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Simulating Atmospheric Heating with Bifrost

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The stellar atmospheric simulation code *Bifrost* is useful for exploring the plasma dynamics of the solar atmosphere, but also for tracking magnetically energetic events that may be efficient in heating the chromosphere and corona. In this study, a cube of quiet Sun was modeled in order to track a) the evolution of quiet Sun photosphere and atmosphere, and b) the effect of a horizontal magnetic flux sheet inserted at the bottom boundary of the computational box, located 2.5 Mm beneath the Solar surface. Before the horizontal flux insertion, a significant magnetic heating event took place in the simulation. The characteristics of this heating event are presented including time series of Joule and viscous heating, magnetic field properties, and plasma velocities. Magnetic field lines are traced in order to understand the topology of the field responsible for the heating, and the field geometry appears to be a bipolar loop with kG-strength footpoints in the photosphere. This bipolar loop is associated with a plasma bubble that extends to roughly 7 Mm above the Solar surface. Analysis of the Joule and viscous heating parameters indicates that a significant amount of heating occurs in the atmosphere when the loop and its associated plasma bubble collapse. A newly-developed test particle module in *Bifrost* called `corks` is employed in order to accurately trace the evolution of this magnetic feature from conception to collapse, and the associated heating may provide insight into how bipolar magnetic features can contribute to atmospheric heating, even in the quiet Sun.

Student poster?

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