

Locating Epicenters

*How do seismologists determine
the location of an earthquake?*

Locating Epicenters

- The first seismograph was invented in 132 AD by the Chinese astronomer and mathematician Chang Heng
 - It could register an earthquake and determine the direction the earthquake came from



First Seismograph

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- Mercalli Scale - measured the intensity of an earthquake based on the effects to Earth's surface, humans, objects in nature and other man-made structures

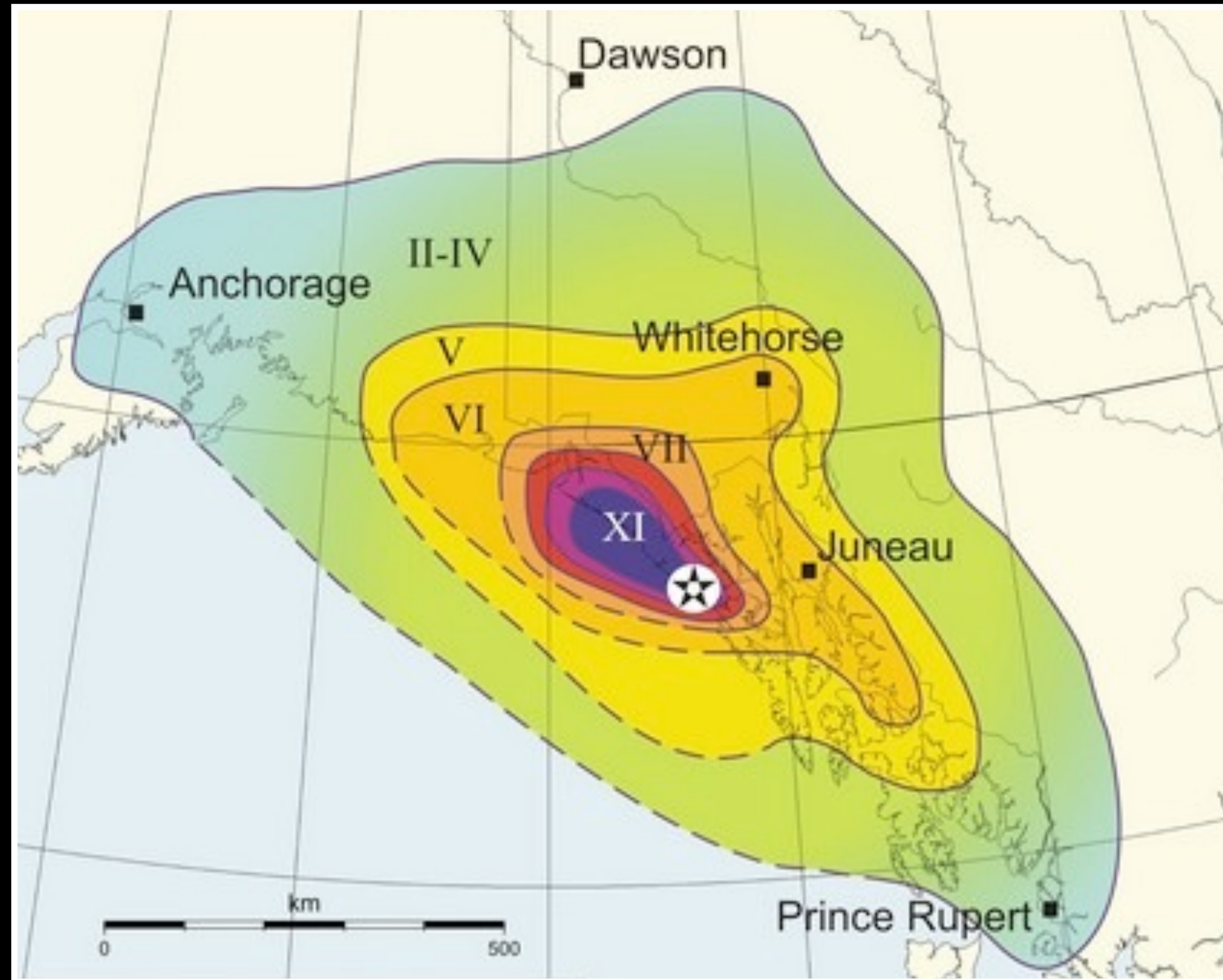


Giuseppe Mercalli

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- Mercalli Scale [continued]
 - Higher values of intensities are closer to the epicenter and lower values of intensity are farther away

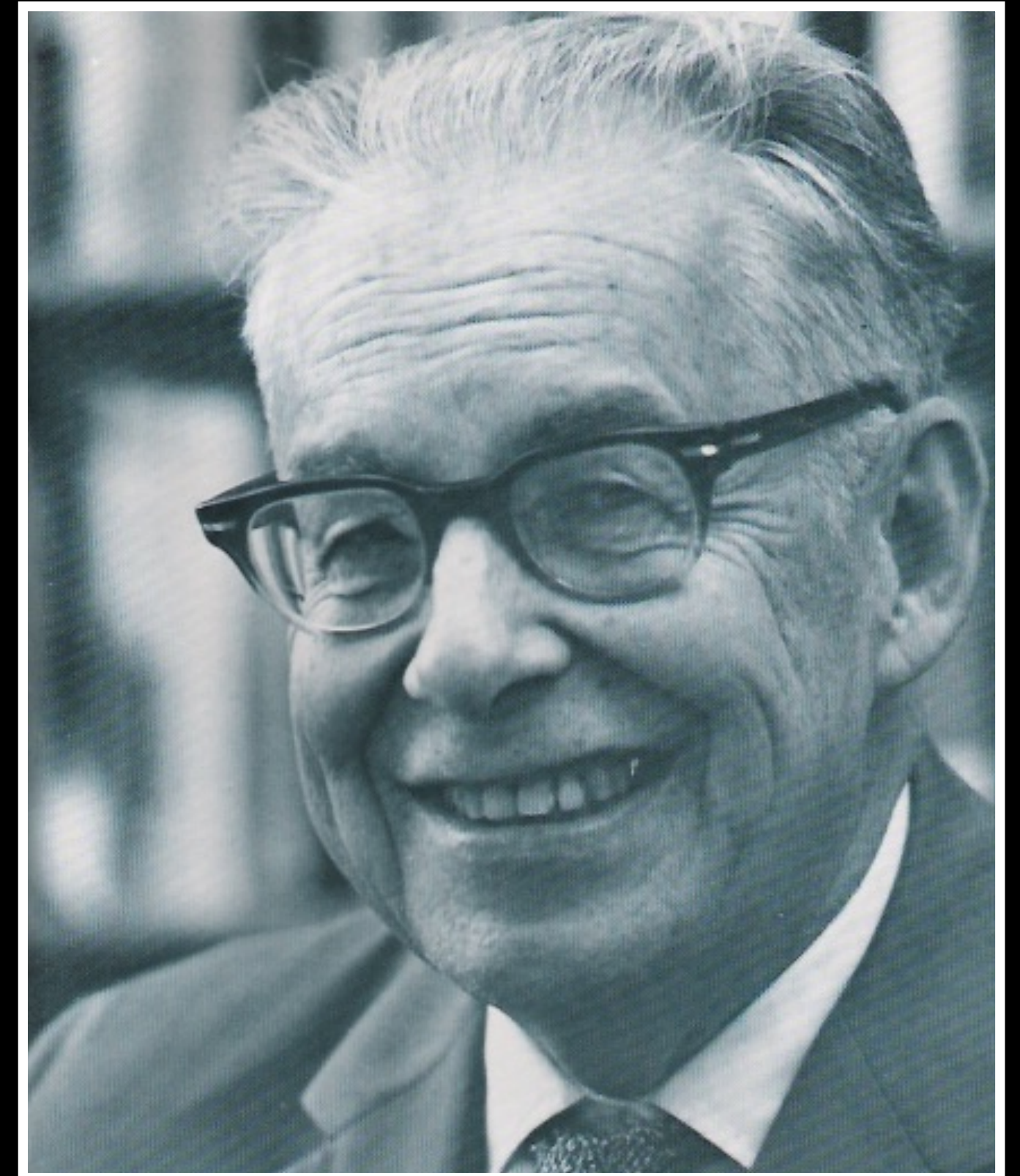
Intensity	Type of Damage
I	Instrumental
II	Feeble
III	Slight
IV	Moderate
V	Rather Strong
VI	Strong
VII	Very Strong
VIII	Destructive
IX	Ruinous
X	Disastrous
XI	Very Disastrous
XII	Catastrophic



Reverse Fault

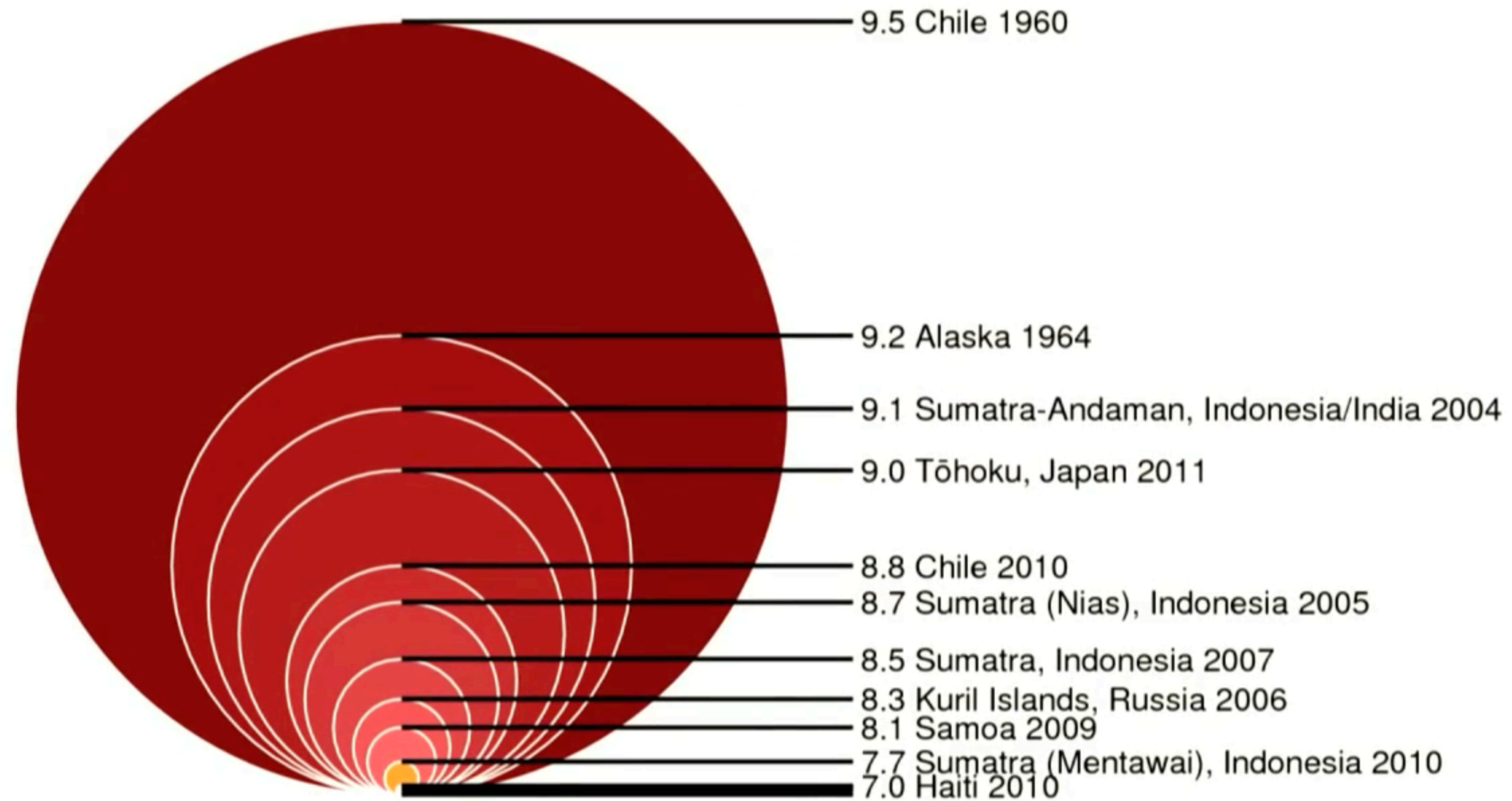
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- Richter Scale - developed by Charles Richter, it measured the amount of energy released during an earthquake using a logarithmic scale
- Magnitude - a number to quantify the amount of seismic energy released from an earthquake



Charles Richter

Comparison of Recent and Historic Earthquakes by Energy Release



Magnitude

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- Richter Scale [continued]
 - The Richter Scale's magnitude is determined from the following measurement:
 - Seismogram's amplitude of waves
 - Distances from other seismographs
 - Epicenter distance

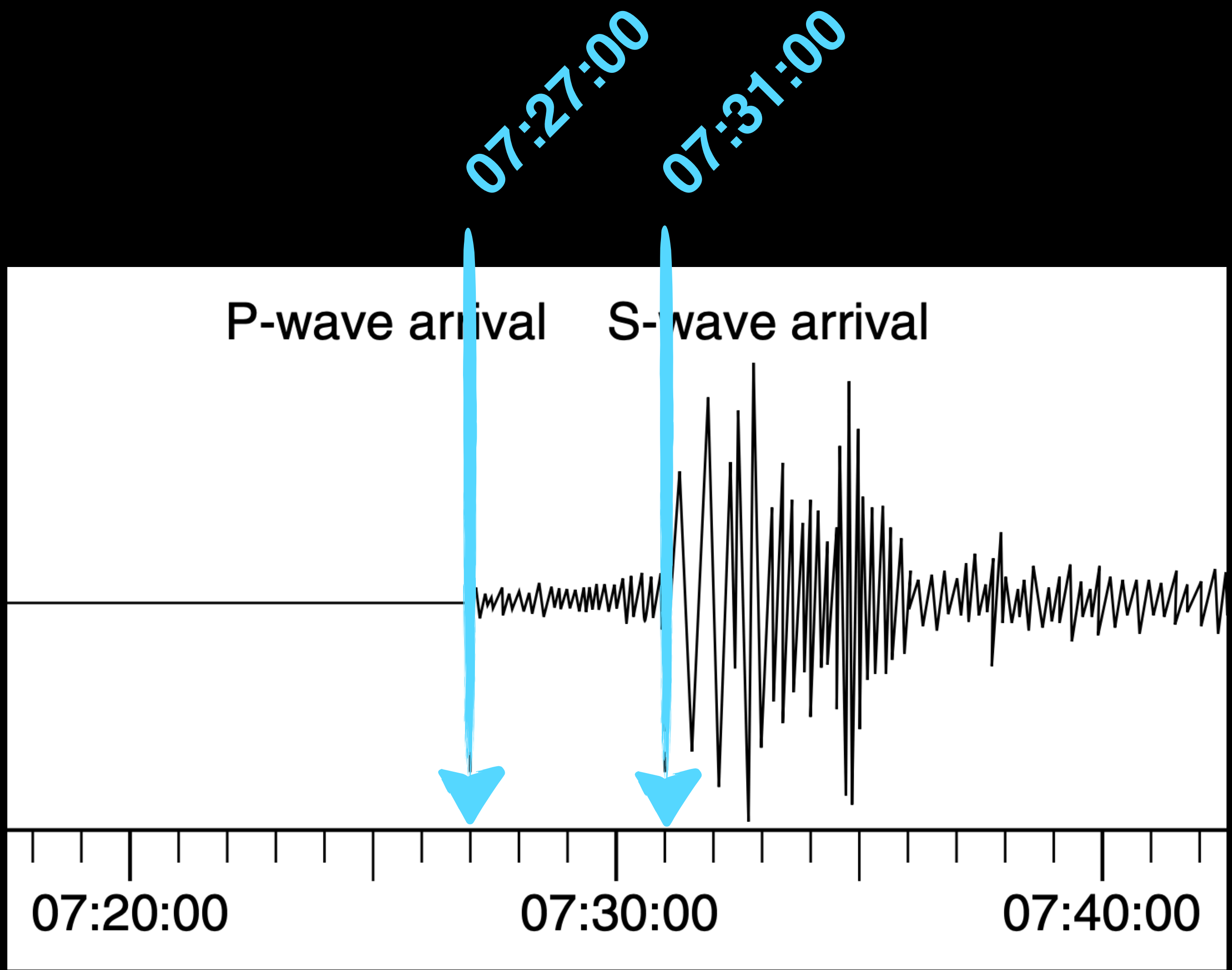
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- Modern seismographs are used to accurately determine the location of an epicenter
- To find the epicenter location you need to triangulate a position using three different seismograph stations



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- Steps to Locate an Epicenter:
 1. Find the arrival time difference between the p-wave and s-wave



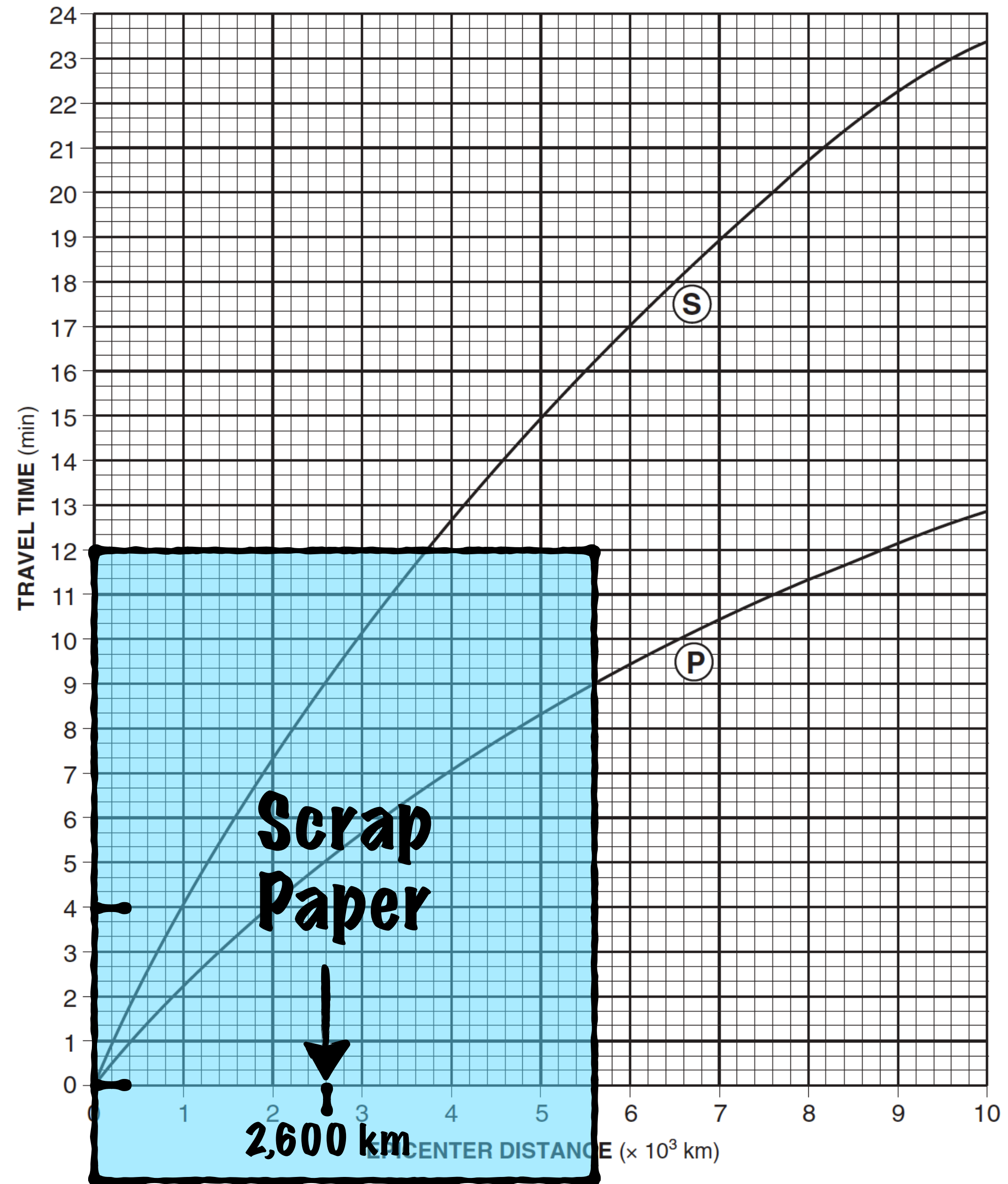
S-wave	07:31:00
P-wave	07:27:00
Difference	00:04:00

Time [h:min:sec]

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- Steps to Locate an Epicenter [continued]:
 2. Use scrap paper to mark the time difference on the “Earthquake P-Wave and S-Wave Travel Time” chart
 3. Slide the scrap paper [with the time difference marks] until it fits perfectly between the S and P lines
 4. Look straight down for the “Epicenter Distance”

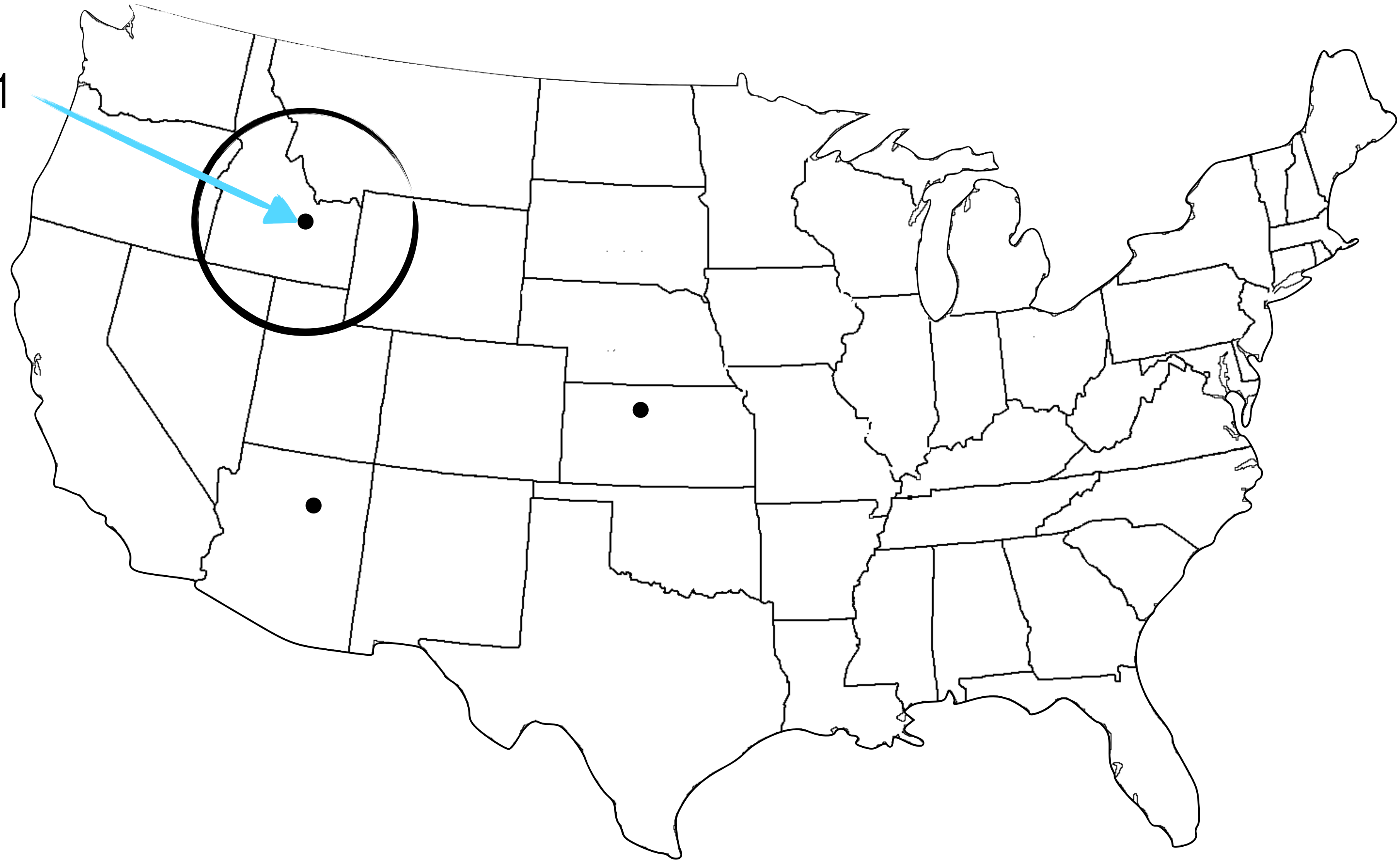
Earthquake P-Wave and S-Wave Travel Time



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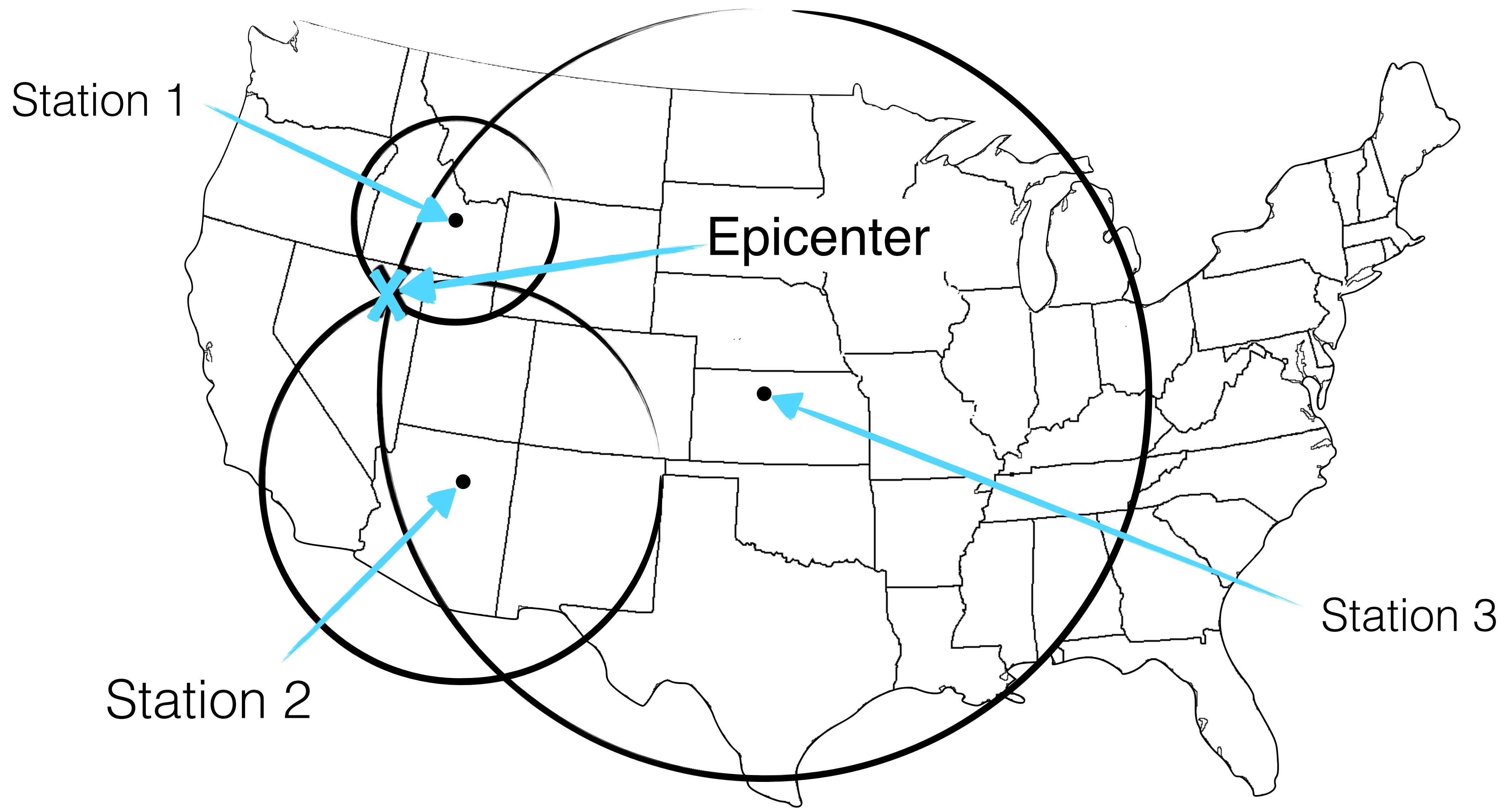
- Steps to Locate an Epicenter [continued]:
 5. Using a safety compass, draw a circle from the seismograph station for the determine “Epicenter Distance”

Station 1



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- Steps to Locate an Epicenter [continued]:
 6. Repeat steps 1-5 for the two additional seismograms to find the intersecting point for the three circles
 7. Mark it with an “X”



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