Volcanic Eruption Simulation

Guillaume Cordonnier, Yannis Kedadry

Abstract

Introduction

- motivations générales
 - rupture (pourquoi les autres méthodes ne sont pas utilisables)

State of the art

- description des méthodes: en une ligne + pourquoi elles ne résolvent pas notre

Method

First approach: Shallow-water

- sans vitesse voisine horizontale

$$u = -\frac{g}{k} \nabla Surface \tag{1}$$

$$\frac{Dh}{Dt} = -h \nabla u \tag{2}$$

$$\frac{Dh}{Dt} = -h\nabla \cdot u \tag{2}$$

Stokes problem

Results

Conclusion

References

[1] Jonathan Gagnon, Julián Guzman, Valentin Vervondel, François Dagenais, David Mould, and Eric Paquette. Distribution update of deformable

- patches for texture synthesis on the free surface of fluids. Computer Graphics Forum, 38, 2019.
- [2] Maud Lastic, Damien Rohmer, Guillaume Cordonnier, Claude Jaupart, Fabrice Neyret, and Marie-Paule Cani. Interactive simulation of plume and pyroclastic volcanic ejections. *Proceedings of the ACM on Computer Graphics and Interactive Techniques*, 5(1):1–15, May 2022.
- [3] Alexey Stomakhin, Craig A. Schroeder, Chenfanfu Jiang, Lawrence Chai, Joseph Teran, and Andrew Selle. Augmented mpm for phase-change and varied materials. *ACM Transactions on Graphics (TOG)*, 33:1 11, 2014.
- [4] Shenfan Zhang, Fanlong Kong, Chen Li, Changbo Wang, and Hong Qin. Hybrid modeling of multiphysical processes for particle-based volcano animation. *Computer Animation and Virtual Worlds*, 28, 2017.
- [5] Barbara Solenthaler, Peter Bucher, Nuttapong Chentanez, Matthias Müller, and Markus H. Gross. Sph based shallow water simulation. In Workshop on Virtual Reality Interactions and Physical Simulations, 2011.
- [6] Noé Bernabeu, Pierre Saramito, and Claude Smutek. Modelling lava flow advance using a shallow-depth approximation for three-dimensional cooling of viscoplastic flows. Geological Society, London, Special Publications, 426, 03 2016.
- [7] Mathieu Desbrun and Marie-Paule Cani. Smoothed Particles: A new paradigm for animating highly deformable bodies. In Ronan Boulic and Gerard Hegron, editors, *Eurographics Workshop on Computer Animation and Simulation (EGCAS)*, pages 61–76, Poitiers, France, August 1996. Springer-Verlag. Published under the name Marie-Paule Gascuel.
- [8] Ross Griffiths. The dynamics of lava flows. Annual Review of Fluid Mechanics, 32:477–518, 01 2000.
- [9] Jos Stam. Real-time fluid dynamics for games. 2003.
- [10] Andreas Kolb, Lutz Latta, and Christof Rezk-Salama. Hardware-based simulation and collision detection for large particle systems. Proceedings of the ACM SIGGRAPH/EUROGRAPHICS conference on Graphics hardware, 2004.
- [11] Jos Stam. Stable fluids. In International Conference on Computer Graphics and Interactive Techniques, 1999.
- [12] Dan Stora, Pierre-Olivier Agliati, Marie-Paule Cani, Fabrice Neyret, and Jean-Dominique Gascuel. Animating lava flows. *Graphics Interface*, 12 2000.