

§ A Ricci flow with surgery

While the Ricci flow is powerful , it can develop singularities in finite time , where the curvature becomes unbounded . To continue the flow past these singularities , Hamilton introduced the concept of Ricci flow with surgery .

This process involves:

1. Singularity Formation : As the Ricci flow evolves , certain regions of the manifold may develop singularities , such as neck pinches or cusps .
2. Surgery : At the points where singularities form , the manifold is "cut" or "modified" in a controlled way to remove the singular regions . This involves:
 - Removing the singular part of the manifold .
 - Gluing in standard geometric pieces (such as caps or cylinders) to smooth out the manifold .
3. Continuation of the Flow : After surgery , the Ricci flow is restarted on the modified manifold , and the process continues .

Ricci flow with surgery is a sophisticated mathematical technique that extends the classical Ricci flow by allowing for the removal of singularities and the continuation of the flow .