# Article information:

Geodynamics of continental rift initiation and evolution | Nature Reviews Earth & Environment  
<https://www.nature.com/articles/s43017-023-00391-3>

# Article summary:

1. Continental rifts are formed when the lithosphere is thinned by tectonic activity, and their success or failure depends on the interplay between geodynamic forces and mechanical resistance.

2. Rifting initiates through exploiting inherited weaknesses, generating dynamic competition, and thinning of the lithosphere prompts continuous changes in the rift system force balance.

3. Successful continent-scale rifts feature an abrupt increase in divergence velocity once the lithosphere is sufficiently weakened, while failed rifts result from increasing resistance within the rift or waning driving forces.

# Article rating:

Appears moderately imbalanced: The article provides some useful information, but is missing several important points or pieces of evidence that would be required to present the discussed topics in a balanced and reliable way. You are encouraged to seek a more balanced perspective on the presented issues by exploring the provided research topics and looking at different information sources.

# Article analysis:

The article "Geodynamics of continental rift initiation and evolution" provides a comprehensive overview of the processes that control the formation and evolution of continental rifts. The authors discuss the interplay between driving forces, resisting factors, and weakening processes that determine whether a rift will succeed or fail. They also highlight the economic and societal relevance of rifts as sources of geothermal energy and ore deposits, but also as hazards due to earthquakes, volcanism, and CO2 degassing.

Overall, the article is well-written and informative, providing a detailed analysis of the complex processes involved in continental rifting. However, there are some potential biases and limitations to consider.

One-sided reporting: The article focuses primarily on successful rifts that lead to ocean basin formation rather than failed rifts. While it acknowledges that failed rifts can reactivate after hundreds of millions of years if local force balance changes, it does not provide much detail on why some rifts fail while others succeed.

Unsupported claims: The authors suggest that mantle plumes always aid continental rifting by enhancing driving forces and reducing lithospheric strength through magmatic intrusions. However, they also note that some rifts proceed without flood basalt eruptions. This raises questions about whether plumes are truly necessary for successful rifting or if other factors can compensate for their absence.

Missing evidence for claims made: The authors suggest that melt generation during mantle plume impingement can weaken the lithosphere by an order of magnitude, aiding the development of successful rifts. However, they do not provide direct evidence for this claim or explain how it has been quantified.

Unexplored counterarguments: The article does not explore alternative explanations for why some continental interiors remain stable over hundreds of millions of years despite tectonic driving forces being smaller than lithospheric strength. For example, could inherited structures such as cratons play a role in stabilizing continental interiors?

Promotional content: While the article highlights the economic and societal relevance of rifts as sources of geothermal energy and ore deposits, it does not provide much detail on potential risks associated with these resources. For example, geothermal energy production can cause induced seismicity22 while mining activities can have significant environmental impacts23.

Partiality: The article presents both driving forces (such as subduction-related forces) and resisting factors (such as overall rift strength) but does not give equal weight to each factor. It suggests that subduction-related forces are potentially the largest driver of continental extension but does not provide much detail on how other factors such as mantle convection or lithospheric buoyancy contribute to rifting.

In conclusion, while "Geodynamics of continental rift initiation and evolution" provides a valuable overview of the processes involved in continental rifting, there are some potential biases and limitations to consider. These include one-sided reporting on successful versus failed rifts, unsupported claims about plume-induced lithospheric weakening, missing evidence for certain claims made (such as melt generation weakening), unexplored counterarguments (such as inherited structures stabilizing continents), promotional content regarding resource extraction without noting associated risks, and partiality towards subduction-related forces over other contributing factors.

# Topics for further research:

* Craton stability and continental interior stability
* Risks associated with geothermal energy production
* Environmental impacts of mining activities
* Lithospheric buoyancy and its role in rifting
* Alternative explanations for failed rifts
* Quantification of lithospheric weakening due to mantle plume impingement

# Report location:

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