Geophysical Research Abstracts
Vol. 21, EGU2019-2204, 2019
EGU General Assembly 2019

Inhomogeneous structure of the southern Aegean revealed by using peak delay times of S-waves

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Southern Aegean is characterized by an ongoing process of oceanic subduction. In this study, 1718 intermediate depth (> 35 km) events recorded by temporary and permanent seismic networks in southern Aegean are used to study the spatial distribution of random inhomogeneities using peak delay times of S-waves. Peak delay times (t_p) are measured as the time difference between S-wave onset and the peak of the S-wave envelope in 2-4, 4-8, 8-16 and 16-32 Hz bands. Peak delay times are also inverted to estimate the scattering parameters (κ and ε_{param}) and peak spectral density function at large wavenumbers ($P_l(m)$) of the medium modeled as von Kármán type. κ controls the frequency dependence of scattering. Regions which show more scattering in higher frequencies should have low κ. ε_{param} indicates the amplitude of $P_l(m)$ in a constant κ medium. Higher ε_{param} at constant κ should imply stronger inhomogeneities. $P_l(m)$ represents the scattering strength in high frequencies. High $P_l(m)$ indicates a greater ability to scatter high-frequency waves. High $P_l(m)$ with low κ across Peloponnese in 0-20 km depth may result from intermixing of oceanic material with continental rocks at different levels with a possibility of fluid activity and salt diapirism in northwest Peloponnese. Moderate $P_l(m)$ in 0-60 km depth across Crete is likely due to a combination of factors including past megathrust earthquakes, sediment underplating and flow of metamorphosed material in a subduction channel. Cyclades shows low κ in 0-40 km depth, indicative of inhomogeneities produced by metamorphic core complexes. Very low κ in 60-80 km depth is consistent with the location of mantle magma reservoir in the back-arc region. Our results suggest that a significant portion of total S-wave attenuation (Q_s^{-1}) in the eastern Cyclades for 20-80 km depth may be due to scattering losses.