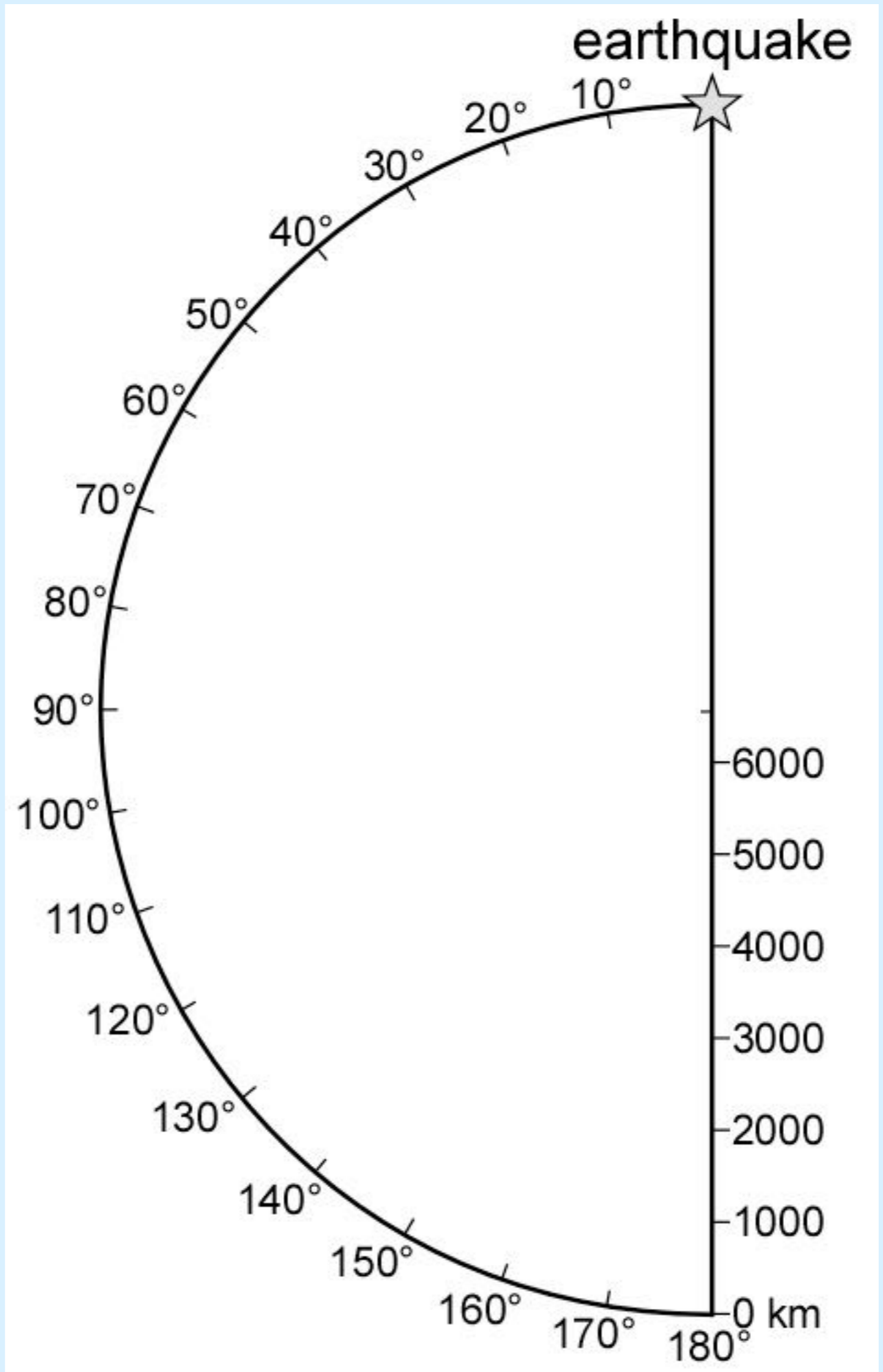
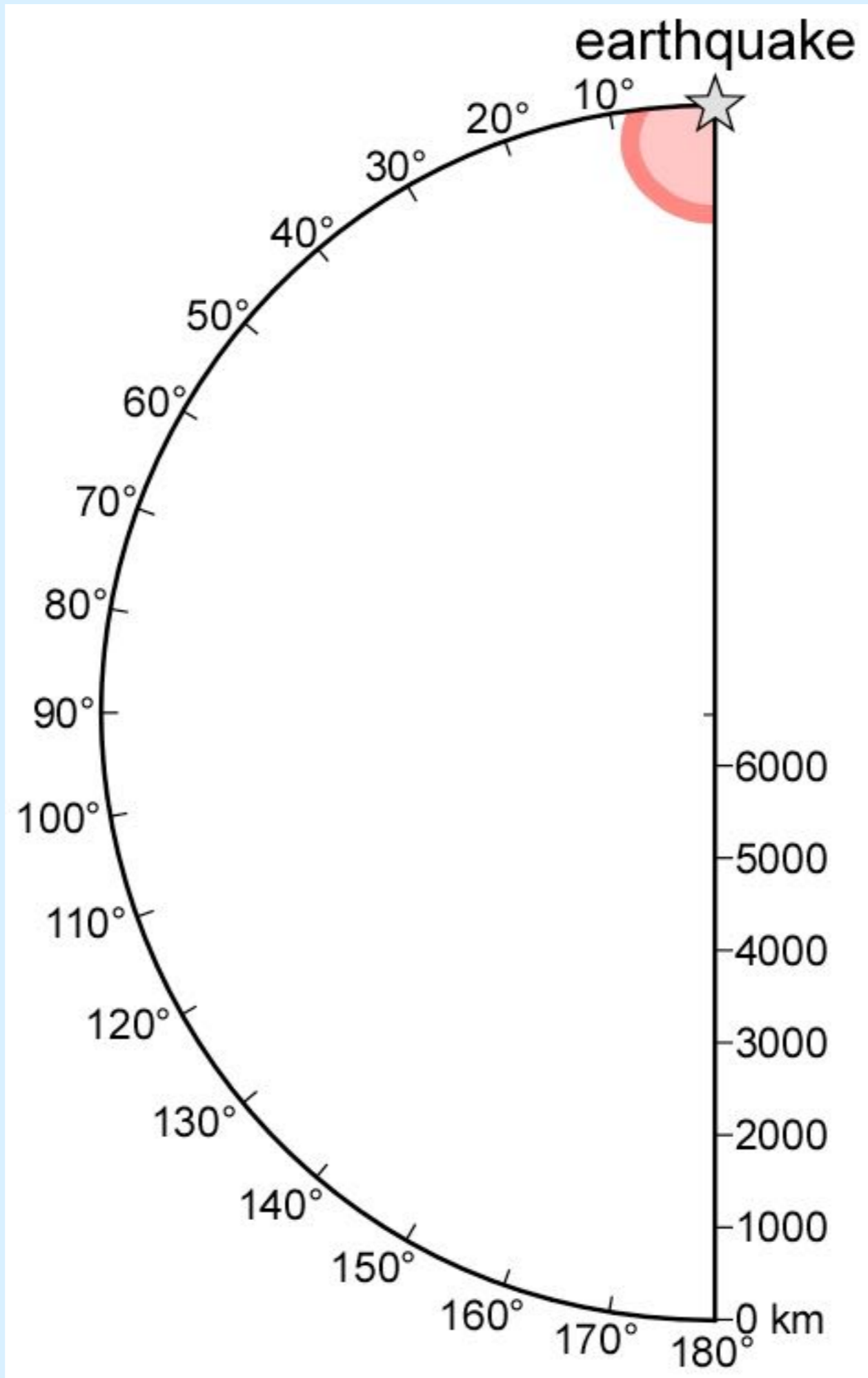
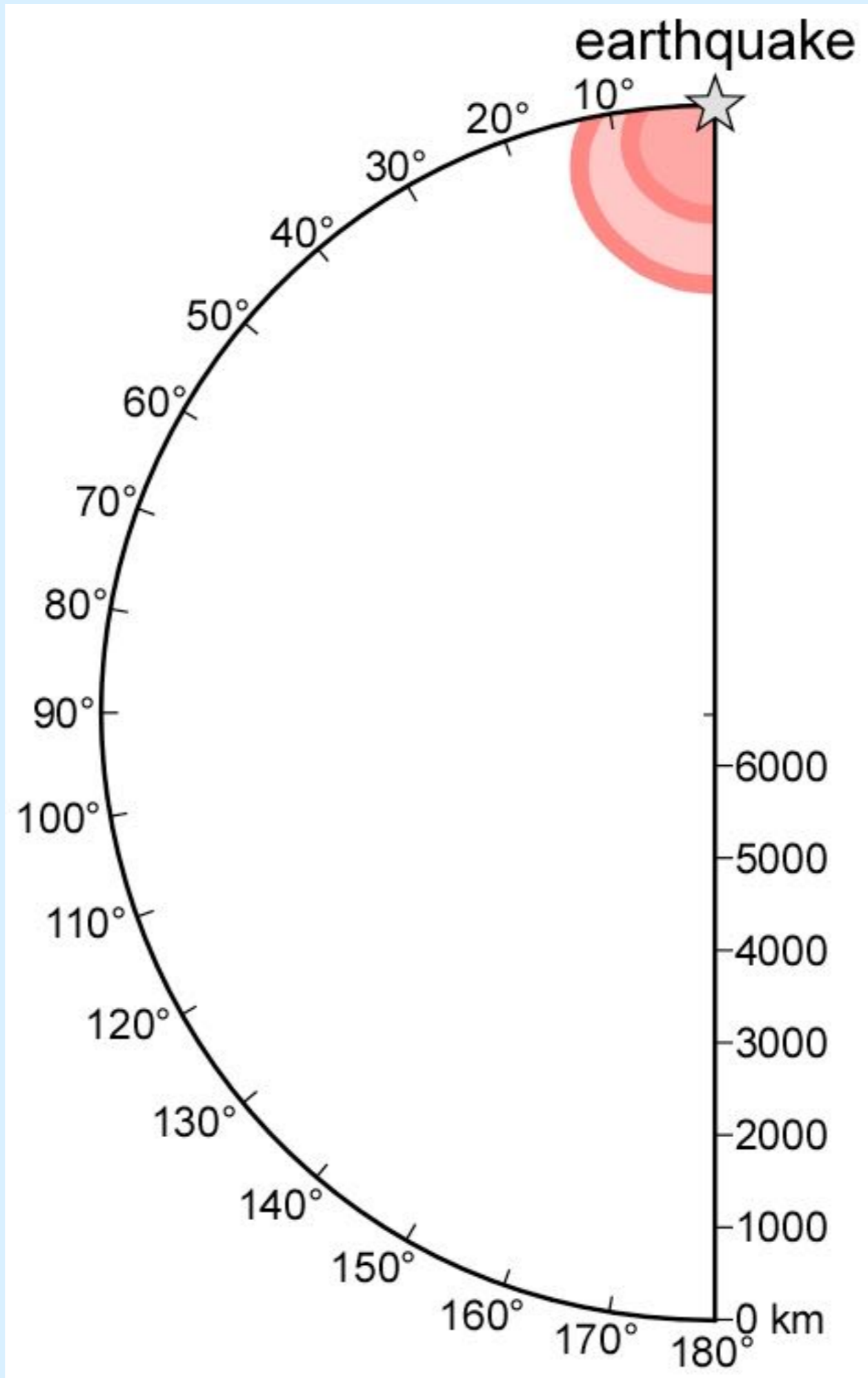


**What do the  
reproducible  
observations  
(*i.e.*, the data)  
tell us about the  
inside of Earth?**

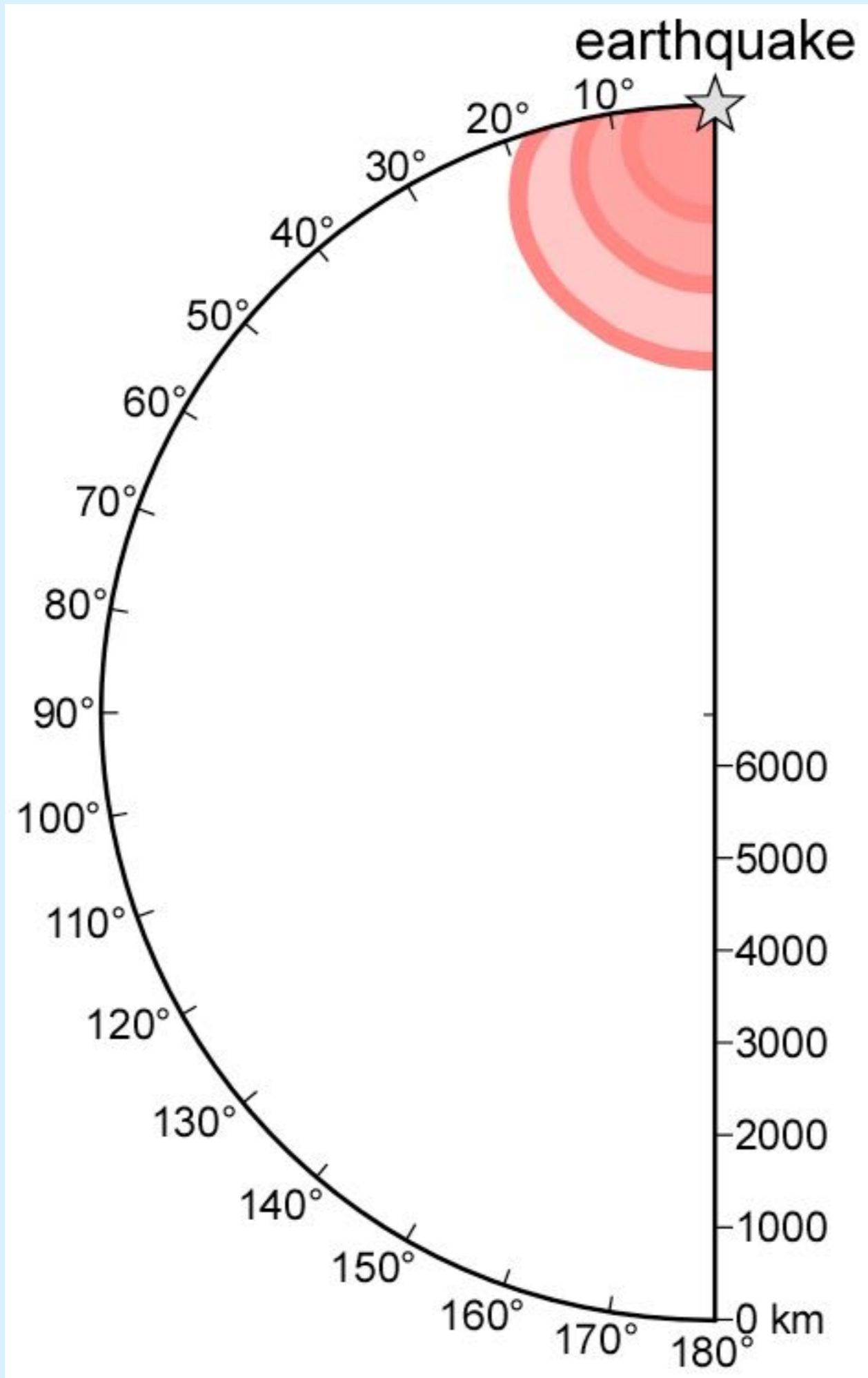




**P-wave front  
emerging  
from  
earthquake  
focus**

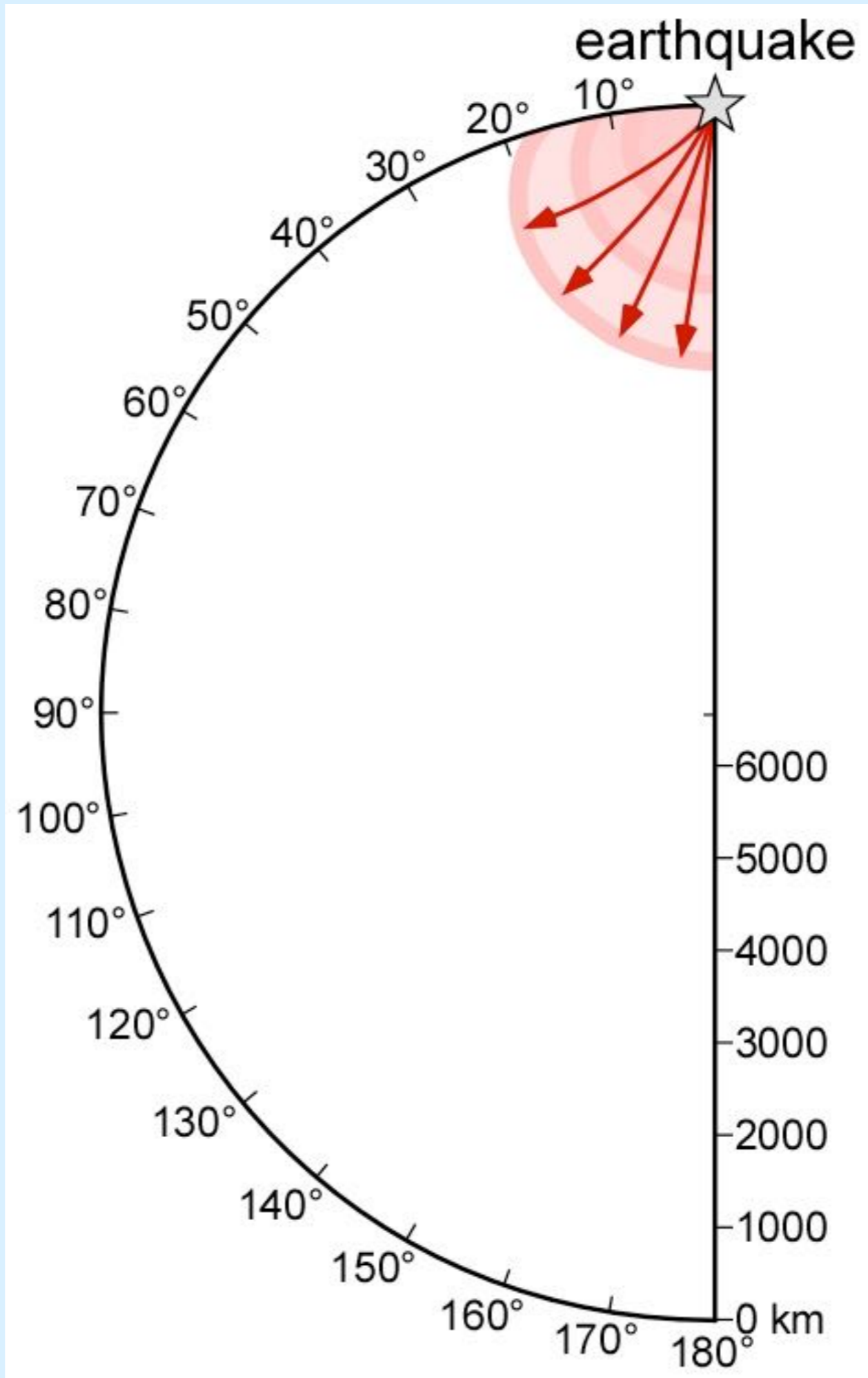


**P-wave front  
emerging  
from  
earthquake  
focus**

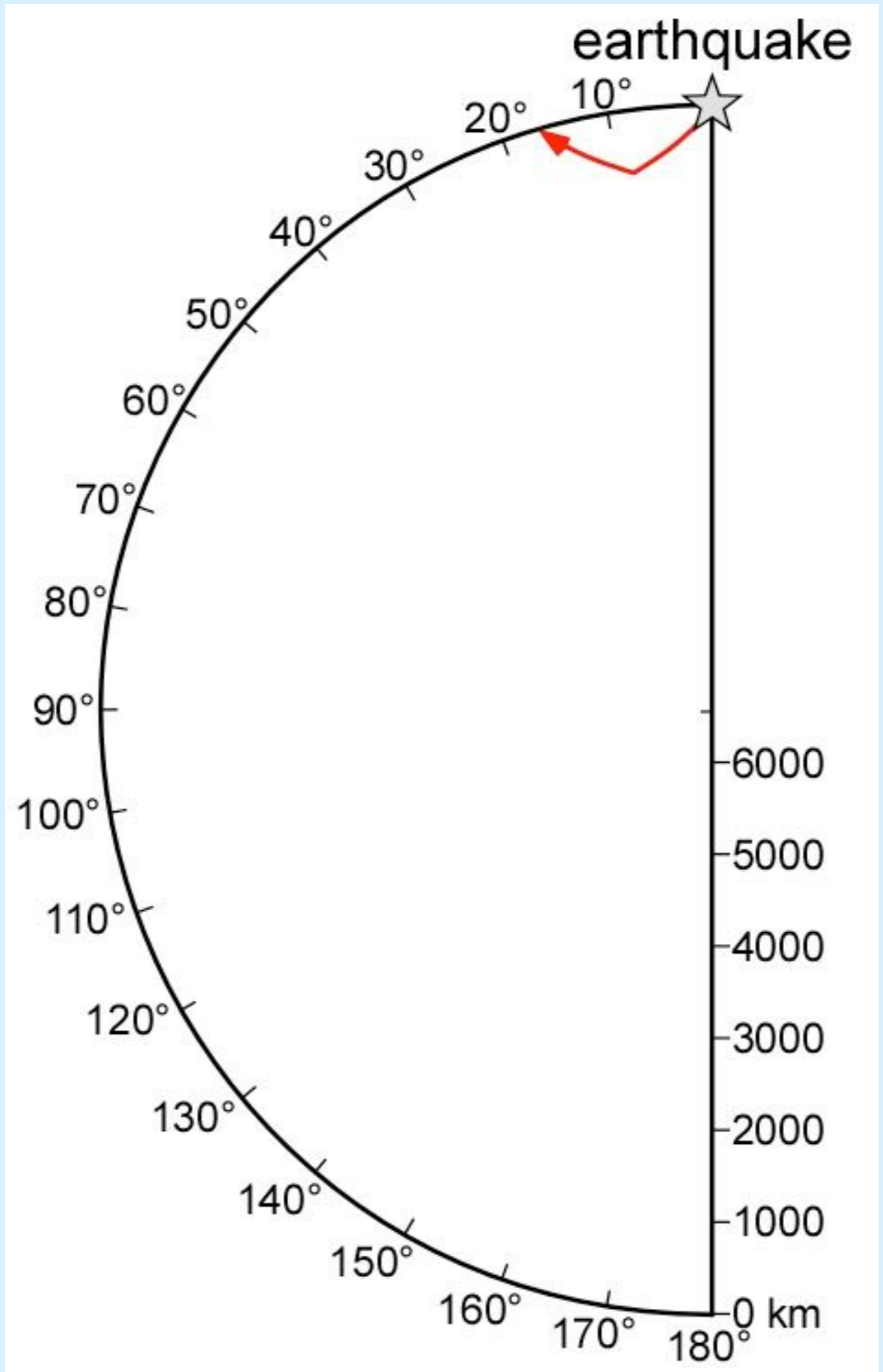


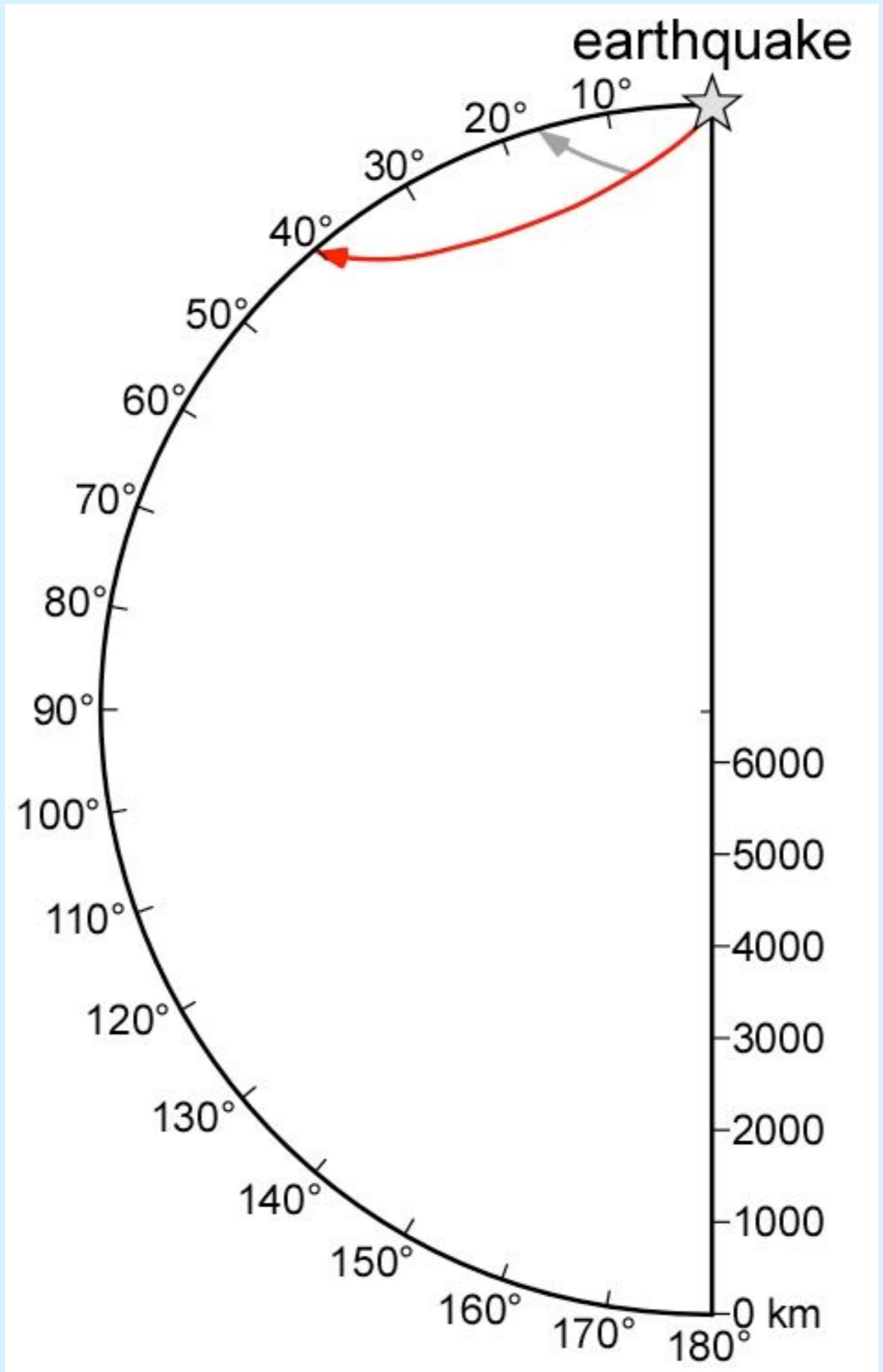
**P-wave front  
emerging  
from  
earthquake  
focus**

**P-wave ray paths radiating perpendicular to wave front.**

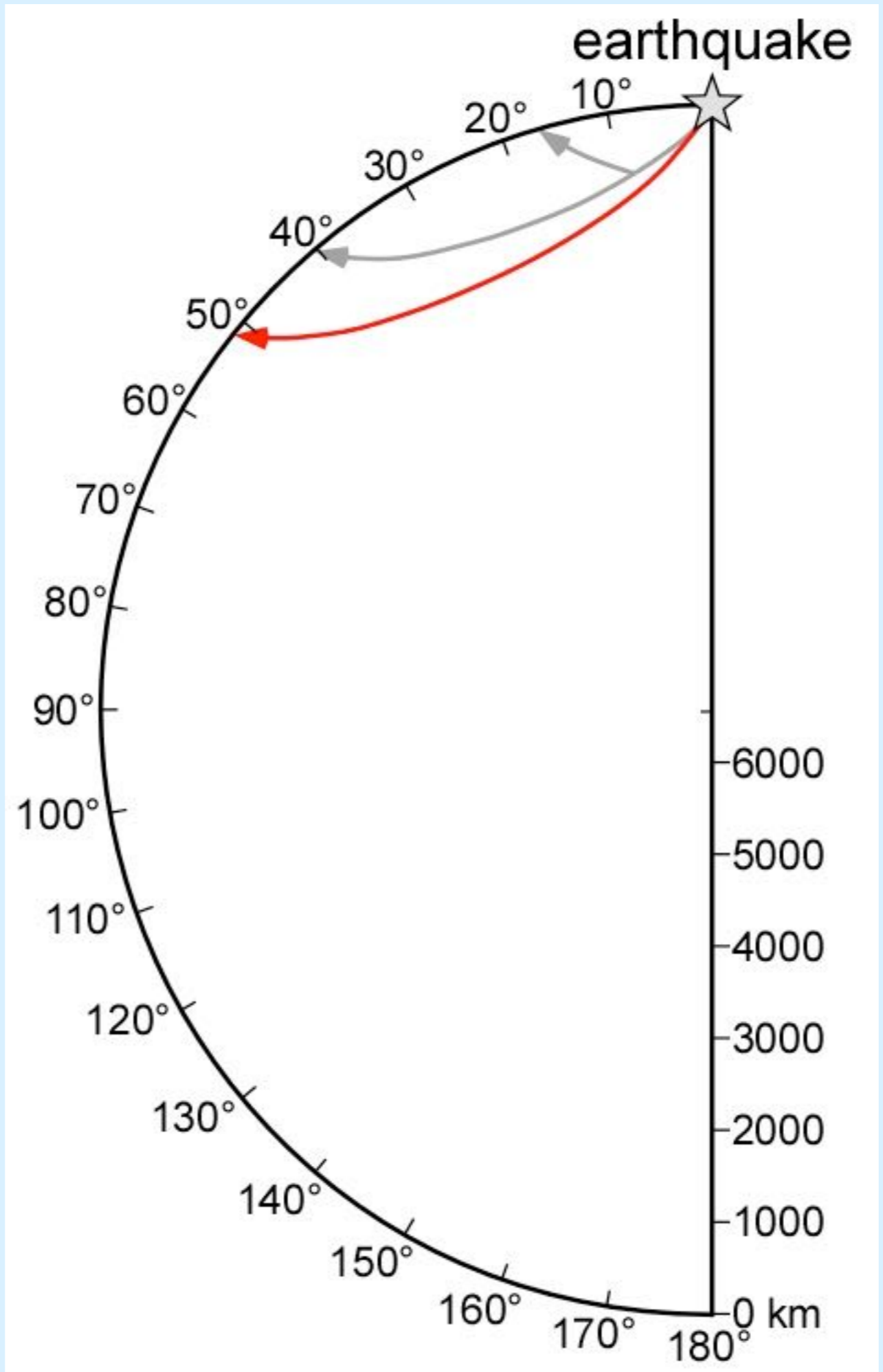


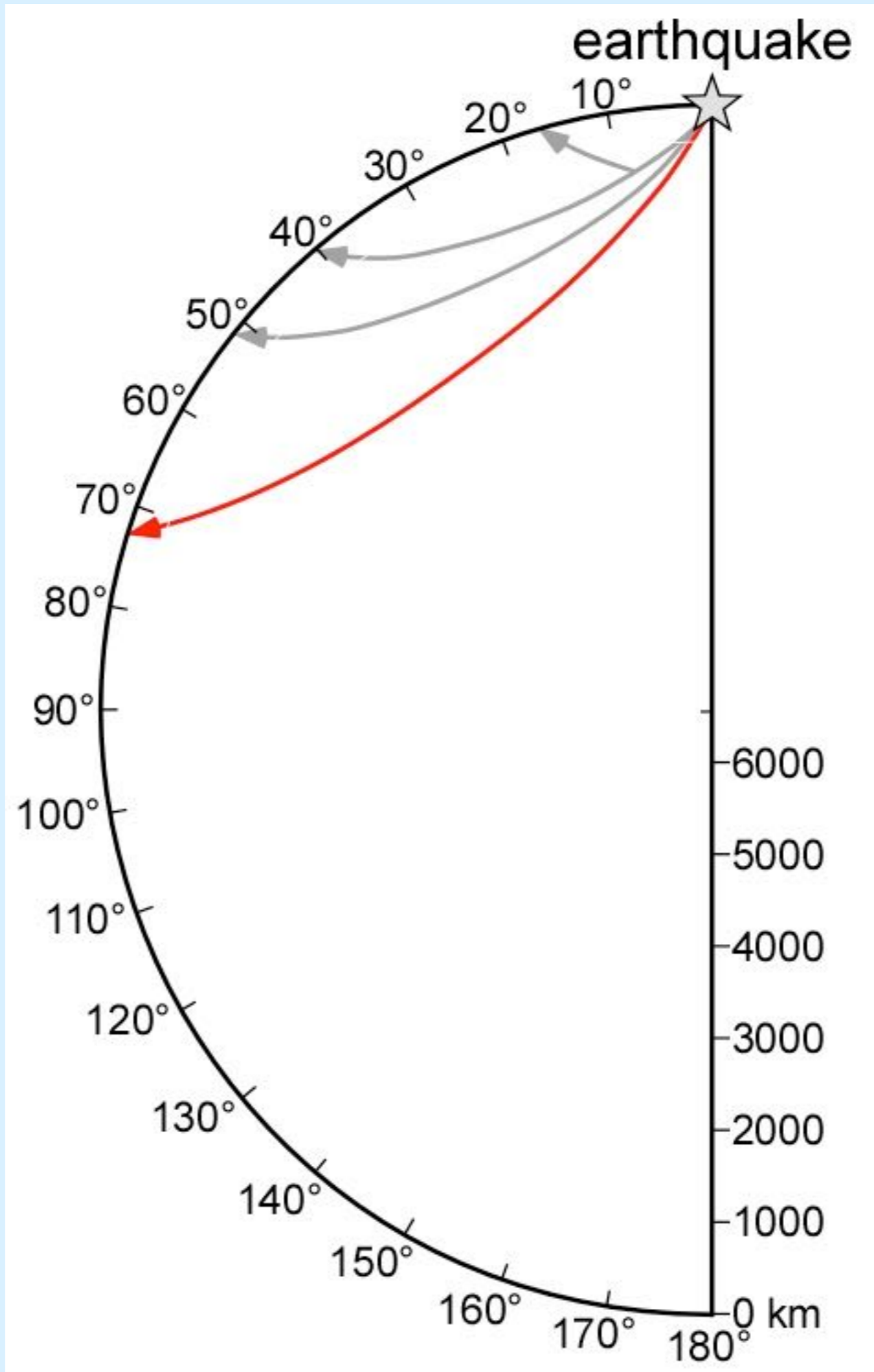
**P-wave front emerging from earthquake focus**

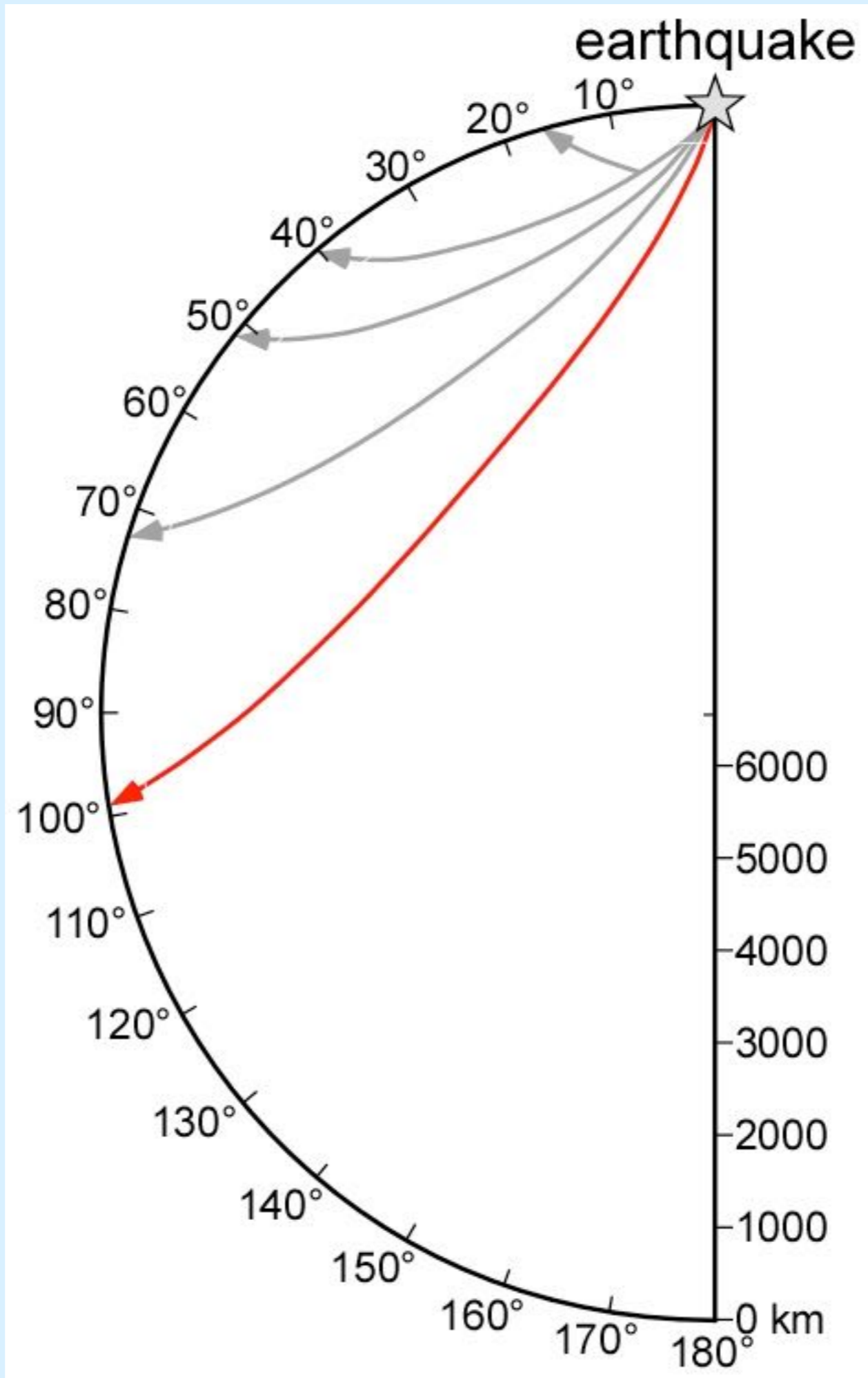


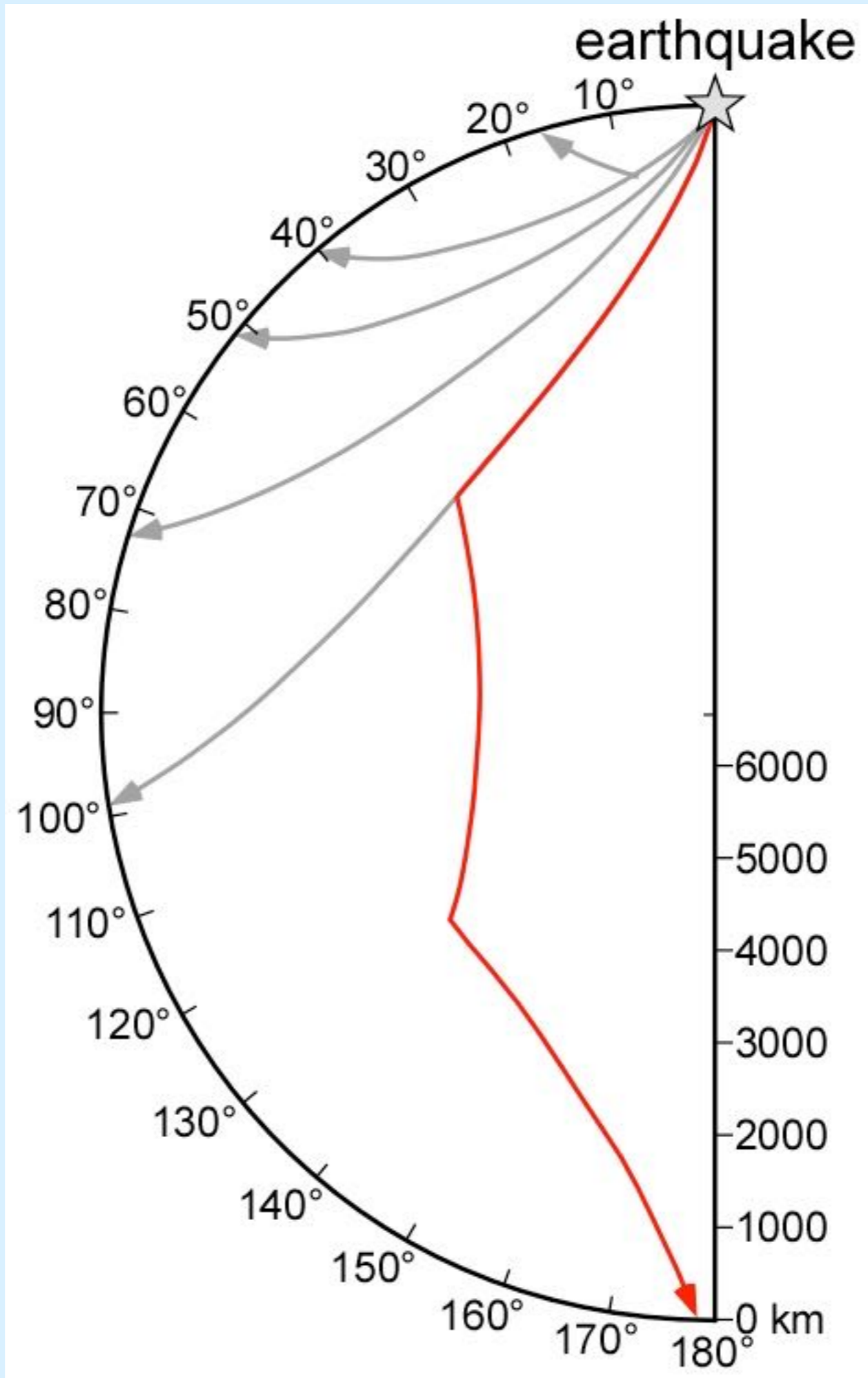


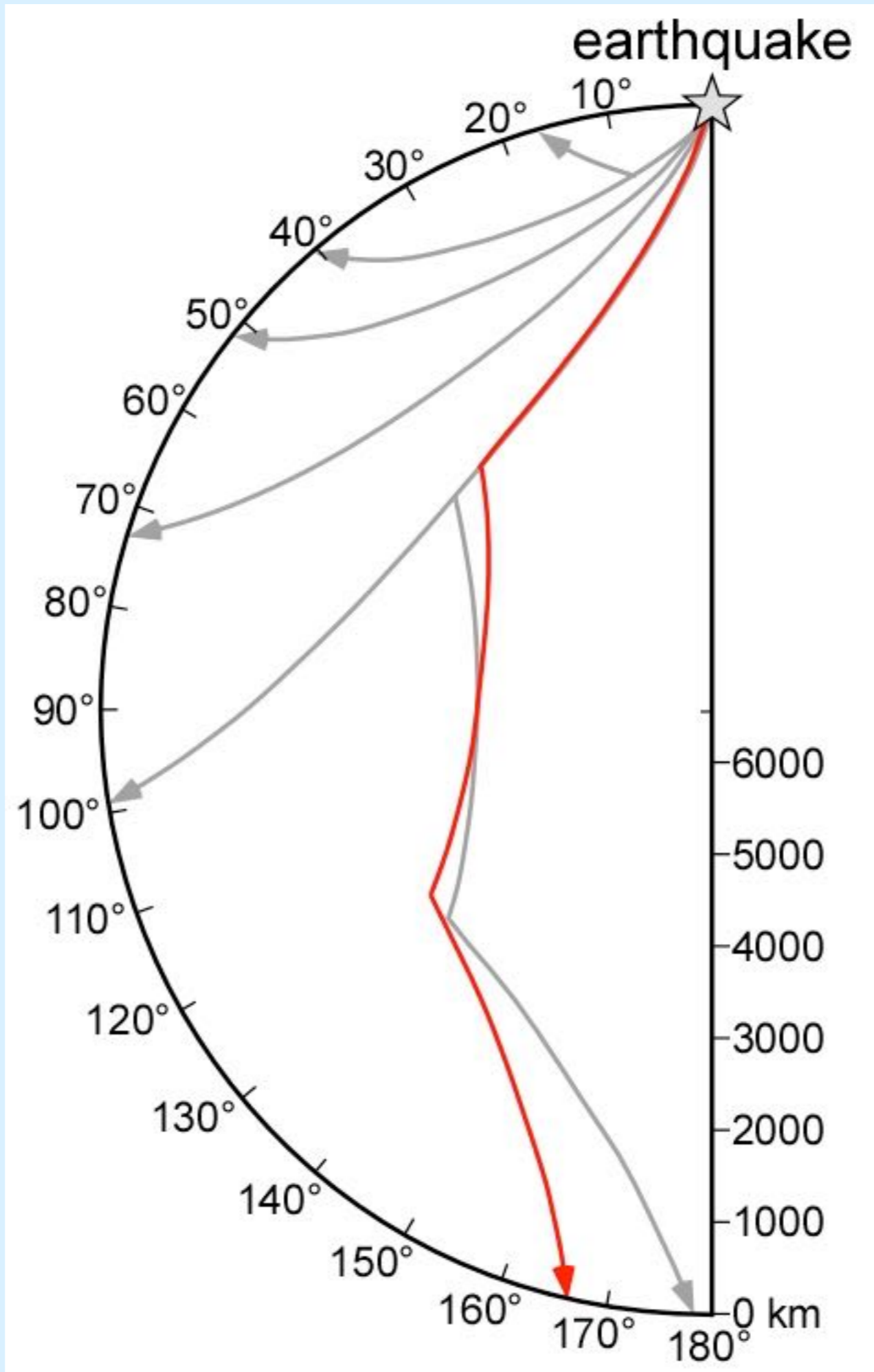


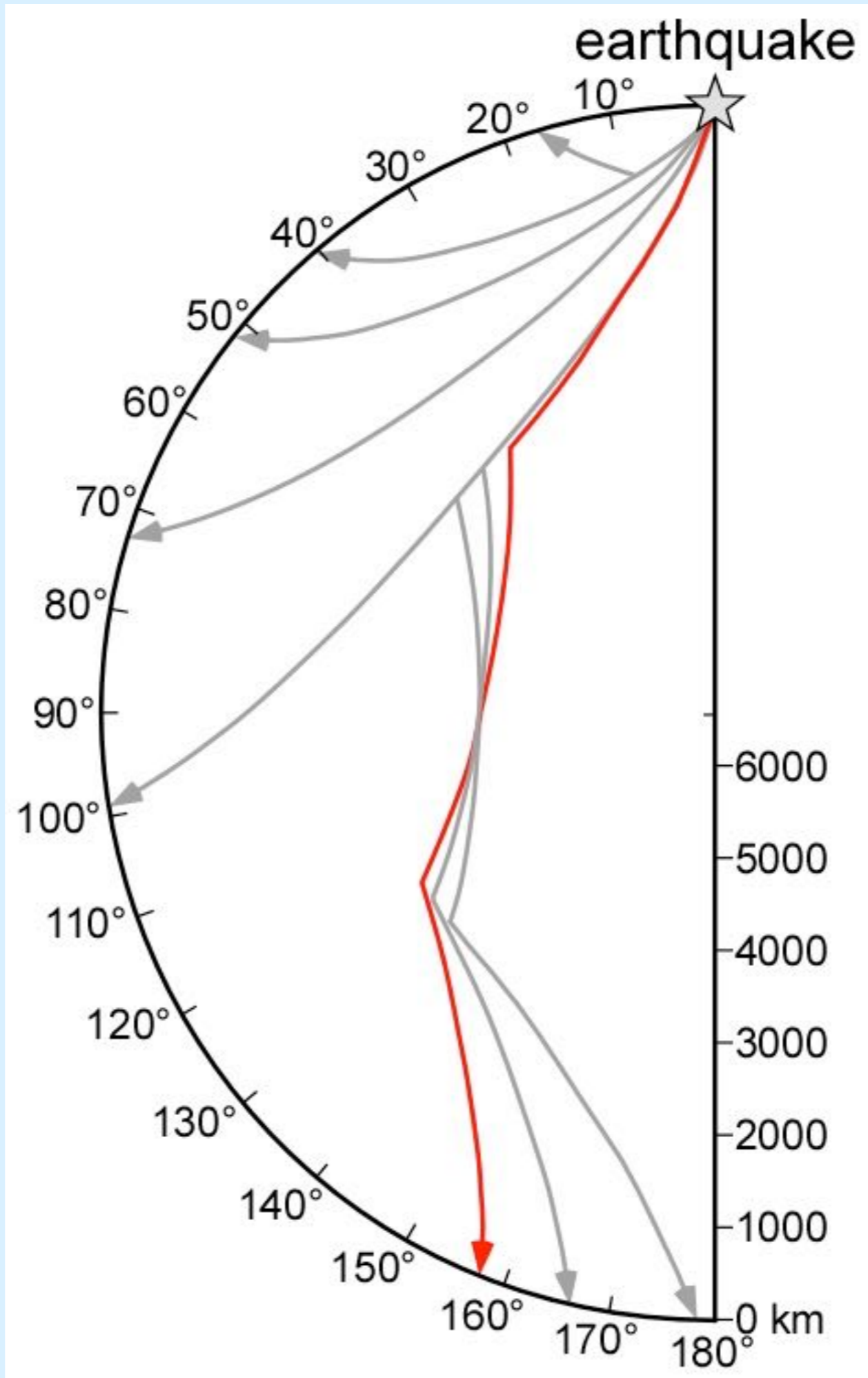




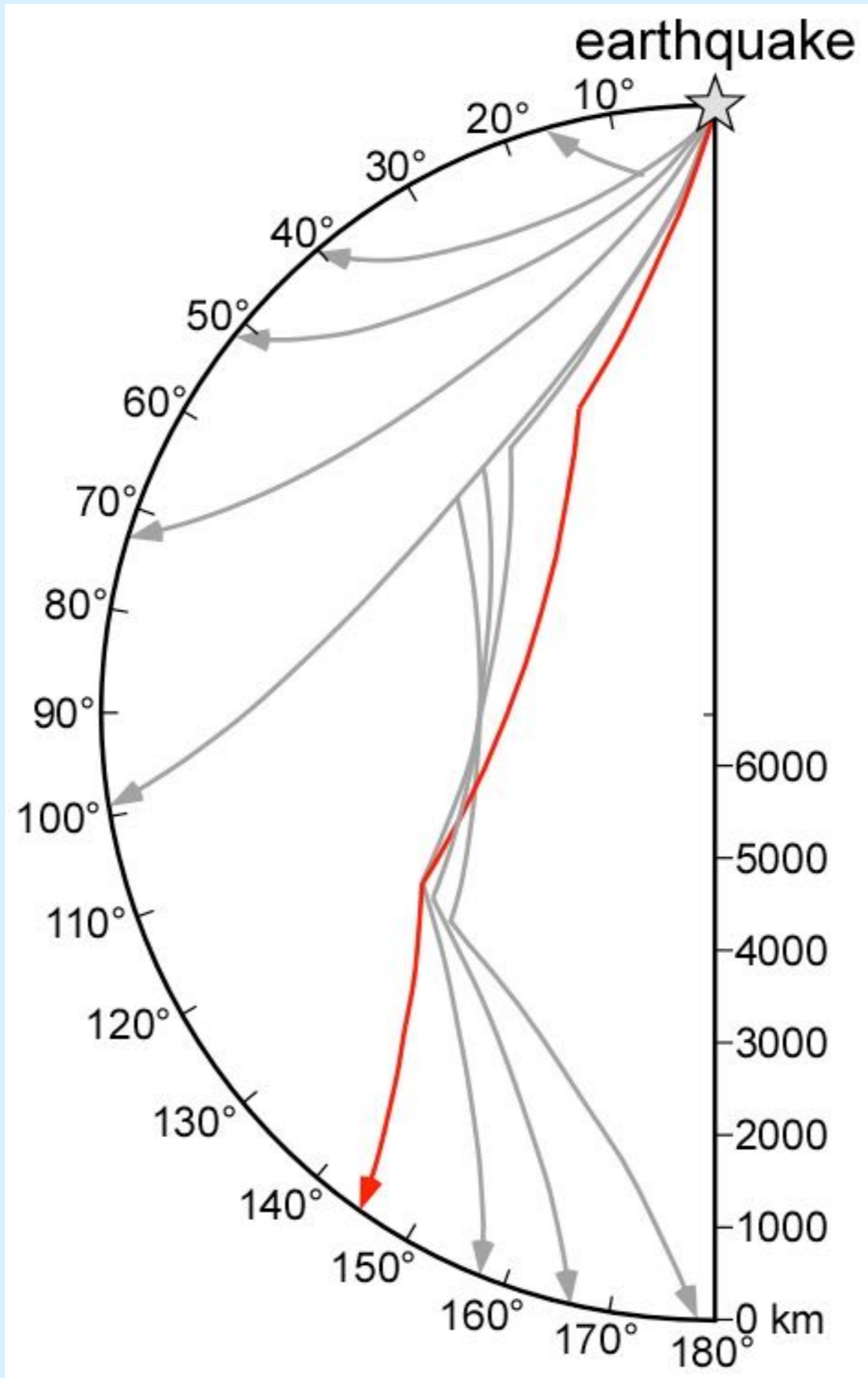


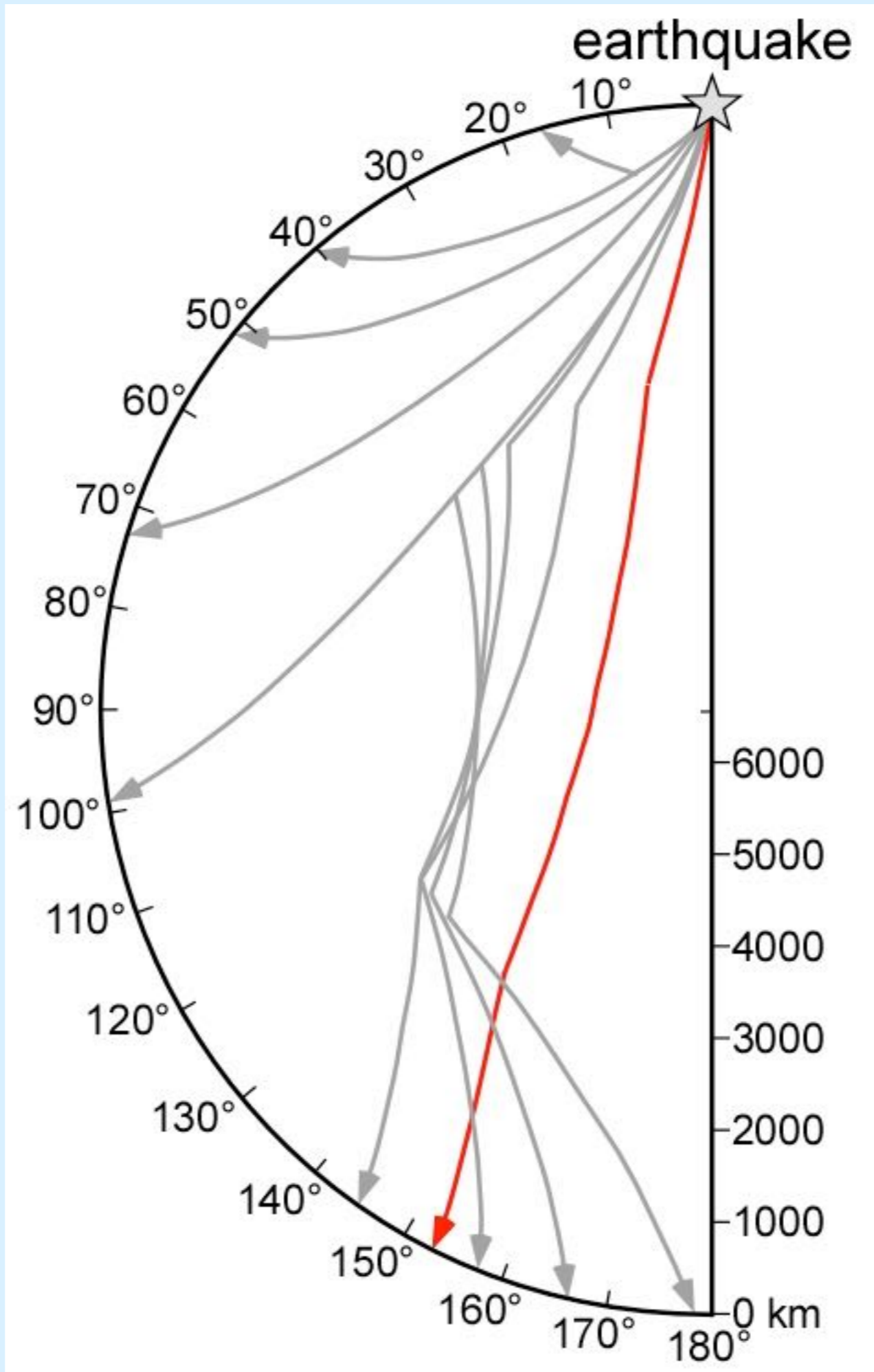




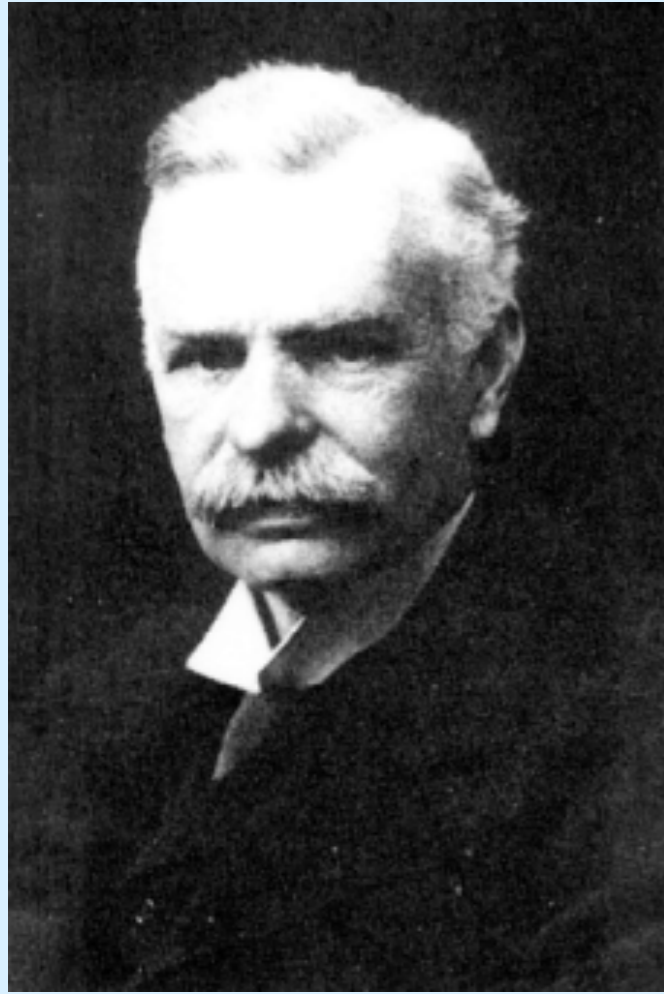




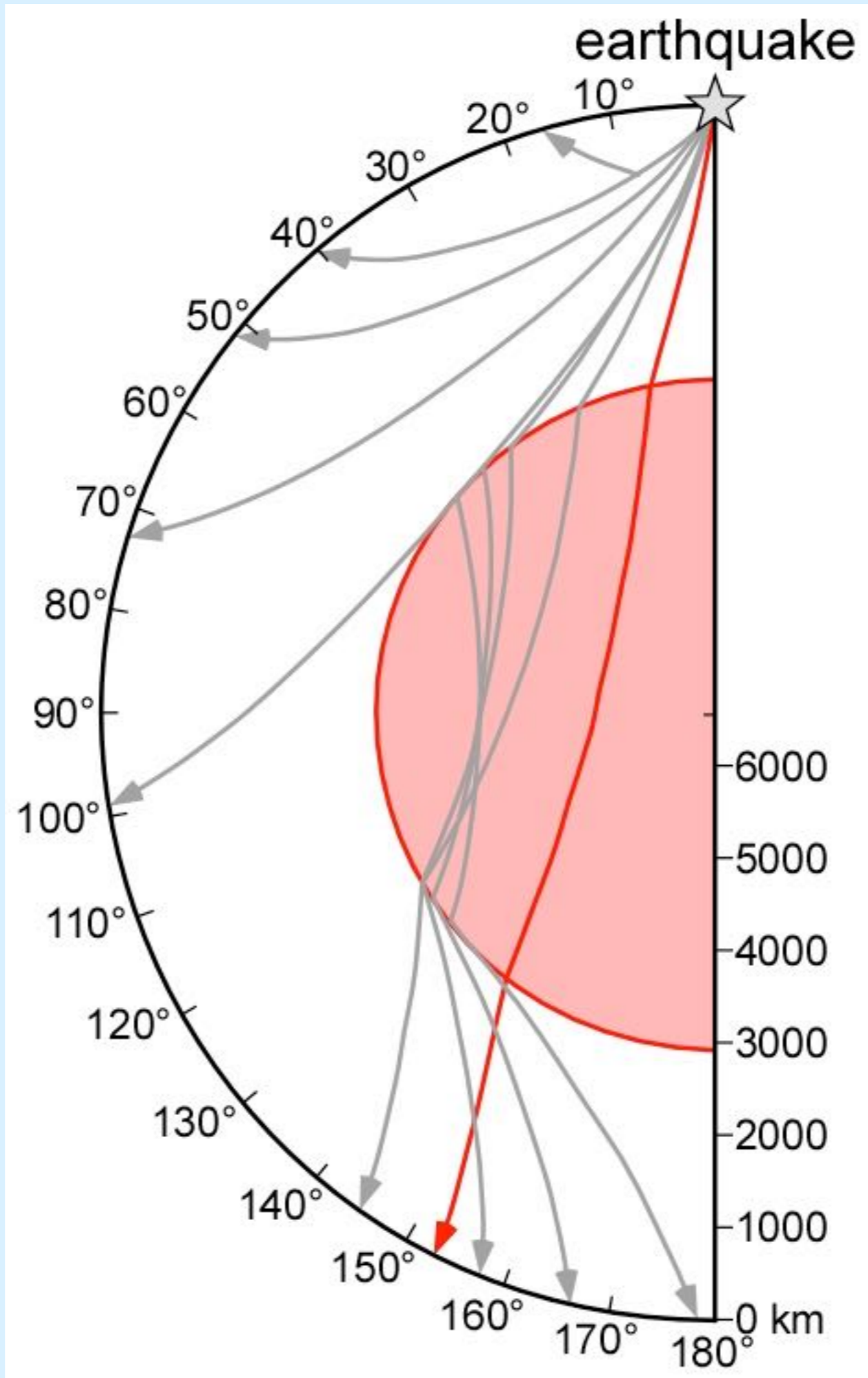




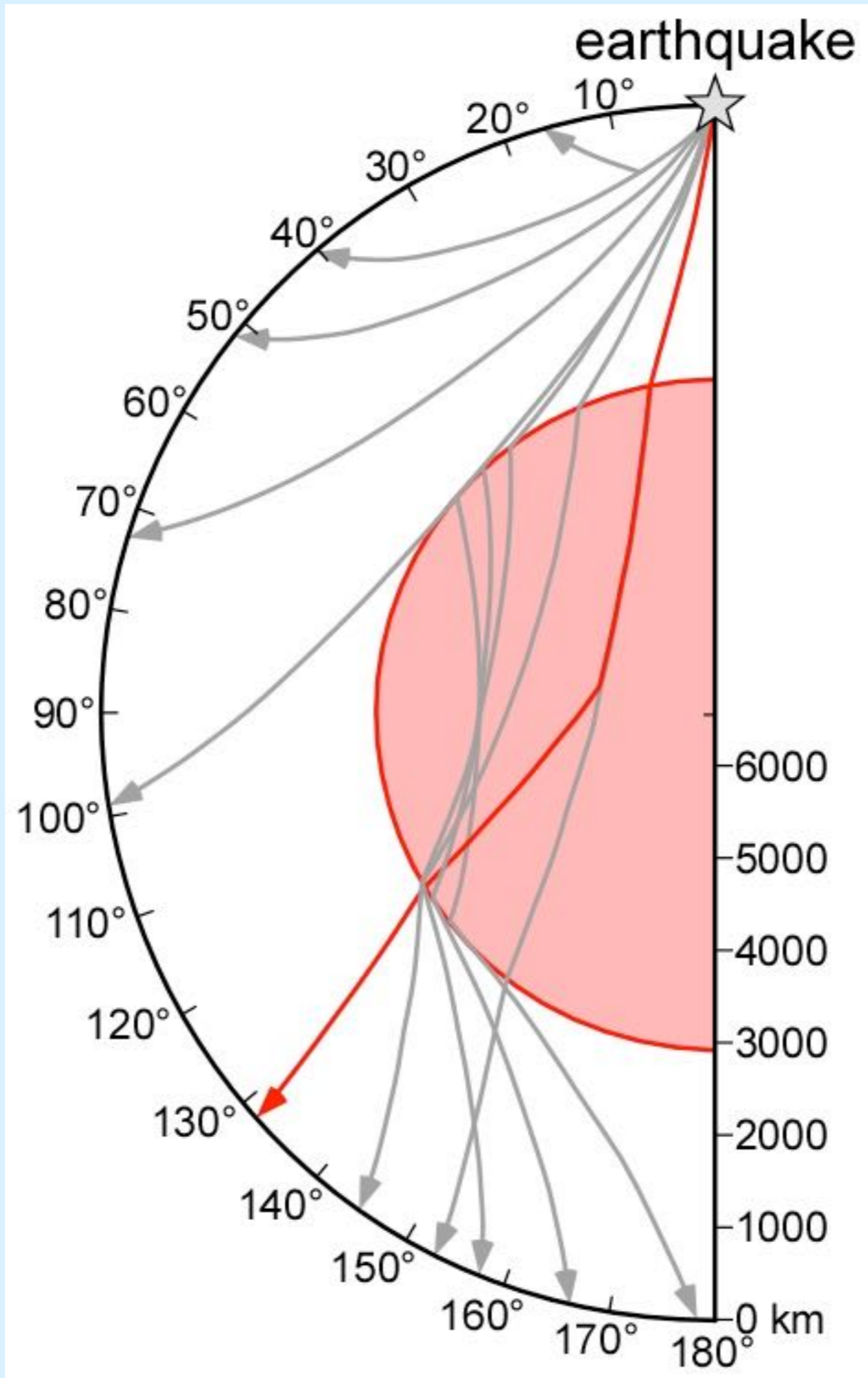


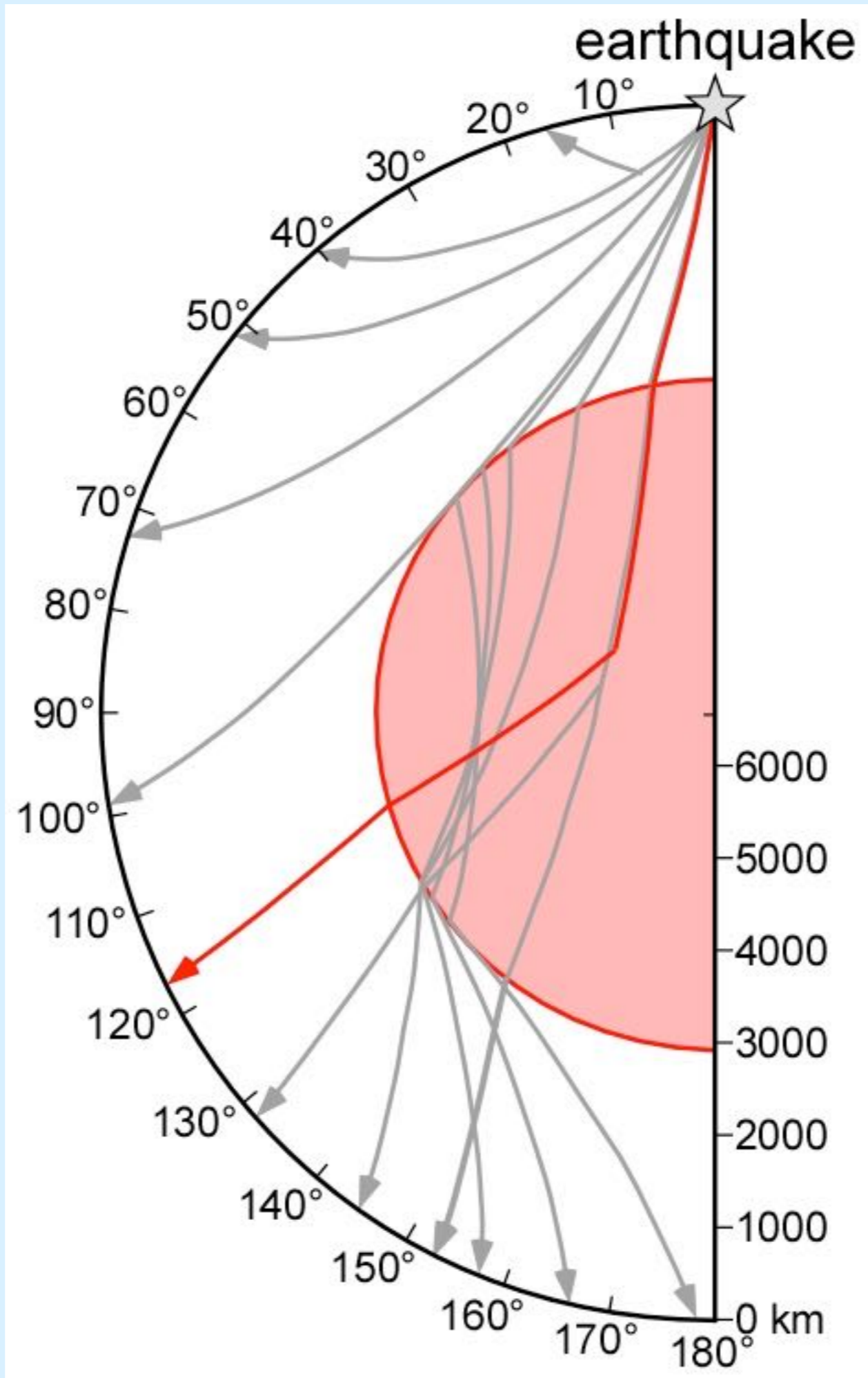


Irish geologist Richard Dixon Oldham discovered the core in 1906.

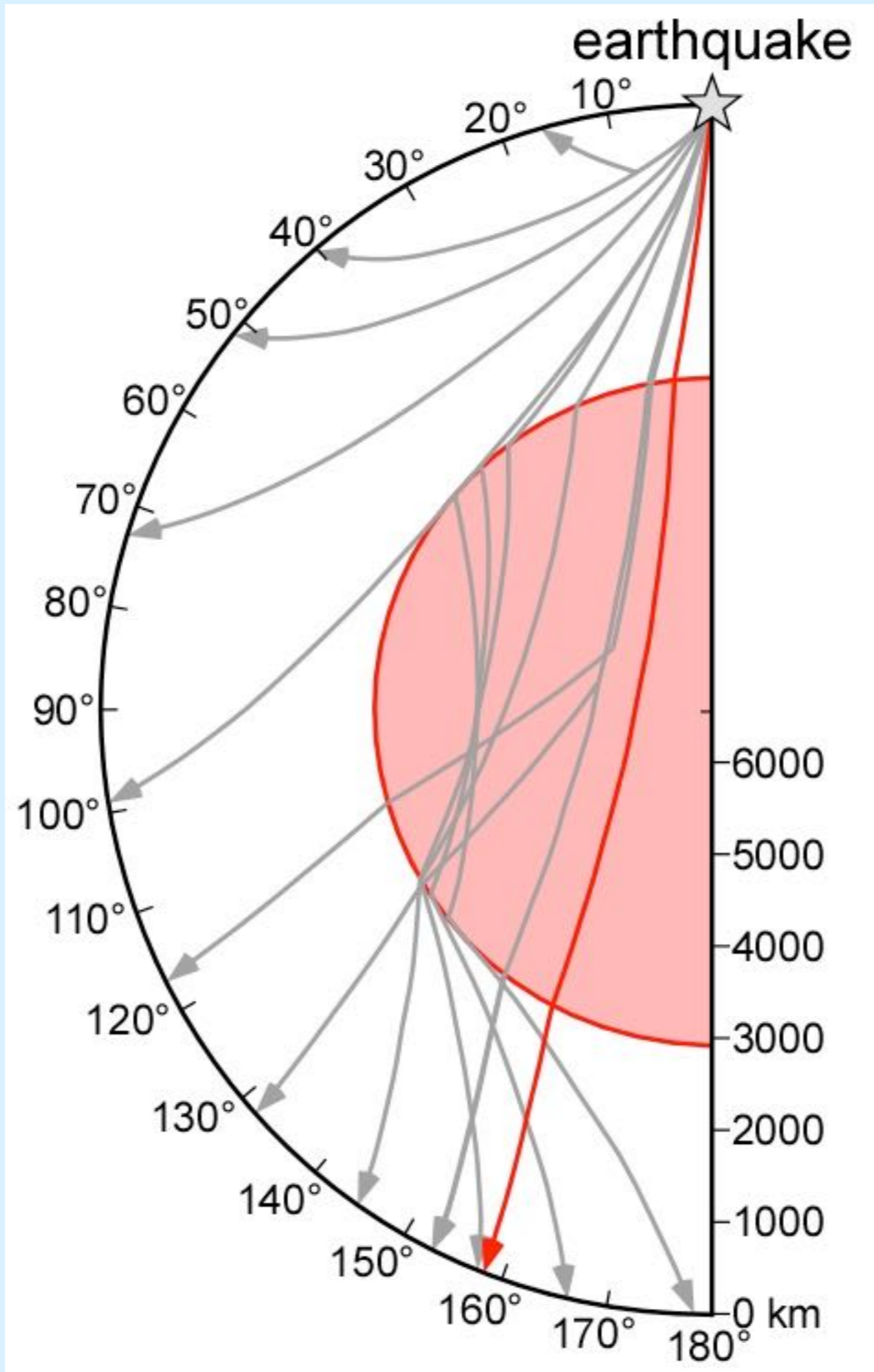


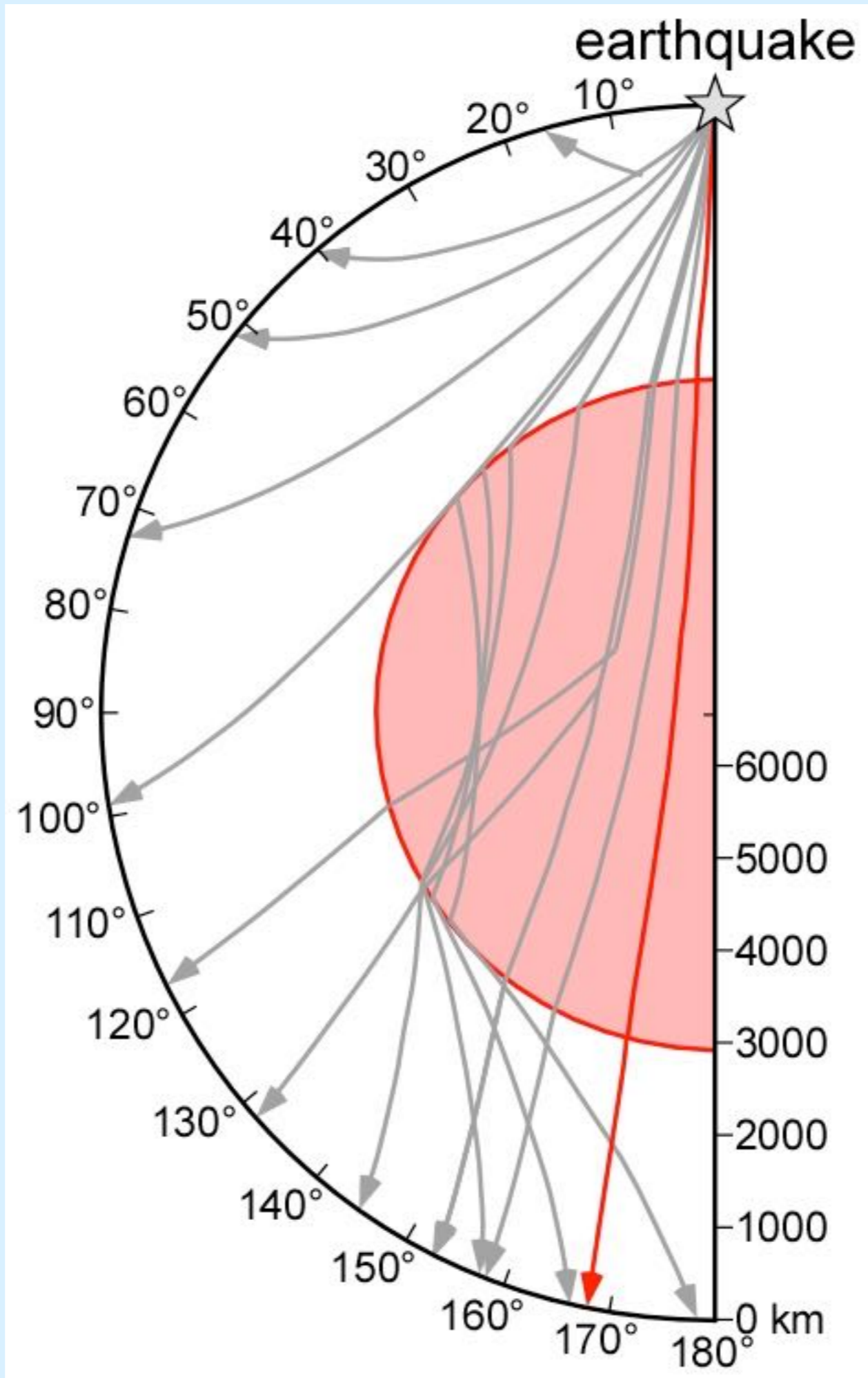
Beno Gutenberg found that the core is ~7000 km in diameter (1914). The core-mantle boundary is called the Gutenberg Discontinuity.

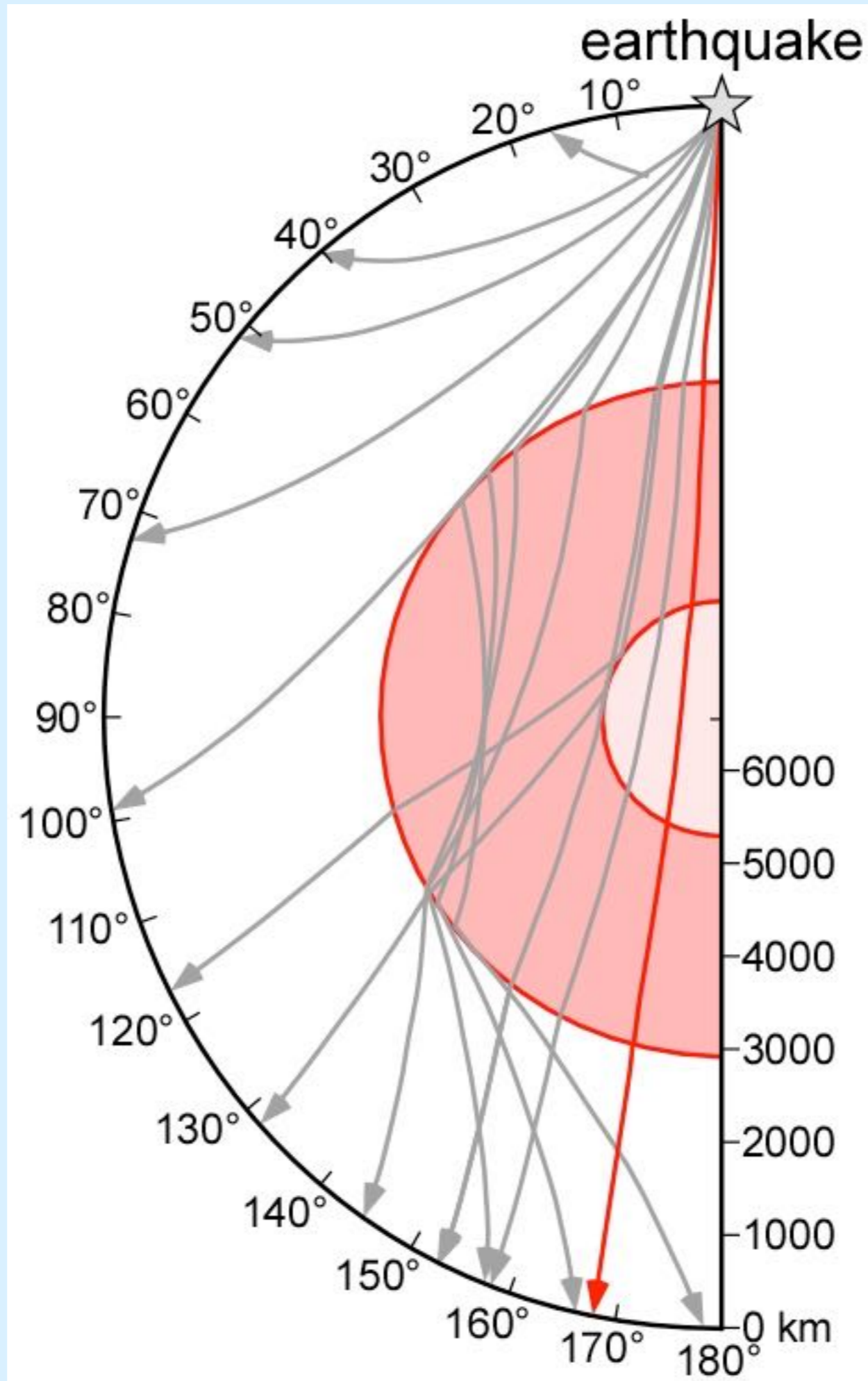








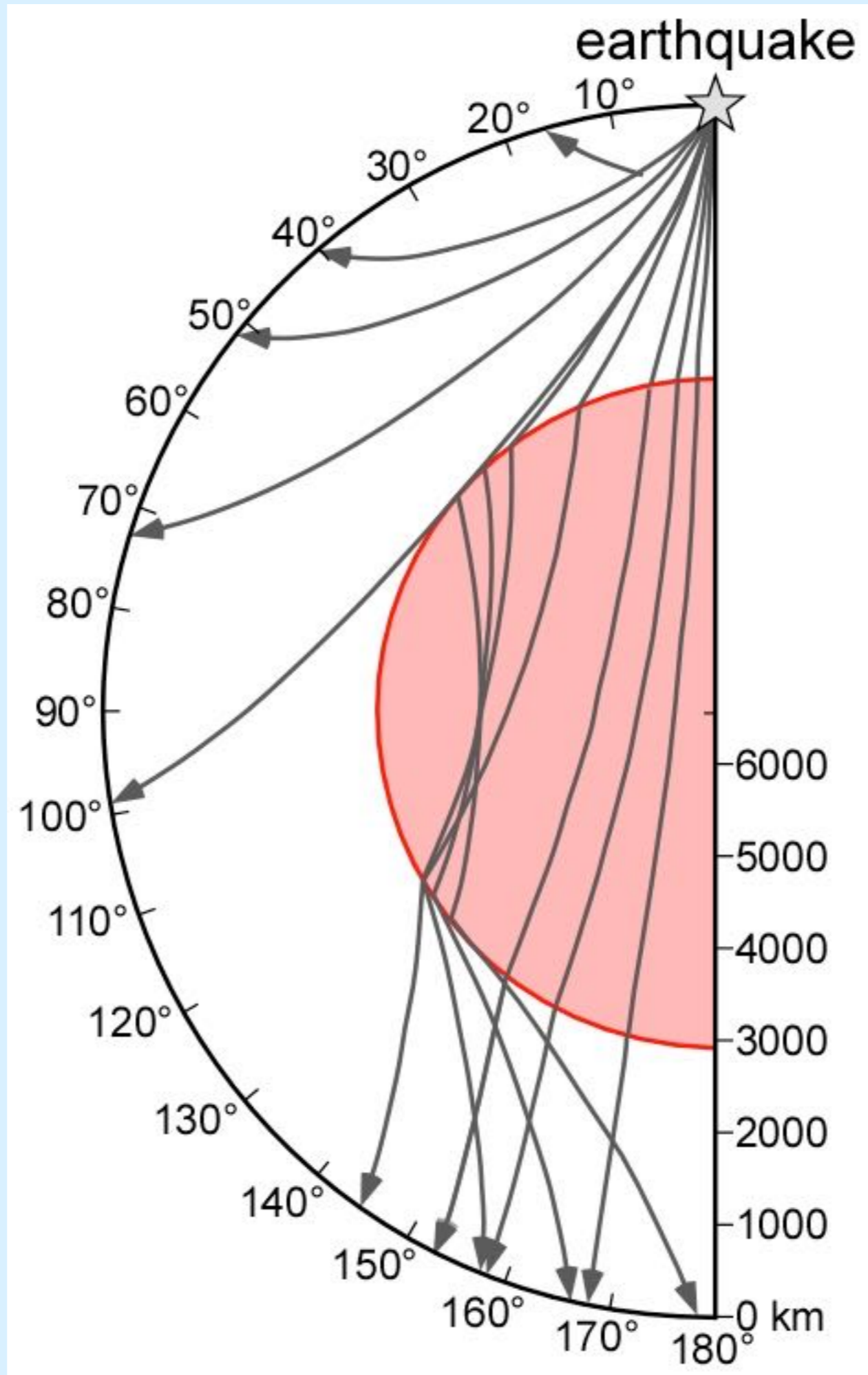




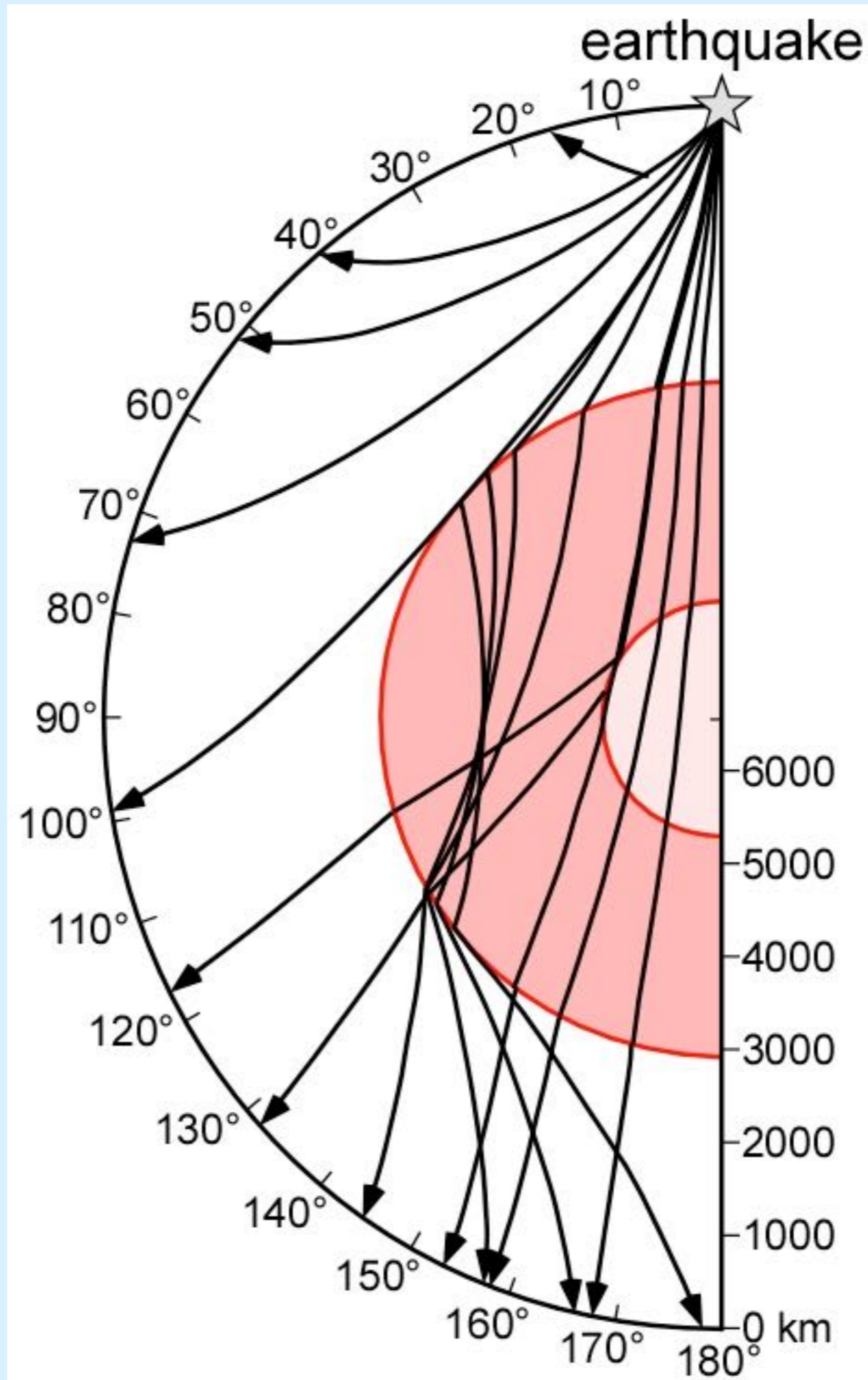
**Danish  
seismologist  
Inge Lehmann  
discovered the  
inner core in  
1936.**



What if we did not have data from the critical area?



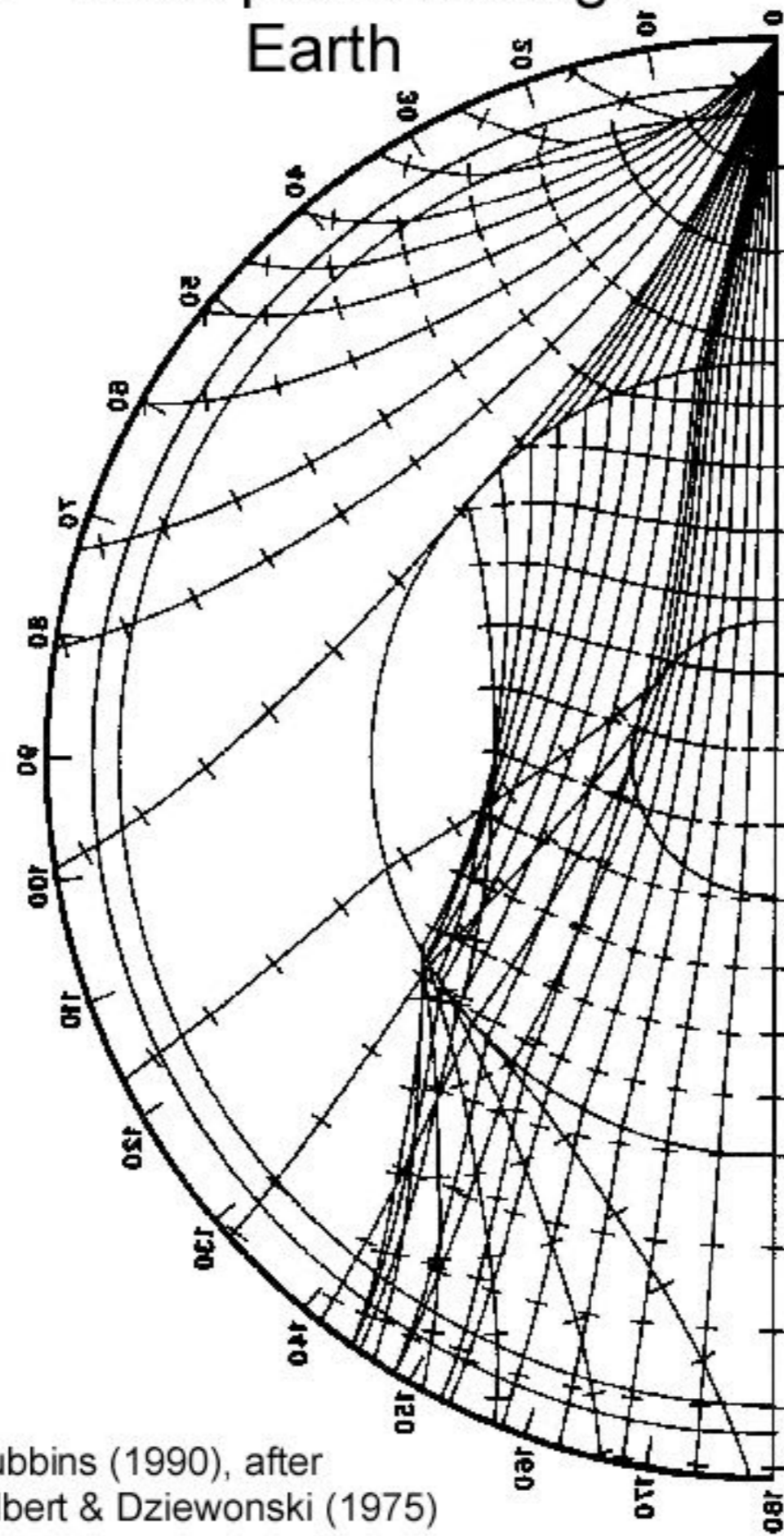
What if we did not have data from the critical area?



A little data can make a **big** difference

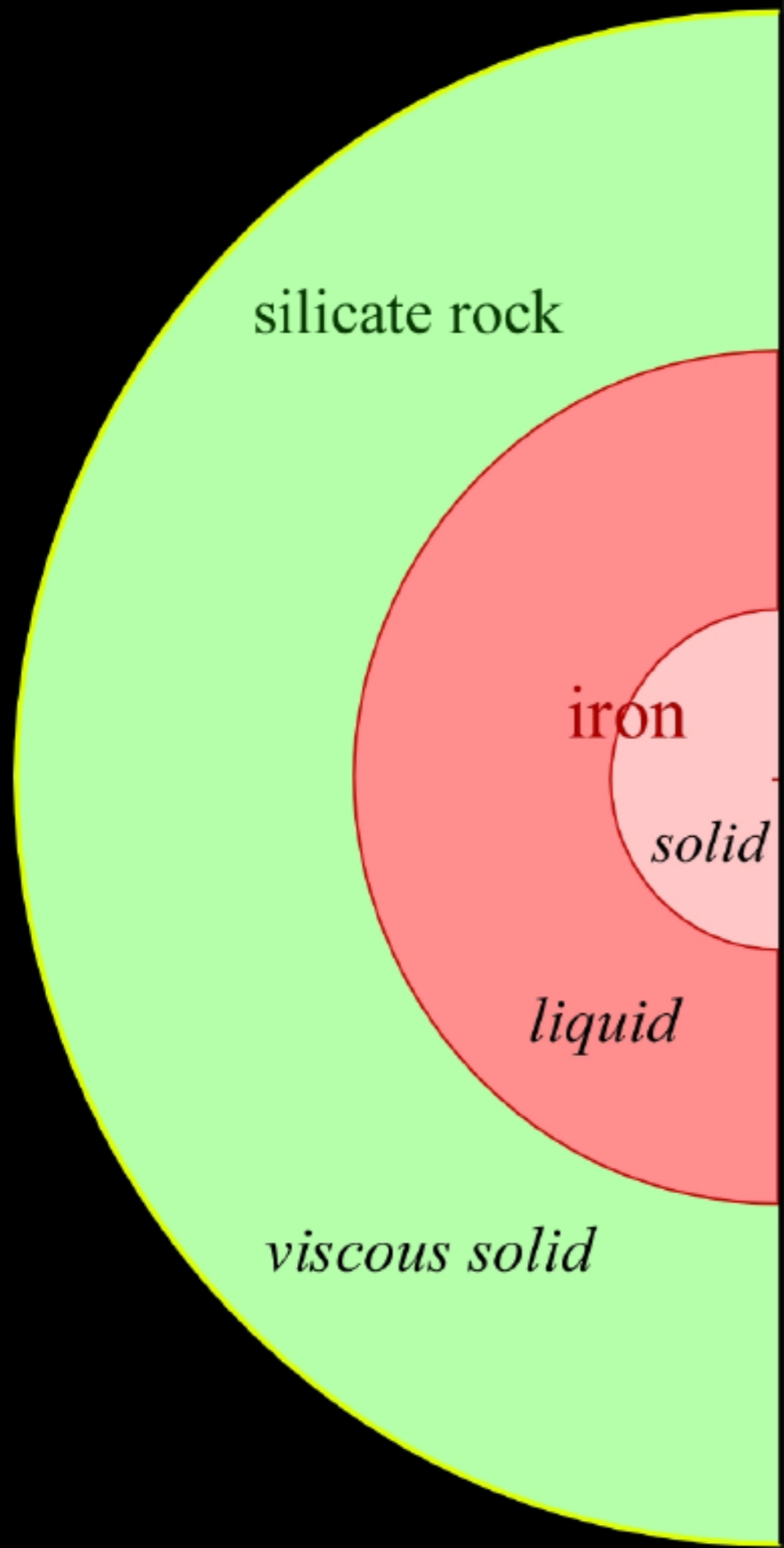


# P-wave paths through Earth



Gubbins (1990), after  
Gilbert & Dziewonski (1975)

[http://ds.iris.edu/seismon/swaves/  
index.php](http://ds.iris.edu/seismon/swaves/index.php)



crust

mantle

2886 km

outer core

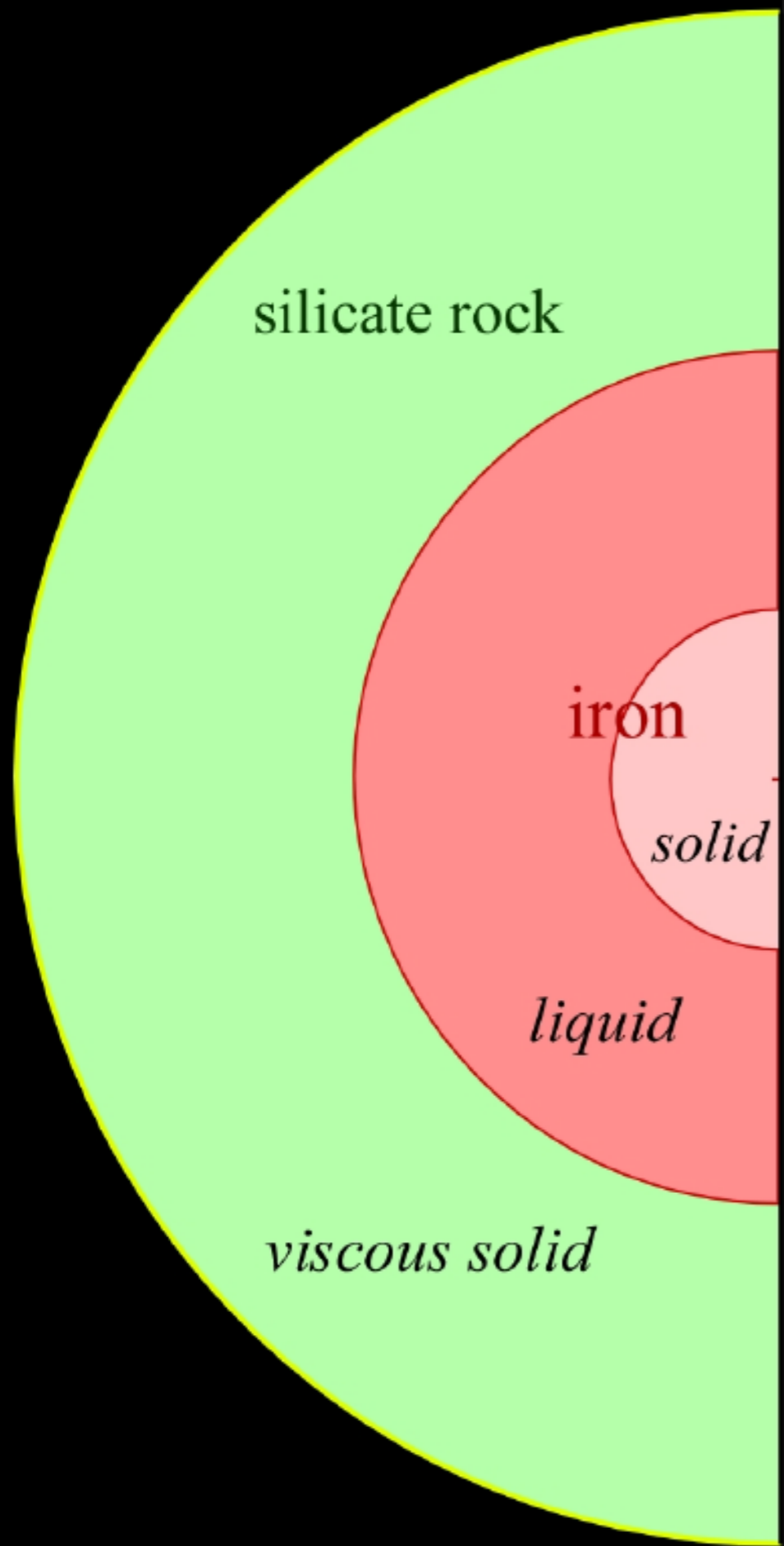
5150 km

inner core

6371 km

average radius

Earth's major  
layers based  
on general  
composition



crust

mantle

2886 km

outer core

5150 km

inner core

6371 km

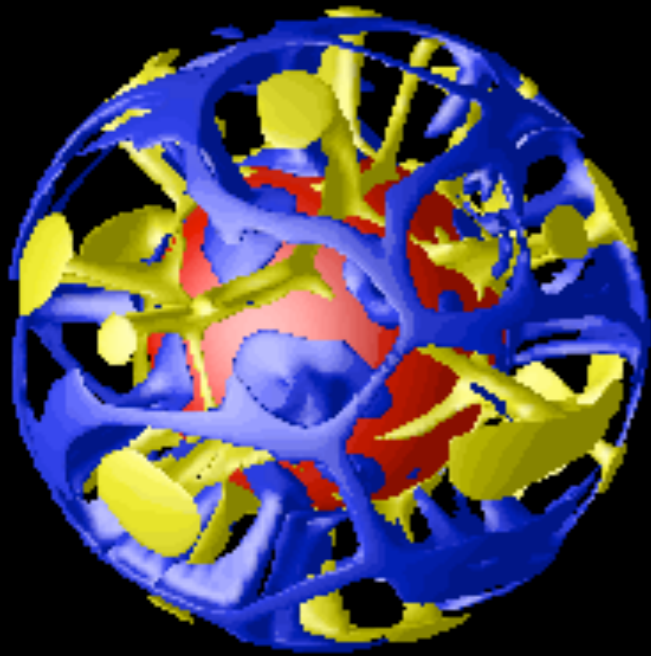
average radius

Earth's major  
layers based  
on general  
composition

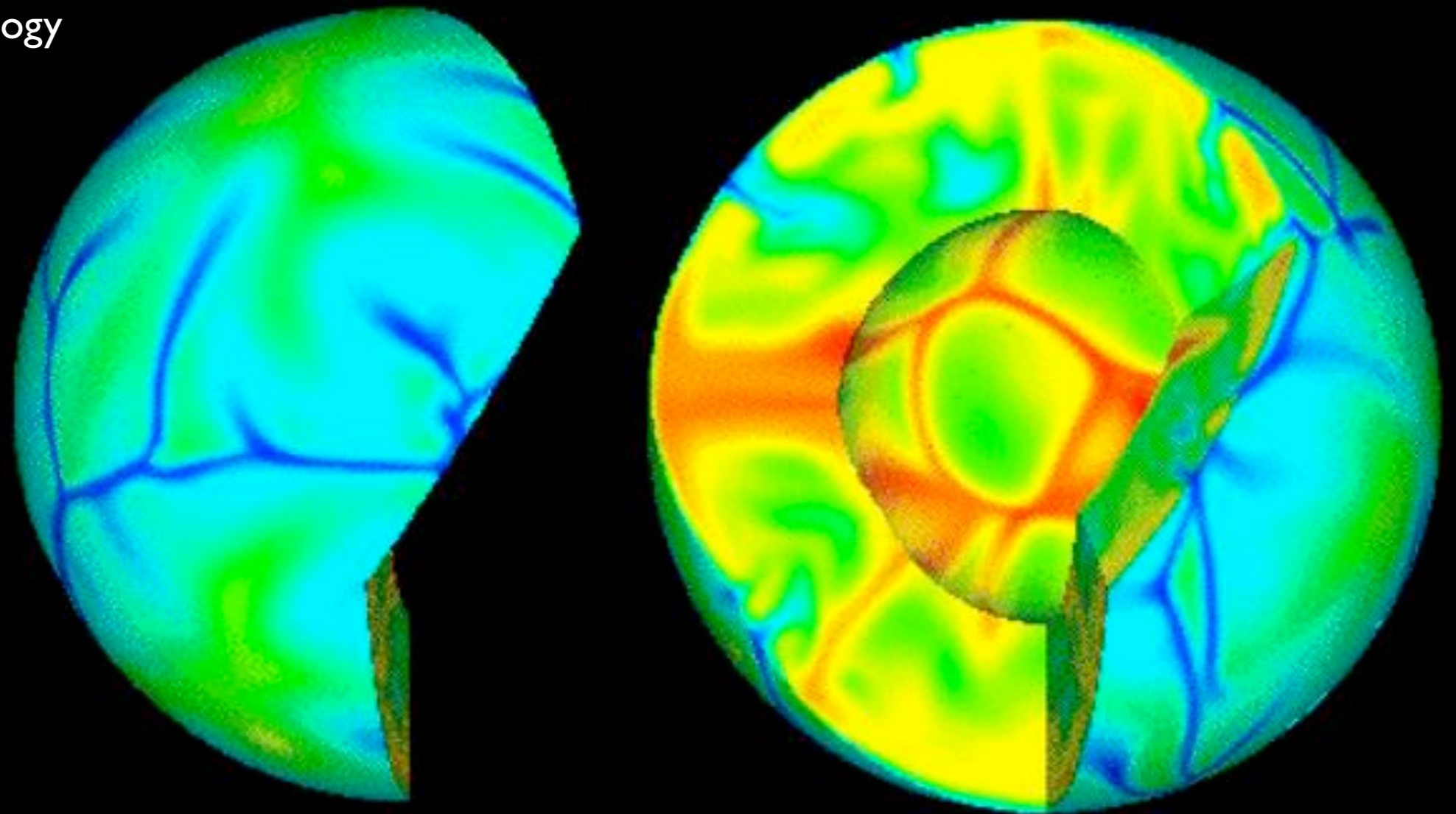
***But really, it's not  
quite that simple...***



Earth's mantle is not static. It flows as a viscous fluid (like silly putty), transferring heat energy by a form of convection.



Harvard Seismology



Bunge, Princeton