We introduce a variation of the classical normalized Ricci flow equations that modifies the volume constraint of those equations to a scalar curvature constraint. The resulting equations are named the conformal Ricci flow equations because of the role that conformal geometry plays in constraining the scalar curvature. These new equations are given by

\[
\frac{\partial g}{\partial t} + 2(\text{Ric}(g) + \frac{1}{n}g) = -pg
\]

\[
R(g) = -1
\]

for a dynamically evolving metric \( g \) and a non-dynamical scalar field \( p \), known as the conformal pressure. The conformal Ricci flow equations are analogous to the Navier-Stokes equations of fluid mechanics

\[
\frac{\partial v}{\partial t} + \nabla_v v + \nu \Delta v = -\text{grad} \ p
\]

\[
\text{div} \ v = 0
\]

Just as the real physical pressure in fluid mechanics serves to maintain the incompressibility constraint of the fluid, the conformal pressure serves as a Lagrange multiplier to conformally deform the metric flow so as to maintain the scalar curvature constraint. The conformal Ricci flow equations can be thought of as Navier-Stokes equations for the metric and also as a parabolic model for the \textit{conformally reduced Einstein evolution equations}. (Received September 14, 2014)