

New Candidate Ultralow-Velocity Zone Locations from Highly Anomalous SPdKS Waveforms

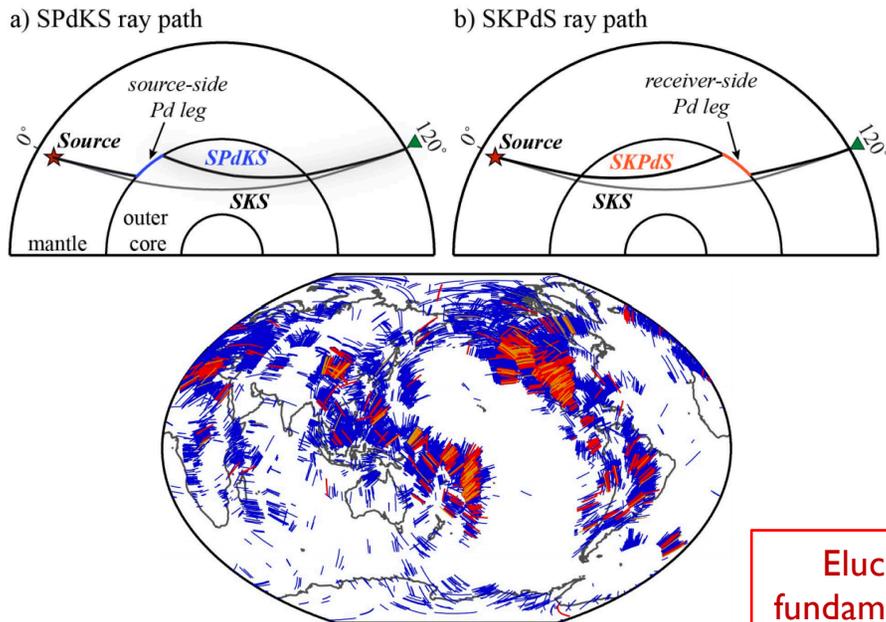
Thorne *et al.*, 2020 in *Minerals*

Authors used unique seismic phase known as SPdKS found within the GSN catalogue.

Their data covered ~60% of the core-mantle boundary surface area. Aim is to map out the locations of “Ultralow-Velocity Zones”.

Seismic Data used:

GSN provide subset of these seismic phases (a,b), resulting in sampling of the core-mantle boundary shown below.



Significance: What are ULVZs??

Regions at the base of the mantle that show extremely low seismic wave speed properties

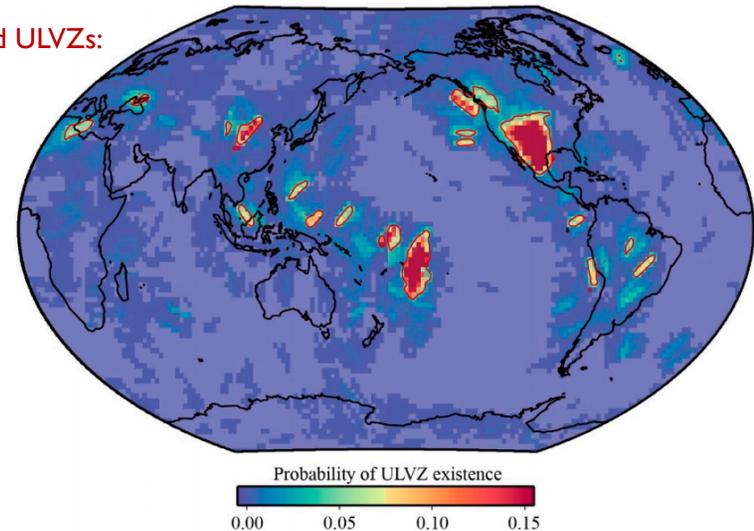
(10-30% slow down, where most of the mantle varies by ~1%).

They're patchy and not very tall, locations from numerous studies find them in slightly differing places.

They may be partially molten or be enriched in iron.

Either way – they provide clues to the evolution of the Earth's system from billions of years ago.

Identified ULVZs:



Elucidating ULVZ locations, seismic characteristics, and morphology is a fundamental goal of understanding mantle dynamics throughout Earth history.

Seismic Ocean Thermometry

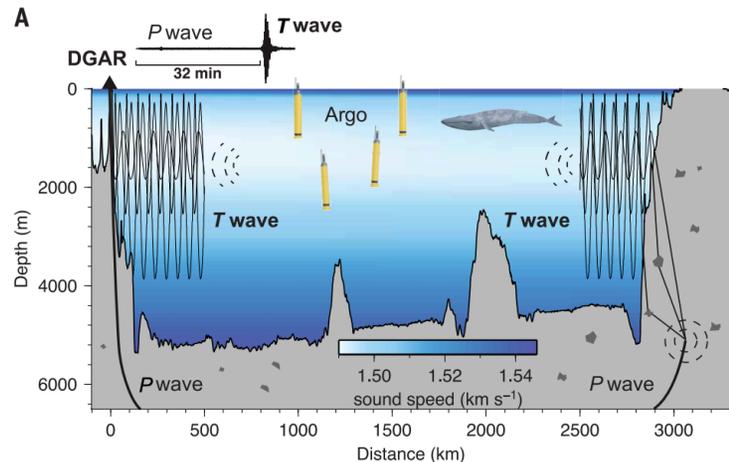
Wu *et al.*, 2020 in *Science*

Authors use seismic waves generated by repeating earthquakes to detect changes to ocean temperature.

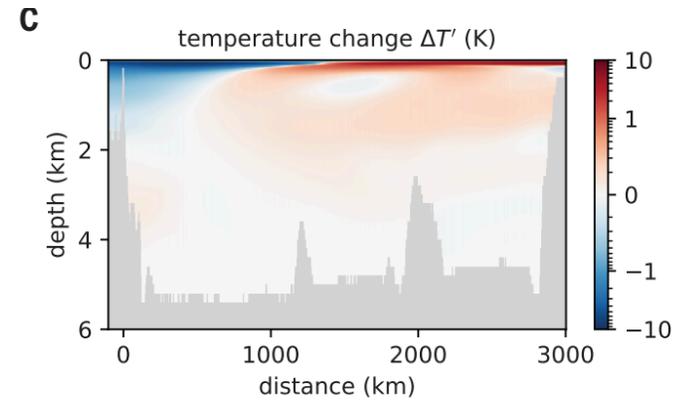
Seismic Data:

P wave travels through the Earth after an earthquake, triggering a T wave traveling through the ocean. Both are measured by an IRIS/GSN station.

The **longevity of GSN stations** allows us to detect changes in the thermal properties of the ocean over decades and over large swaths of our oceans.



Key Result: Estimated temperature changes across 3000 km across equatorial East Indian Ocean between 2005-2016



Seismic Ocean Thermometry provides an independent way to monitor ocean temperature changes that can not only cover large areas of the ocean, but a significant timespan given the longevity of the GSN.

This is key to understanding the effect of anthropogenic climate change and societal issues such as sea level rise through thermally expanding seas...