This year's modeling work focused on the numerical difficulties of simulating structures with discordant spatial and temporal scales. The result of this effort was the ability to simulate shock waves passing through an inhomogeneous media with multi-scale distributions of cloudlet structures (See Figure 1).

The disruption of the shock wave from hitting multiple, dense cloudlets imposes a complex, muti-scale structure on the shock front. The makes quantifying shock front parameters (velocity, acceleration, width, etc.) challenging. To deal with this challenge specialized software was designed to track the leading and trailing edges of the shock front (see Figure 2). This allows for detailed analysis of the evolution of the shock.

The ability to simulate multiple cloudlet distributions and analyze the ways that the cloudlets modify the evolution of the shock, allow for the testing of tradition analytical models of shock evolution. Currently we are testing the parametric limits of where the assumptions made in White and Long (1991). A paper entitled Numerical Verification of the White and Long SNR Model, is being prepared for publication in early 2015.

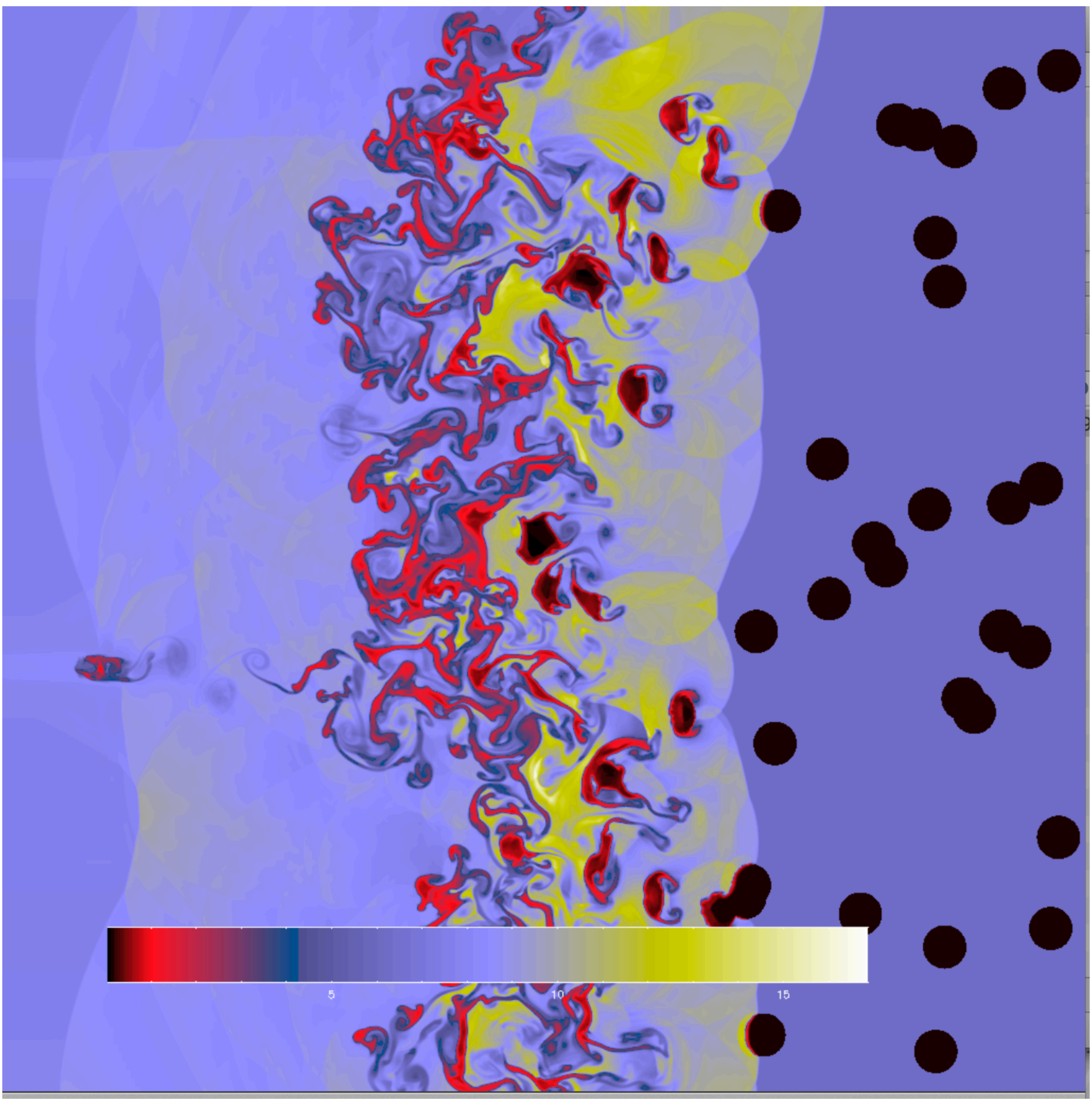

Figure 1: A simulation showing the temperature profile of a shockwave passing through an interstellar medium filled with randomly distributed, dense cloudlets. The initially simple shock front gains a complex multi-scale structure as the cloudlets disrupt it.

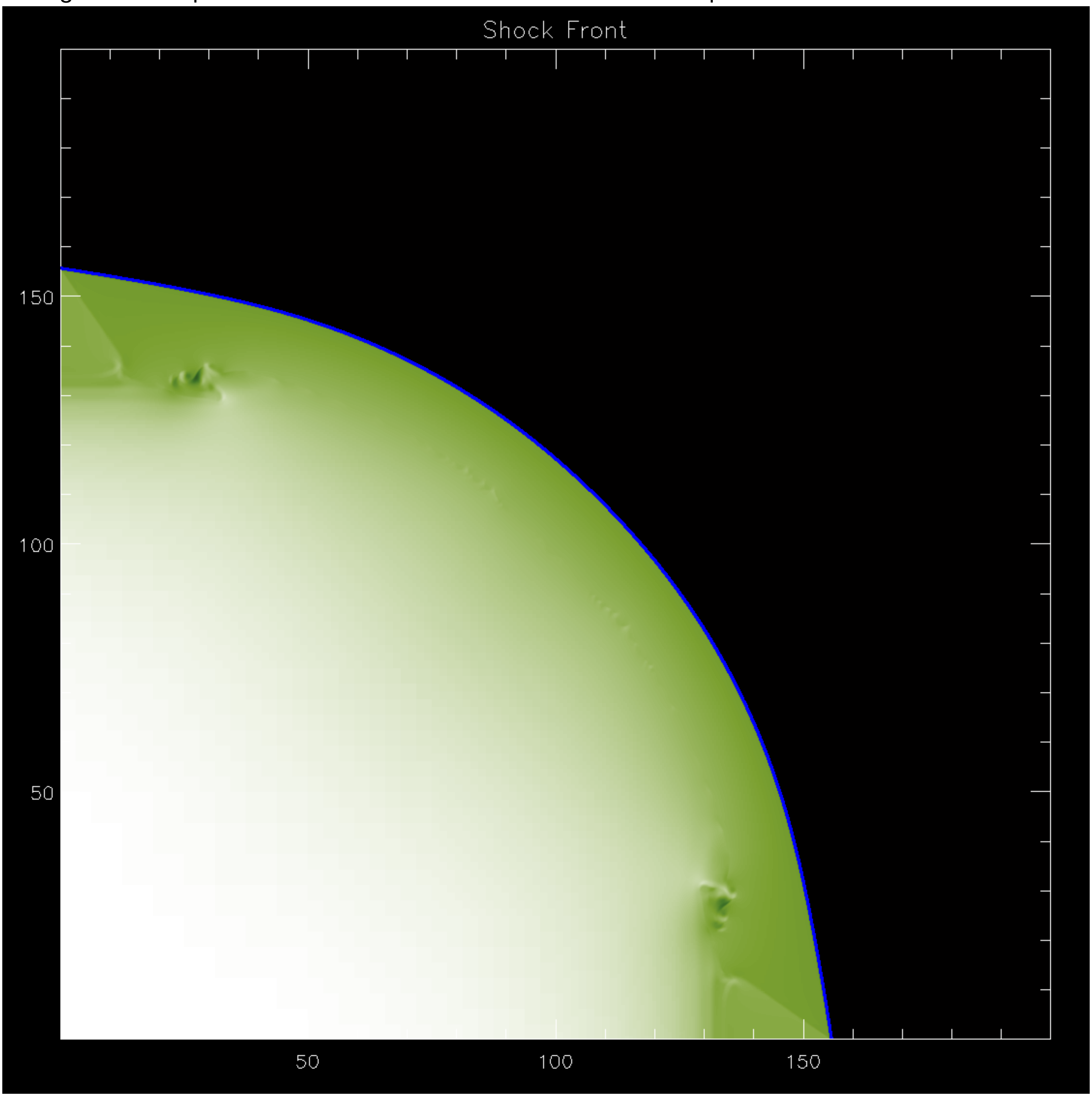

Figure 2: An image of the initial test of the shock front detection algorithm. The blue line indicates the leading edge of the shock.