described by the above model, since pressure between the subcondensations remains negligible. Presumably however near $Z = 0$ there will be collisions between subcondensations and much of the kinetic energy will then be converted into heat and radiated. We conjecture that there may also be a large-scale instability associated with the ordinary instability of the Maclaurin spheroids at an ellipticity of 0·9529. This may also give rise to a distribution of mass with a great concentration towards the centre, as envisaged by Mestel (2).

If the initial temperature is not small, so that the adiabatic compression gives pressures sufficient to support the system before growth of subcondensations, then the evolution will probably be governed by the rate at which energy can be radiated, a situation quite opposed to that considered here.

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A NON-SINGULAR ELECTROMAGNETIC FIELD

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In an earlier paper (2) the author and Radhakrishna have, under certain conditions, obtained the following result.

For every empty space-time associated with the metric

$$ds^2 = e^{\lambda-2v}(dt^2 - d\rho^2) - \rho^2 e^{-2v} d\Phi^2 - e^{2v} dz^2, \tag{1}$$

there exists an electromagnetic field *in vacuo* corresponding to the metric

$$ds^2 = e^{\lambda-\mu}(dt^2 - d\rho^2) - \rho^2 e^{-\mu} d\Phi^2 - e^{\mu} dz^2, \tag{2}$$

if μ is given by

$$e^{\mu} = (\alpha + \tfrac{1}{2}\beta^2)\operatorname{sech}^2 v. \tag{3}$$

Here λ, v and μ are functions of ρ and t only and α, β are arbitrary constants. α must, however, be positive. Also ρ, Φ, z and t correspond respectively to x^1, x^2, x^3 and x^4.

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The expressions for the non-vanishing components of the electromagnetic field tensor and the electromagnetic energy tensor are given by

$$\left.\begin{aligned} F_{31} &= -F_{13} = \left(\frac{2\alpha+\beta^2}{8\pi}\right)^{\frac{1}{2}} \operatorname{sech}^2 v v_1, \\ F_{34} &= -F_{43} = \left(\frac{2\alpha+\beta^2}{8\pi}\right)^{\frac{1}{2}} \operatorname{sech}^2 v v_4 \end{aligned}\right\} \tag{4}$$

and

$$\left.\begin{aligned} E^4_4 &= -E^1_1 = \left(\frac{2\alpha+\beta^2}{16\pi}\right) e^{-\lambda} \operatorname{sech}^4 v(v_1^2+v_4^2), \\ E^2_2 &= -E^3_3 = \left(\frac{2\alpha+\beta^2}{16\pi}\right) e^{-\lambda} \operatorname{sech}^4 v(v_1^2-v_4^2), \\ E^4_1 &= -E^1_4 = \left(\frac{2\alpha+\beta^2}{8\pi}\right) e^{-\lambda} \operatorname{sech}^4 v v_1 v_4, \end{aligned}\right\} \tag{5}$$

respectively. Here the lower suffixes 1 and 4 after an unknown function imply a partial differentiation with respect to ρ and t respectively and λ, v satisfy the equations

$$\lambda_1 = 2\rho(v_1^2+v_4^2), \tag{6}$$

$$\lambda_4 = 4\rho v_1 v_4, \tag{7}$$

$$v_{11} - v_{44} + \frac{v_1}{\rho} = 0, \tag{8}$$

the last of which is the Euclidean wave equation in cylindrical coordinates.

If we consider the empty space-time associated with (1) for which v and λ are given by (1)

$$v = 2^{\frac{1}{2}} b\,[u+(u^2+w^2)^{\frac{1}{2}}]^{\frac{1}{2}}\,[u^2+w^2]^{-\frac{1}{2}}, \tag{9}$$

$$\lambda = -\frac{2b^2\rho^2(u^2-w^2)}{(u^2+w^2)^2} + \frac{b^2}{c^2}\left[\frac{\rho^2-t^2-c^2}{(u^2+w^2)^{\frac{1}{2}}}+1\right], \tag{10}$$

where

$$u = \rho^2 - t^2 + c^2, \quad w = 2ct, \tag{11}$$

b, c being arbitrary constants, then it obviously follows that the corresponding solution representing an electromagnetic field *in vacuo* is given by (2), (3), (4), (9), (10) and (11). This solution is non-singular in the same sense as Bonnor's (1).

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