



University of
Zurich ^{UZH}

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Beamer report

Subtitle

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Compilation: requires L^AT_EX environment

- ① Just compile like an ordinary Beamer/L^AT_EX:

`pdflatex+biber+pdflatex+pdflatex`

- ② Or use compilation script:

- Linux or MacOS: run in terminal

- `./artratex.sh pb`: full compilation with reference cited in biblatex format

- `./artratex.sh p`: run `pdflatex` only, no biber for reference

- ③ Switch to Chinese: just add the "CJK" option in "artrabeamer.tex":

```
\usepackage[CJK,biber,authoryear,tikz,table,xlink]{Style/
artrabeamer}
```

- ④ Many other functionalities: check the available options below the line

```
\usepackage[biber,authoryear,tikz,table,xlink]{Style/
artrabeamer} in "artrabeamer.tex"
```

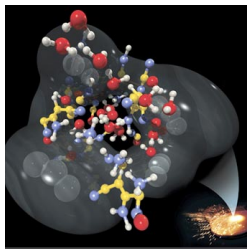
Useful commands added to generic L^AT_EX

- `\enorc{English}{Chinese}`: automatically switch between English and Chinese versions
- `\tikzart[t=m]{}:` draw coordinate system to help you position contents
- `\tikzart[t=p, x=-7, y=3, w=4] "comments" {figname}`: position a picture named "figname" at location "(x,y)" with width "w=4" and comments below the picture.
- `\tikzart[t=o, x=0, y=-0.8, s=0.8] {objects-such-as-tikz-diagrams}`: position objects at location "(x,y)" with scaling "s=0.8"
- `\tikzart[t=v, x=9.5, y=-6.5, w=0.5] {Video/vortex_preserve_geo.mp4} [\includegraphics{cover_image}]`: position a video at location "(x,y)" with a cover image of width "w=0.5"
- `\lolt{lowlight}, \hilt{highlight}`: make the item show in different color when in different state

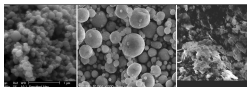
Draw coordinate systems + Position a picture



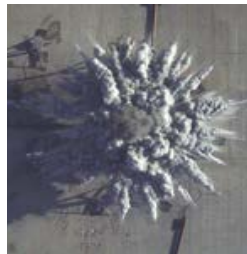
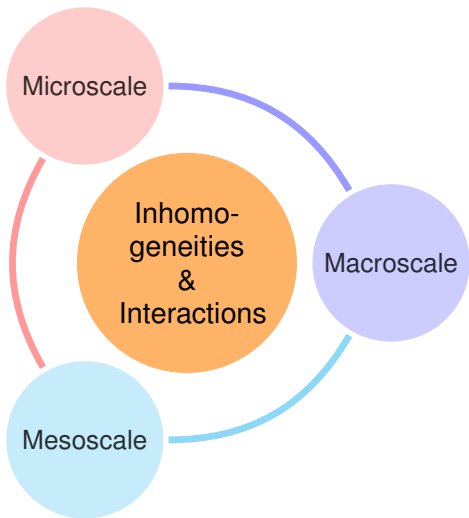
Smart diagrams + Position objects + Citation + Trim figures + Low/Highlight



(reed2008transient)

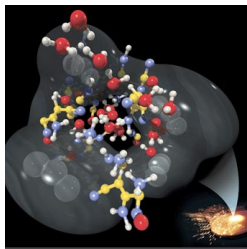


(zhang2009reaction)

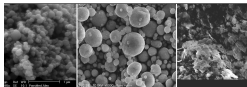


(zhang2010hybrid)

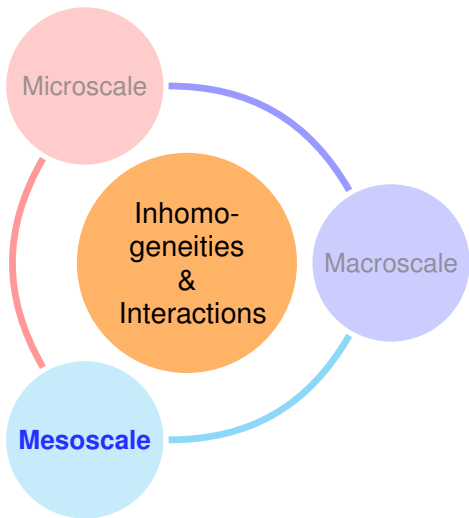
Smart diagrams + Position objects + Citation + Trim figures + Low/Highlight



(reed2008transient)



(zhang2009reaction)



(zhang2010hybrid)

Math + Position text + Full citation + Notes

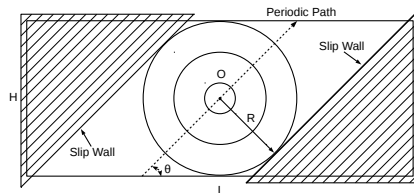
$$\psi_I = f(\{\psi_N\}, \psi_O)$$

- 1 Prediction step: $\psi_I^* = \left[\sum w(d_N) \psi_N \right] / \left[\sum w(d_N) \right]$
- 2 Boundary condition enforcement step: $\psi_O = C \psi_I + \text{RRHS}$
- 3 Correction step: $\psi_I = \left[\psi_I^* + \frac{w(d_O)}{\sum w(d_N)} \psi_O \right] / \left[1 + \frac{w(d_O)}{\sum w(d_N)} \right]$

mo2018immersed

Type	Example form	C	RRHS
Dirichlet	$\psi_O = g$	0	g
Neumann	$\frac{\partial \psi}{\partial n} \Big _O = \frac{\partial \psi_O}{\partial n}$	1	$- \mathbf{x}_I - \mathbf{x}_O \frac{\partial \psi_O}{\partial n}$
Robin	$\alpha \psi_O + \beta \frac{\partial \psi}{\partial n} \Big _O = g$ $(\mathbf{V} \cdot \mathbf{n}) _{\mathbf{x}=\mathbf{x}_O} = \mathbf{V}_S \cdot \mathbf{n}$	$\frac{\beta}{\beta - \mathbf{x}_I - \mathbf{x}_O \alpha}$	$\frac{- \mathbf{x}_I - \mathbf{x}_O g}{\beta - \mathbf{x}_I - \mathbf{x}_O \alpha}$
Cauchy	$\frac{\partial(\mathbf{V} \cdot \hat{\mathbf{t}})}{\partial n} \Big _{\mathbf{x}=\mathbf{x}_O} = 0$ $\frac{\partial(\mathbf{V} \cdot \tilde{\mathbf{t}})}{\partial n} \Big _{\mathbf{x}=\mathbf{x}_O} = 0$	$\begin{bmatrix} n_x & n_y & n_z \\ \hat{t}_x & \hat{t}_y & \hat{t}_z \\ \tilde{t}_x & \tilde{t}_y & \tilde{t}_z \end{bmatrix}^T \begin{bmatrix} 0 & 0 & 0 \\ \hat{t}_x & \hat{t}_y & \hat{t}_z \\ \tilde{t}_x & \tilde{t}_y & \tilde{t}_z \end{bmatrix}$	$\begin{bmatrix} n_x & n_y & n_z \\ \hat{t}_x & \hat{t}_y & \hat{t}_z \\ \tilde{t}_x & \tilde{t}_y & \tilde{t}_z \end{bmatrix}^T \begin{bmatrix} n_x & n_y & n_z \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} \cdot \mathbf{V}_S$

Position animation + Make Table



To play the video, the compiled PDF should be moved out from the "Tmp" directory

$m_x \times m_y$	L_1 error	L_1 order	L_2 error	L_2 order	L_∞ error	L_∞ order
40×20	$3.536\text{e-}2$	—	$6.097\text{e-}2$	—	$4.105\text{e-}1$	—
80×40	$9.113\text{e-}3$	1.956	$2.497\text{e-}2$	1.288	$1.997\text{e-}1$	1.039
160×80	$2.034\text{e-}3$	2.163	$6.548\text{e-}3$	1.931	$5.236\text{e-}2$	1.931
320×160	$5.114\text{e-}4$	1.992	$1.640\text{e-}3$	1.997	$1.278\text{e-}2$	2.035
640×320	$1.287\text{e-}4$	1.990	$4.097\text{e-}4$	2.001	$3.119\text{e-}3$	2.034
1280×640	$3.233\text{e-}5$	1.993	$1.024\text{e-}4$	2.000	$7.818\text{e-}4$	1.996



Ordinary text

- **A 3D, high-resolution, parallelized, gas-solid flow solver**
 - Establishes a numerical framework for the direct simulation of gas-solid flows.
 - Solves coupled and interface-resolved fluid-fluid, fluid-solid, and solid-solid interactions.
 - Addresses shocked flow conditions, irregular and moving geometries, and multibody contact and collisions.
- **Advancement in understanding particle clustering and jetting**
 - Demonstrates a valid statistical dissipative property in solving explosively dispersed granular materials with respect to Gurney velocity.
 - Extends the time range of the velocity scaling law with regard to Gurney energy in the Gurney theory from the steady-state termination phase to the unsteady evolution phase.
 - Proposes an explanation for particle clustering and jetting instabilities to increase the understanding of experimental observations.

Thank you for your attention!



Part I

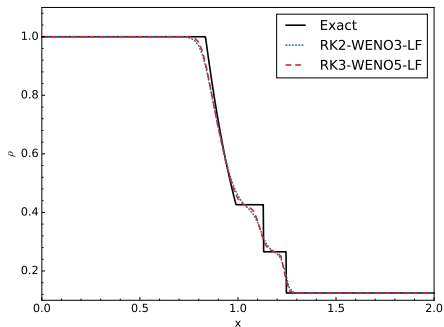
Appendix

5 Appendix

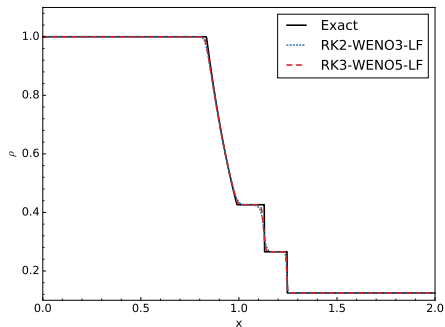
Classic Beamer Style

References

Sod's problem (sod1978survey)



$n = 100$



$n = 500$

$$\rho = 1; \quad u = 0; \quad p = 1 \quad \text{if } 0 \leq x < 1$$

$$\rho = 0.125; \quad u = 0; \quad p = 0.1 \quad \text{if } 1 < x \leq 2$$

References I