From Crystals to Hurricanes -- How to Scale Simulations Across 7 Oders of Magnitude
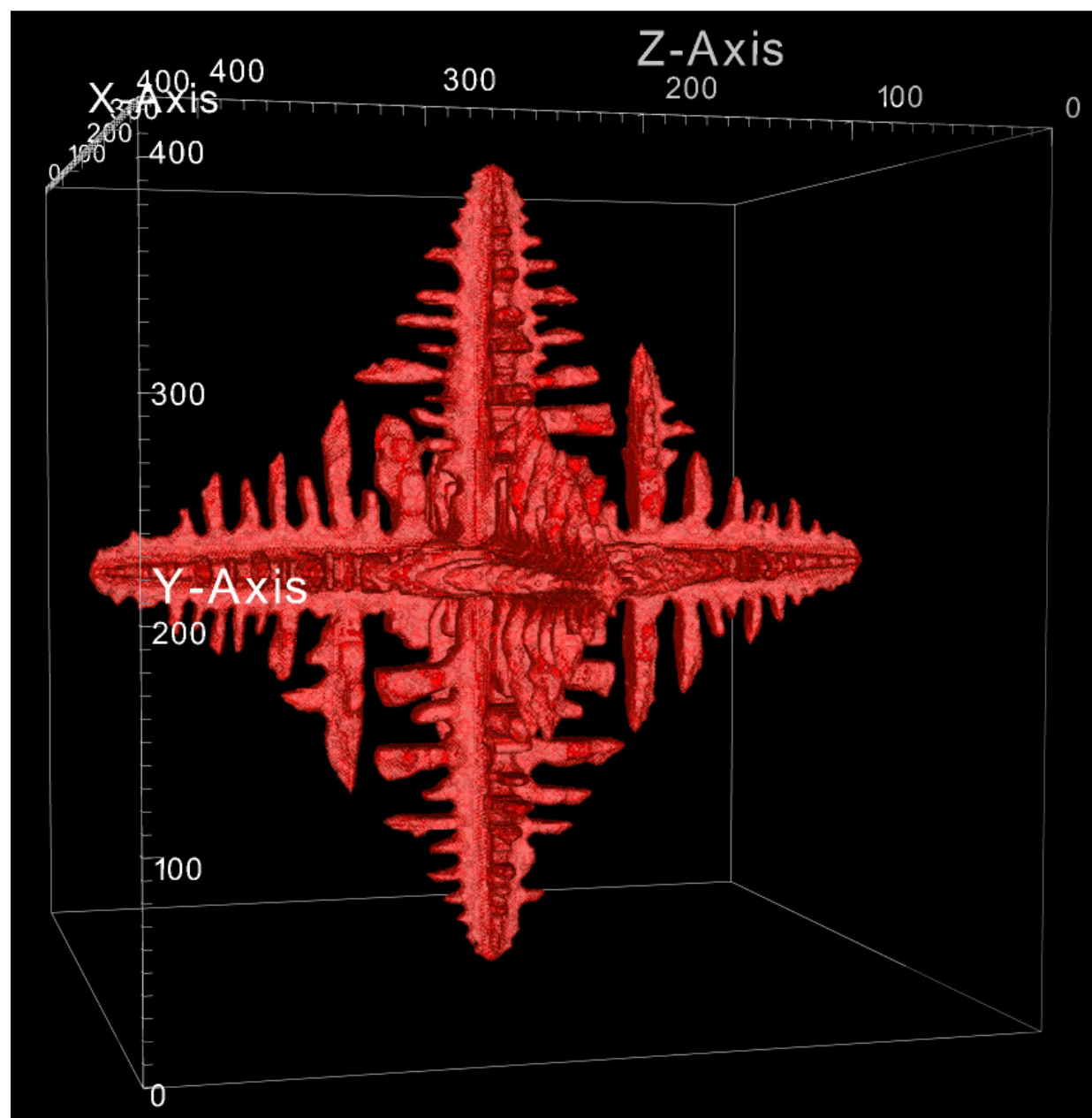
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Computer simulations have become the major workhorse of many engineering and science disciplines. Today, we simulate events ranging from crystal growth in metal alloys to tropical cyclones. Simultaneously, the scale, complexity, and variety of high performance computing systems keeps growing. Each new generation of systems is reducing the number of potential users who are able to fully harness their capabilities. New tools are required to regrow the community of developers that can create fully scalable and efficient numerical simulations. In this talk I'll highlight key challenges and solutions for this goal - so that developers can stop worrying about details of the supercomputer, and start focusing again on their science domain.