# 1 De Villiers

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*Question* The funnel wall flow originates very close to the BH. Also the 'dancing" features appear close to it. Both might be affected by the BH boundary condition. I'm quite sure that you have applied a proper boundary condition over there, but I ask you to comment on it (tests, etc.) Great work!!

*Answer* Boundary conditions are always an issue in numerical work, and considerable effort goed into ensuring that the boundaries are not a source of instability or inappropriate behaviour. The methods paper (De Villiers & Hawley, ApJ 589, 458-480 (2003)) describes a test suite that was applied to the code. An important caution: it is often possible to 'tune" a code, especially its boundary conditions, to pass a given test with spectacular results. However, it sometimes happens that a choiceof boundary conditon which generates good test results fails spectacularly in 'realistic" simulations. The GRMHD code was tested with the same OUTFLOW boundary conditions as are currently used in all components of the test suite (with specific exceptions, e.g. Alfven pulse tests which required periodic boundary conditions).

An interesting note: a black hole can be a good thing to have as a physical boundary. The presence of the lapse function ($\alpha = 1/\sqrt{-g^{tt}}$) actually helps absorb waves impinging on the inner radial boundary, effectively by redshifting them to zero energy. So, the well known 'reflection problem" of outflow boundary conditions is effectively cured in the GRMHD code by the lapse function.

Having said that, boundary conditions will always remain a source of concern, frustration and aggravation in numerical code.