PhysRevD.62.044034 equation (20)

```
from shared import *
import cdblib

jsonfile = 'bssn-eqtns-20.json'
cdblib.create (jsonfile)

# ------------------------------------------------------------------------

DGiBarDt := \partial_{t}{GammaBar^{i}}.                  # cdb(eq20.00,DGiBarDt)
DGiBarDt := - 2 ABar^{i j} \partial_{j}{N}
            + 2 N (  GammaBar^{i}_{j k} ABar^{k j}
                   - (2/3) gBar^{i j} \partial_{j}{trK}
                   + 6 ABar^{i j} \partial_{j}{\phi}).   # cdb(eq20.01,DGiBarDt)

substitute   (DGiBarDt,defGammaBarU)                     # cdb(eq20.02,DGiBarDt)

distribute   (DGiBarDt)
DGiBarDt = product_sort (DGiBarDt)                       # cdb(eq20.03,DGiBarDt)

canonicalise (DGiBarDt)                                  # cdb(eq20.04,DGiBarDt)
                                                         # cdb(eq20.99,DGiBarDt)

cdblib.put ('DGiBarDt',DGiBarDt,jsonfile)
```

$$\partial_t \bar{\Gamma}^i = -2\bar{A}^{ij}\partial_j N + 2N\left(\bar{\Gamma}^i{}_{jk}\bar{A}^{kj} - \frac{2}{3}\bar{g}^{ij}\partial_j \mathrm{tr}K + 6\bar{A}^{ij}\partial_j\phi\right) \tag{eq20.01}$$

$$= -2\bar{A}^{ij}\partial_j N + 2N\left(\frac{1}{2}\bar{g}^{ie}\left(\partial_j\bar{g}_{ek} + \partial_k\bar{g}_{je} - \partial_e\bar{g}_{jk}\right)\bar{A}^{kj} - \frac{2}{3}\bar{g}^{ij}\partial_j \mathrm{tr}K + 6\bar{A}^{ij}\partial_j\phi\right) \tag{eq20.02}$$

$$= -2\bar{A}^{ia}\partial_a N + N\bar{A}^{ab}\bar{g}^{ic}\partial_b\bar{g}_{ca} + N\bar{A}^{ab}\bar{g}^{ic}\partial_a\bar{g}_{bc} - N\bar{A}^{ab}\bar{g}^{ic}\partial_c\bar{g}_{ba} - \frac{4}{3}N\bar{g}^{ia}\partial_a \mathrm{tr}K + 12N\bar{A}^{ia}\partial_a\phi \tag{eq20.03}$$