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Solutions in the 2+1 null surface formulation

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The null surface formulation of general relativity (NSF) differs from the standard approach by featuring a function Z, describing families of null surfaces, as the prominent variable, rather than the metric tensor. It is possible to reproduce the metric, to within a conformal factor, by using Z (entering through its third derivative, which is denoted by Λ) and an auxiliary function Ω. The functions Λ and Ω depend upon the spacetime coordinates, which are usually introduced in a manner that is convenient for the null surfaces, and also upon an additional angular variable. A brief summary of the (2+1)-dimensional null surface formulation is presented, together with the NSF field equations for Λ and Ω. A few special solutions are found and their properties explored. One such solution describes a spacetime for a perfect fluid source with variable mass-energy density.