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Kinematics, fabrics and geochronology analysis in the Médog shear zone, Eastern Himalayan Syntaxis

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The Himalaya orogen is a classic example of an orogenic system created by continent–continent collision [1]. Although there are many studies concerning collision time, tectonic evolutionary history, metamorphism and deformation, our understanding of the orogen belt remains incomplete. The Himalayan orogen is bordered by four large boundaries: the Yarlung-Tsangpo suture to the north, the Main Frontal Thrust (MFT) to the south, the left-slip Chaman fault to the west, and the right-slip Sagaing fault to the east [2]. The eastern Himalayan syntaxis (EHS) represents the east termination of the main Himalayan arc. Understanding the tectonics of the EHS plays a key role in constructing the origin and evolution of the Himalaya orogen belt. Thus, the kinematics, microstructure, geochronology and fabric analyses of the deformation structures are critically important.

The EHS, structurally below the Gangdese magmatic belt, is a high-grade metamorphic terrane. This terrane primarily consists of orthogneiss and paragneiss with high amphibolite-granulite facies that are often interlayered with high-pressure granulites and mantle-derived mafic-ultramafic xenoliths. These rocks experienced high grade metamorphism in the upper green schist to upper amphibolite or granulite facies [3]. The EHS is confined by boundary faults, including the sinistral-shearing Dongjiu-Milin fault to the west and the dextral-slipping Médog Shear zone to the east [4].

In this study, we report kinematics, fabrics and geochronology data of the Médog shear zone in the EHS. Analyses of the crystallographic preferred orientation (CPO) of quartz (EBSD analysis) demonstrated that there are three major slip systems: (1) basal <a> slip, (2) prism [c] slip, and (3) prism <a> slip. These slip systems are consistent with microstructures of low-temperature shearing, medium- temperature shearing and high-temperature shearing, respectively. Zircons from the two gneiss samples possess inherited magmatic cores and metamorphic overgrown rims, yielding a metamorphic age of 29.4~28.6 Ma. It is suggested that the dextral shearing along the Médog shear zone was not earlier than the Early Oligocene. The $^{40}Ar/^{39}Ar$ analysis indicates that the Médog shear zone experienced three thermo-tectonic events from the Late Oligocene to the Pliocene, e.g., ~23.4 Ma, 16.9~12.6 Ma and ~5.3 Ma. We correlate the Oligocene metamorphic event and the Late Oligocene to the Pliocene multi-stage thermo-tectonic events that resulted from subduction of the northeast corner of the India plate.

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