Geophysical Research Abstracts
Vol. 21, EGU2019-3500, 2019
EGU General Assembly 2019

D'' Discontinuity and It's Lateral Heterogeneity Beneath South-East Asia

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The lowermost 100-300 km of the mantle (termed the D" region) has long been characterised as anomalous in material properties relative to the bulk of the lower mantle. While the detailed velocity structure of D" is still unresolved, it is apparent that lateral heterogeneity exists on a scale lengths ranging from tens of kilometres to thousands of kilometres.In particular, velocity discontinuities have been clearly observed under north central Asia (Eurasia), the Indian Ocean, the Arctic, certain areas of the Pacific Ocean, portions of South America, Central America, and Alaska that lie along the Pacific Rim. Taking the interpretations for these studies at face value, one infers that the P and S discontinuities are intermittent feature of D", rather than global structure.Many global seismic observations have indicated that a distinct phase exists between the SH and ScS phases at an epicentral distance of 70-95 degrees; the sign of this phase is consistent with the sign of SH (ScS): either both signs positive and both negative. Theoretical calculations have revealed that this phase should derive from the D" discontinuity, therefore the phase in question is generally referred to as the SdS phase.The use of SdS phase in D" discontinuity studies is significantly limited by data distribution. In principle, certain epicentral distances greater than 70 degree and focal depths greater than 300 km are required to ensure the identification of clear SdS. However, deep earthquakes frequently occur only in specific regions, significantly restricting the spatial feasibility of using SdS of deep earthquakes to study the D" layer. Therefore, the previous studies utilizing this method have focused only on specific regions. This work attempts to examine the presence of the D" under the Southeast Asia region using seismic waveform data majorly from Europe & Asian stations. The events used are from Solomon Islands, which is in south-western Pacific. In order to attempt to outline the global characteristics of this discontinuity, this study focuses on event of the year 2000 and onwards, as post 2000 most of the global broadband network has been deployed and it continues to grow. The Russian stations (Kyrgyzstan) have provided some good quality of data to study the waveforms. This study comprises (i) Preparation of a map with the possible source receiver combination to get an idea for the selection of initial events and for future purpose (ii) Examination of P waves by checking waveform complexity pattern with distance, rotation and linear polarisation of data, to eliminate other possibilities behind the intermediate phase (iii) Matching the theoretical and observed differential travel times for direct S and ScS to be sure of the phases identified (iv) Identification of the phases (v) Windowing under a certain time window (vi) Preparing a composite travel time plot to check for the behaviour of the intermediate phase with increasing epicentral distance (vii) Preparation of the final map showing the mapped region with ScS reflection points. The final results assert the existence of D" discontinuity beneath this region.