such as the vacuum, translation invariance dictates that the dependence on r drops out entirely, and the Wigner transforms then coincide with the momentum-space Fourier transforms of the Green functions and self energies. Although we will in the present paper consider the evolution of a fragmenting jet system in vacuum, the subsequent formulation is tailored to apply also to more general translation *non*-invariant situations in moderately inhomogenous media.

The Dyson-Schwinger equations (28) can now be converted into kinetic equations by performing the Wigner transformation (31) for all Green functions and self energies, and using (33). One arrives at two distinct equations for each of the Wigner transforms $\mathcal{S}$, $\mathcal{D}$ and Δ ($\tilde{\Delta}$), with rather different physical interpretations: (i) a *transport equation*, and (ii) a *constraint equation*. The *transport equations* are

$$\begin{aligned}
p \cdot \partial_r \, \mathcal{S}_{ij}(r,p) \;&=\; \frac{1}{2}\,\delta_{ij}\,\gamma \cdot \partial_r \;+\; \frac{1}{4}(\gamma \cdot p \,+\, \Sigma)\,\mathcal{F}_{ij}^{(+)} \;+\; \frac{i}{8}\gamma \cdot \partial_r \,\mathcal{F}_{ij}^{(-)} \\
p \cdot \partial_r \, \mathcal{D}_{ab}^{\mu\nu}(r,p) \;&=\; \frac{1}{4}\,\mathcal{G}_{ab}^{\mu\nu\,(+)} \\
p \cdot \partial_r \, \Delta(r,p) \;&=\; -\frac{1}{4}\,\mathcal{H}^{(+)} \,,
\end{aligned} \tag{34}$$

whilst the *constraint equations* are

$$\begin{aligned}
\left[\left(p^2 - \frac{1}{4}\partial_r^2\right)\delta_{ik} \,-\, \Sigma_{ik}^2(r,p)\right]\,\mathcal{S}_{kj}(r,p) \;&=\; \delta_{ij}\,(\gamma \cdot p + \Sigma) \,+\, \frac{i}{4}(\gamma \cdot p + \Sigma)\,\mathcal{F}_{ij}^{(-)} \,-\, \frac{1}{8}\,\gamma \cdot \partial_r\,\mathcal{F}_{ij}^{(+)} \\
\left[g_\sigma^\mu\left(p^2 \,-\, \frac{1}{4}\partial_r^2\right)\delta_{ac} \,-\, \Pi_{\sigma,\,a,c}^\mu(r,p)\right]\,\mathcal{D}_{cb}^{\sigma\nu}(r,p) \;&=\; -\,\delta_{ab}\left(g_{\mu\nu} - \mathcal{E}^{\mu\nu}\right) \,+\, \frac{i}{4}\,\mathcal{G}_{ab}^{\mu\nu\,(-)} \\
\left[p^2 \,-\, \frac{1}{4}\partial_r^2 \,+\, \Xi(r,p)\right]\,\Delta(r,p) \;&=\; 1 \,-\, \frac{i}{4}\,\mathcal{H}^- \,.
\end{aligned} \tag{35}$$

The equations for $\tilde{\Delta}$ are formally identical to those of Δ. The operator functions $\mathcal{F}$, $\mathcal{G}$, and $\mathcal{H}$ ($\tilde{\mathcal{H}}$), which include the effects of spatial inhomogenities, are given by ($\partial_r^\mu \equiv \partial/\partial r^\mu$ $\partial_p^\mu \equiv \partial/\partial p^\mu$):

$$\begin{aligned}
\mathcal{F}_{ij}^{(-)} \;&=\; \left(\left[\partial_p^\mu\Sigma\,,\partial_\mu^r\mathcal{S}\right]_- - \left[\partial_r^\mu\Sigma\,,\partial_\mu^p\mathcal{S}\right]_-\right)_{ij} &\qquad \mathcal{F}_{ij}^{(+)} \;&=\; \left(\left\{\partial_p^\mu\Sigma\,,\partial_\mu^r\mathcal{S}\right\}_+ - \left\{\partial_r^\mu\Sigma\,,\partial_\mu^p\mathcal{S}\right\}_+\right)_{ij} \\
\mathcal{G}_{ab}^{\mu\nu\,(-)} \;&=\; \left(\left[\partial_p^\mu\Pi\,,\partial_\mu^r\mathcal{D}\right]_- - \left[\partial_r^\mu\Pi\,,\partial_\mu^p\mathcal{D}\right]_-\right)_{ab}^{\mu\nu} &\qquad \mathcal{G}_{ab}^{\mu\nu\,(+)} \;&=\; \left(\left\{\partial_p^\mu\Pi\,,\partial_\mu^r\mathcal{D}\right\}_+ - \left\{\partial_r^\mu\Pi\,,\partial_\mu^p\mathcal{D}\right\}_+\right)_{ab}^{\mu\nu} \\
\mathcal{H}^- \;&=\; \left[\partial_p^\mu\Xi\,,\partial_\mu^r\Delta\right]_- \,-\, \left[\partial_r^\mu\Xi\,,\partial_\mu^p\Delta\right]_- &\qquad \mathcal{H}^+ \;&=\; \left\{\partial_p^\mu\Xi\,,\partial_\mu^r\Delta\right\}_+ \,-\, \left\{\partial_r^\mu\Xi\,,\partial_\mu^p\Delta\right\}_+ \,.
\end{aligned} \tag{36}$$

Eqs. (34) and (35) are our general master equations. The physical significance [19] of the transport equations (34) and the constraint equations (35) is that the former essentially