**Shear-Wave Splitting and Anisotropy observed**

**in the Caucasus Region of West Asia**

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Caucasus Organic Belt is composed of Caucasus-Iran-Anatolian/Armenia (CIA), was formed by continental collision between Arabian Plate and Eurasian Plate. We can know surface deformation by direct observation and mantle flow by seismic anisotropy which rock and mineral in Earth interior record the history of forcing. Therefore, understanding mantle flow below CIA region can help us illustrate the continental collision zone dynamics. We have unique opportunity to study Greater and Lesser Caucasus where are deficient in analysis of shear-wave splitting (SWS) because previous studies were more focused on Iran and Anatolian Plateau of Turkey.

We mainly used the broad-band seismograph deployed in Georgia and Armenia in 2010-2020 and collected SK(K)S phases of tele-seismic waves to analyze the fast-direction and splitting time of seismic anisotropy. Especially, we applied principal components analysis to improve SWS method used in the past. Totally, we used 46 stations and 1346 high-quality shear waves to understand the anisotropy below the station. Furthermore, we confirmed the depth and strength of anisotropy via 1-D forward modeling because shear wave integrates the anisotropy of ray path.

The results of SWS indicate that overall fast-direction shows NE-SW direction which is subparallel with absolute plate motion. Moreover, splitting time dramatically decreases from 1.06s in Western Caucasus to 0.7s in volcanic area of Armenia where were identified active magmatism region. We proposed that the large-scale seismic anisotropy is asthenosphere dominate and obvious variation of strength may be related to small-scale thermal anomaly caused by upwelling of upper mantle.

**Keywords:** Caucasus, seismic anisotropy, shear-wave splitting, asthenosphere, mantle flow

1. 背景介紹

高加索造山帶為阿爾卑斯-喜馬拉雅造山帶的一部份，由阿拉伯板塊與歐亞板塊間的陸-陸板塊碰撞形成。

1. 動機
   1. 地表觀測可以告訴我們板塊運動行為，但地函的運動行為無法直接使用儀器量測。Seismic anisotropy可以用來了解岩石圈過去的變形行為或是軟流圈現今的流場運動
   2. 前人研究已探討土耳其、伊朗西北邊的地函動力關係，若欲了解西亞完整地體動力關係，高加索地區=key
2. 主要目的

利用剪力波分離量測非均向性，得知非均向性的方向與強度，能為大陸碰撞的動力機制提供證據

1. 回顧這區域的研究

Most of these studies reveal prominent low-velocity anomalies in the uppermost mantle beneath the collision belts

1. 資料  
   中研院地球所與台大地質系佈放寬頻地震儀，利用遠震波相SKS, SKKS波相量測非均向性參數，
2. 方法與目標

整體結果顯示高加索地區的快方向為東北西南走向, 延遲時間為1.4~0.75s，與前人在NW伊朗 NE土耳其結果一致，並且在火山區域有延遲時間變小的現象，可能與高加索地區的火成活動有關

1. 未來計畫

The asthenosphericflow beneath the thinner lithosphere

the overheated asthenosphere appears to be very close tothe bottom of the crust. It heats the crustal rocks, leads to activemelting and forming magma reservoirs.

1. 議題（做什麼）
2. 方法（怎麼做)
3. 成果