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# Escape coordinates outside black holes

Pieter Blue<sup>\*1</sup>

<sup>1</sup>University of Edinburgh – School of Mathematics The University of Edinburgh James Clerk Maxwell Building The King's Buildings Peter Guthrie Tait Road Edinburgh EH9 3FD, United Kingdom

## Abstract

In proving estimates of decay of fields outside black holes, it is now common to use a foliation by spacelike hypersurfaces that cross the event horizon and null infinity. The traditional way that this has been done is to work with the standard radial Schwarzschild-like coordinates away from the horizon and infinity, to use something like Eddington-Finkelstein coordinates near the boundaries, and to apply a smooth cut-off function to transition from one set of coordinates to another.

In this brief talk, I will describe new set of coordinates with all the desirable properties and which can be written as analytic expressions in the standard Schwarzschild-like coordinates. Several of the vector fields that arise in the decay of fields have surprisingly simple expressions in these coordinates. For null geodesics, these vector fields generate energies that can be treated as escape functions.

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<sup>\*</sup>Speaker