Evolution equations for vacuum G_2-models containing both Gowdy and Bianchi $VI^*_{-\frac{1}{9}}$

November 9, 2010

$$\partial_0 E = (q + 2\Sigma_+)E \tag{1}$$

$$\partial_0 \Sigma_+ = (q-2)\Sigma_+ - 2(N_-^2 + N_c^2) + \frac{1}{3}(E\partial_x - r)A + 3\Sigma_2^2 - \frac{1}{3}(E\partial_x - r + u + A)u \tag{2}$$

$$\partial_0 \Sigma_- = (q-2)\Sigma_- - 2\sqrt{3}N_-^2 - (E\partial_x - r + u - 2A)N_c - \sqrt{3}\Sigma_2^2 + 2\sqrt{3}\Sigma_c^2 \tag{3}$$

$$\partial_0 \Sigma_c = (q-2)\Sigma_c - 2\sqrt{3}N_- N_c + (E\partial_x - r + u - 2A)N_- - 2\sqrt{3}\Sigma_-\Sigma_c \tag{4}$$

$$\partial_0 \Sigma_2 = (q - 2 - 3\Sigma_+ + \sqrt{3}\Sigma_-)\Sigma_2 \tag{5}$$

$$\partial_0 N_- = (q + 2\Sigma_+ + 2\sqrt{3}\Sigma_-)N_- + (E\partial_x - r + u + 2\sqrt{3}N_c)\Sigma_c \tag{6}$$

$$\partial_0 N_c = (q + 2\Sigma_+)N_c - (E\partial_x - r + u)\Sigma_- \tag{7}$$

$$\partial_0 A = (q + 2\Sigma_+)A - (E\partial_x - r - u)(1 + \Sigma_+) \tag{8}$$

Note:

- $q = 2(\Sigma_+^2 + \Sigma_-^2 + \Sigma_2^2 + \Sigma_c^2) + \frac{1}{2}(3\gamma - 2)\Omega - \frac{1}{3}(E\partial_x - r + u - 2A)u$
- $X = (E, \Sigma_+, \Sigma_-, \Sigma_c, \Sigma_2, N_-, N_c, A)$ are functions of (x,t) where $x \in S^1$
- r, u are abbreviations composed of variables in the state space X, like q
- additionally: Equation for Matter (including the "Matter density" Ω), the Gauss and Condazzi contraints...
- $BVI^*_{-\frac{1}{9}}$ is defined by the conditions $E = u = r = 0$ and $N_c = \sqrt{3}A$
- Gowdy is defined by $\Sigma_2 = 0$ and $A = 0$