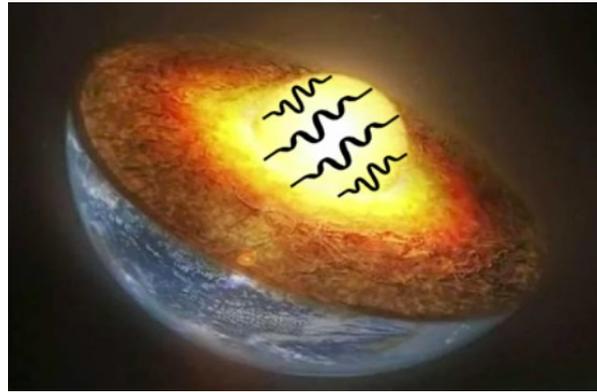


REACHING FOR THE HOLY GRAIL OF MODERN GLOBAL SEISMOLOGY: NEW INSIGHTS INTO THE CENTRE OF THE EARTH FROM THE DETECTION OF J WAVES

More than 75 years ago, the Earth's core was hypothesized to be solid in the centre as a result of a liquid–solid phase change in iron, which implies that shear waves in its solid part (seismic J–phase) should exist. Some claims of such observations have been made, but the J–phase has remained elusive until the present day. According to some researchers, the compressional body waves that convert to shear waves during passage through the inner core (a.k.a. PKJKP) were termed “the holy grail of body wave seismology”.



I will tell a story on how the quest for the PKJKP took an unexpected turn: we employed recent advances in the global correlation wavefield to detect the presence of the J waves unequivocally.

From the observations of the J–phase, we obtained new estimates for shear properties of the Earth's centre, including shear wave speed, resistance to shear and attenuation.

I will present evidence for a “soft inner core”, which explains the absence of PKJKP waves in the seismic wavefield and has significant implications for geodynamics and mineral physics studies.

HRVOJE TKALČIĆ

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Associate Professor Hrvoje Tkalčić is Head of Seismology and Mathematical Geophysics at the Research School of Earth Sciences, the Australian National University (ANU). He obtained a Diploma of Engineering degree in physics with specialty in geophysics from the University of Zagreb, Croatia and his PhD in Seismology from the University of California at Berkeley. He has been using observational seismology and mathematical geophysics tools to understand the internal workings of the Earth. He contributed to the understanding of structure and dynamics of the deepest parts of the Earth's interior including the core and the lowermost mantle and developed and applied various methods to study lithospheric structure. His recent projects focus on developing innovative approaches in Earth imaging, and on studying physics of seismic sources including volcanic earthquakes and explosions using a rigorous treatment of uncertainty. He has been contributing towards improving the global coverage of seismic data by leading and participating in deployments in remote regions of Earth. He and his team has just been awarded a ship time worth \$5.5M on the Australian Research Vessel Investigator to deploy an ocean bottom seismometers array in the Southern Ocean near the Macquarie ridge complex in 2020.

Tkalčić is the manager of the Warramunga Seismic and Infrasound monitoring facility in the Northern Territory, Australia, that the ANU is running on behalf of the United Nations. He is a winner of Excellence in Research Achievement Award by the Australian AuScope. He has contributed more than 70 peer reviewed research papers. His book "Earth's Inner Core Revealed by Observational Seismology" was published by Cambridge University Press in 2017.