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1  from shared import *
2  import cdblib
3
4  jsonfile = 'prd62.json'
5  cdblib.create (jsonfile)
6
7  # -----
8  # eqn 09
9  lhs := \partial_{t}{gBar_{i j}}.                # cdb(prd62.eq09.lhs, lhs)
10 rhs := -2 N ABar_{i j}.                        # cdb(prd62.eq09.rhs, rhs)
11
12 cdblib.put ('prd62.eq09.lhs', lhs, jsonfile)
13 cdblib.put ('prd62.eq09.rhs', rhs, jsonfile)
14
15 # -----
16 # eqn 10
17 lhs := \partial_{t}{\phi}.                        # cdb(prd62.eq10.lhs, lhs)
18 rhs := -(1/6) N trK.                            # cdb(prd62.eq10.rhs, rhs)
19
20 cdblib.put ('prd62.eq10.lhs', lhs, jsonfile)
21 cdblib.put ('prd62.eq10.rhs', rhs, jsonfile)
22
23 # -----
24 # eqn 11
25 lhs := \partial_{t}{K}.                            # cdb(prd62.eq11.lhs, lhs)
26 rhs := - g^{i j} D_{i j}{N}                      # cdb(prd62.eq11.rhs, rhs)
27         + N (ABar_{i j} ABar^{i j} + (1/3) trK**2).
28
29 cdblib.put ('prd62.eq11.lhs', lhs, jsonfile)
30 cdblib.put ('prd62.eq11.rhs', rhs, jsonfile)
31
32 # -----
33 # eqn 12
34 lhs := \partial_{t}{ABar_{i j}}.                    # cdb(prd62.eq12.lhs, lhs)
35 rhs := N (trK ABar_{i j} - 2 ABar_{i a} ABar^{a}_{j})
36         + \exp(-4\phi) (N R_{i j} - D_{i j}{N})

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37         - (1/3) g_{i j} (N R_{a b} - D_{a b}{N}) g^{a b}).      # cdb(prd62.eq12.rhs,rhs)
38
39 cdblib.put ('prd62.eq12.lhs',lhs,jsonfile)
40 cdblib.put ('prd62.eq12.rhs',rhs,jsonfile)
41
42 # -----
43 # eqn 15
44 lhs := R^{\phi}_{i j}.                                           # cdb(prd62.eq15.lhs,lhs)
45 rhs := - 2 DBar_{a b}{\phi}
46         - 2 gBar_{a b} gBar^{c d} DBar_{c d}{\phi}
47         + 4 DBar_{a}{\phi} DBar_{b}{\phi}
48         - 4 gBar_{a b} gBar^{c d} DBar_{c}{\phi} DBar_{d}{\phi}.
49                                                         # cdb(prd62.eq15.rhs,rhs)
50
51 cdblib.put ('prd62.eq15.lhs',lhs,jsonfile)
52 cdblib.put ('prd62.eq15.rhs',rhs,jsonfile)
53
54 # -----
55 # eqn 17
56 lhs := GammaBar^i.                                              # cdb(prd62.eq17.lhs,lhs)
57 rhs := - \partial_j{gBar^i j}.                                  # cdb(prd62.eq17.rhs,rhs)
58
59 cdblib.put ('prd62.eq17.lhs',lhs,jsonfile)
60 cdblib.put ('prd62.eq17.rhs',rhs,jsonfile)
61
62 # -----
63 # eqn 18
64 lhs := RBar_{i j}.                                              # cdb(prd62.eq18.lhs,lhs)
65 rhs := - (1/2) gBar^{l m} \partial_{l m}{gBar_{a b}}
66         + (1/2) gBar_{k a} \partial_b{GammaBar^k}
67         + (1/2) gBar_{k b} \partial_a{GammaBar^k}
68         + (1/2) GammaBar^k GammaBar_{a b k}
69         + (1/2) GammaBar^k GammaBar_{b a k}
70         + gBar^{l m} gBar^{k e} ( GammaBar_{e l a} GammaBar_{b k m}
71                                 + GammaBar_{e l b} GammaBar_{a k m}
72                                 + GammaBar_{k a m} GammaBar_{e l b}).    # cdb(prd62.eq18.rhs,rhs)
73
74 cdblib.put ('prd62.eq18.lhs',lhs,jsonfile)

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75 cdblib.put ('prd62.eq18.rhs',rhs,jsonfile)
76
77 # -----
78 # eqn 19
79 lhs := \partial_{t}{GammaBar^{i}}. # cdb(prd62.eq19.lhs,lhs)
80 rhs := - \partial_{j}{2 N ABar^{i j}}. # cdb(prd62.eq19.rhs,rhs)
81
82 cdblib.put ('prd62.eq19.lhs',lhs,jsonfile)
83 cdblib.put ('prd62.eq19.rhs',rhs,jsonfile)
84
85 # -----
86 # eqn 20
87 lhs := \partial_{t}{GammaBar^{i}}. # cdb(prd62.eq20.lhs,lhs)
88 rhs := - 2 ABar^{i j} \partial_{j}{N}
89         + 2 N ( GammaBar^{i}_{j k} ABar^{k j}
90                 - (2/3) gBar^{i j} \partial_{j}{trK}
91                 + 6 ABar^{i j} \partial_{j}{\phi}). # cdb(prd62.eq20.rhs,rhs)
92
93 cdblib.put ('prd62.eq20.lhs',lhs,jsonfile)
94 cdblib.put ('prd62.eq20.rhs',rhs,jsonfile)

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$$\partial_t \bar{g}_{ij} = -2N \bar{A}_{ij} \quad (\text{prd62.eq09.rhs})$$

$$\partial_t \phi = -\frac{1}{6} N \text{tr} K \quad (\text{prd62.eq10.rhs})$$

$$\partial_t K = -g^{ij} D_{ij} N + N \left(\bar{A}_{ij} \bar{A}^{ij} + \frac{1}{3} \text{tr} K^2 \right) \quad (\text{prd62.eq11.rhs})$$

$$\partial_t \bar{A}_{ij} = N \left(\text{tr} K \bar{A}_{ij} - 2 \bar{A}_{ia} \bar{A}^a{}_j \right) + \exp(-4\phi) \left(N R_{ij} - D_{ij} N - \frac{1}{3} g_{ij} (N R_{ab} - D_{ab} N) g^{ab} \right) \quad (\text{prd62.eq12.rhs})$$

$$\bar{\Gamma}^i = -\partial_j \bar{g}^{ij} \quad (\text{prd62.eq17.rhs})$$

$$\partial_t \bar{\Gamma}^i = -2 \partial_j (N \bar{A}^{ij}) \quad (\text{prd62.eq19.rhs})$$

$$= -2 \bar{A}^{ij} \partial_j N + 2N \left(\bar{\Gamma}^i{}_{jk} \bar{A}^{kj} - \frac{2}{3} \bar{g}^{ij} \partial_j \text{tr} K + 6 \bar{A}^{ij} \partial_j \phi \right) \quad (\text{prd62.eq20.rhs})$$

$$R^\phi{}_{ij} = -2 \bar{D}_{ab} \phi - 2 \bar{g}_{ab} \bar{g}^{cd} \bar{D}_{cd} \phi + 4 \bar{D}_a \phi \bar{D}_b \phi - 4 \bar{g}_{ab} \bar{g}^{cd} \bar{D}_c \phi \bar{D}_d \phi \quad (\text{prd62.eq15.rhs})$$

$$\bar{R}_{ij} = -\frac{1}{2} \bar{g}^{lm} \partial_{lm} \bar{g}_{ab} + \frac{1}{2} \bar{g}_{ka} \partial_b \bar{\Gamma}^k + \frac{1}{2} \bar{g}_{kb} \partial_a \bar{\Gamma}^k + \frac{1}{2} \bar{\Gamma}^k \bar{\Gamma}_{abk} + \frac{1}{2} \bar{\Gamma}^k \bar{\Gamma}_{bak} + \bar{g}^{lm} \bar{g}^{ke} (\bar{\Gamma}_{ela} \bar{\Gamma}_{bkm} + \bar{\Gamma}_{elb} \bar{\Gamma}_{akm} + \bar{\Gamma}_{kam} \bar{\Gamma}_{elb}) \quad (\text{prd62.eq18.rhs})$$