}\rvert dxdy}{\iint \alpha_{Hg} dxdy}$
z = 0	0.656072	81.47658	0.00805
z = 1	1.44867	81.47658	0.01778
z = 5	2.727214	81.47658	0.03347
z = 10	2.558071	81.47658	0.0314
z = 15	2.985824	81.47658	0.036646
z = 20	4.918749	81.47658	0.06037
z = 30	2.842337	81.47658	0.034885
z = 45	9.797211	81.47658	0.1203