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横跨喜马拉雅造山带的构造运动转换与变形分配

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Transformation of tectonic movement and deformation partitioning across the Himalayan orogenic belt

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摘要

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摘要 喜马拉雅造山带包含喜马拉雅弧和东、西构造结3个基本部分,它们是大陆碰撞后印度板块继续向北移动,并向西藏高原下俯冲产生的构造变形系统.该系统的重要地质特征之一,是同时存在多种不同样式、不同或相反性质的地壳变形,例如地壳南北向缩短与东西向伸展,高原隆起与山间盆地地下沉,与造山带走向大致平行的向北倾斜或向南倾斜的逆断层,东西向(如藏南滑脱带)和南北向的正断层,北东和北西向的走滑断层,绕垂直轴(平面弧形)和水平轴(剖面褶皱)的弯曲等.这些现象表明,在完整、刚硬的印度次大陆插进破碎(拼合)、柔软的西藏下面后,造山带以南印度向北的简单刚体运动在跨越喜马拉雅南缘后转换为多种变形,分配到喜马拉雅造山带及其北边的广大大陆内地区.这样的转换过程可能是以不连续方式发生在新生代以来不同地质年代,发生并保留在不同的深度,所造成的变形特征与深部热状态和分层流变性质,以及许多局部条件有关,如原有构造走向与印度板块运动方向之间的几何关系(角度),被变形地质体的相对强度,不同变形体之间的相互作用以及局部应力状态的改变等.喜马拉雅造山带向南凸出的弧形,是由浅表的逆断层上盘的向南滑动形成的,受地形及重力梯度控制,基本上与弧的走向正交,掩盖了深部可能存在的斜向俯冲.喜马拉雅东、西构造结的变形过程在时间、空间上的差异,是西藏东部下地壳向东、东南流动的部分原因,这样的流动可能限制或改变了东构造结附近的地壳变形样式.

关键词: 喜马拉雅造山带 构造结 构造运动转换 变形分配 分层流变 下地壳流

Abstract: The Himalayan orogenic belt consists of 3 basic units, i.e. the Himalayan arc, eastern and western syntaxes, which are a deformation system resulted from the continuing northward motion and underthrust of the Indian plate after the India-Eurasia collision. In geology, this system is characterized by coexisting various kinds of crustal deformation, such as north-south shortening and east-west extension, plateau uplift and subsidence of intermountain basins, northward or southward dipping thrust faults that are roughly parallel to the strike of the orogenic belt, east-west trending and north-south trending normal faults, northeast or northwest directed strike-slip faults, and flexures around vertical or horizontal axes. These phenomena imply that after the intact and hard India plate plunged beneath the fragmented and soft Tibetan plateau, the northward motion of the Indian rigid body has transformed into various deformation across the Himalayas, which are partitioned in a broad intracontinental region in the north. Such a transformation might occurred in a discontinuous manner during different geological times, yielding varied signatures at different depths. The features of resultant deformation are associated with thermal state at depth and stratified rheology as well as other local conditions, such as the geometrical relationship between the existing structure and motion direction of the India plate, relative strength of deformed geological massifs, interaction between structures and variations of local stress state. The southward convex shape of the Himalayan arc is produced by the southward slide of hanging walls of thrust faults, that is dictated by topography and gravity gradients, roughly perpendicular to the strike of the arc, concealing the possible oblique subduction at depth. The proposed eastward and southeastward flow of lower crust in eastern Tibet is likely in part attributed to the differences of deformation processes in time and space of the eastern and western Himalayan syntaxes, which has limited and changed the deformation style around the eastern Himalayan syntaxis.

Keywords: Himalayan orogenic belt syntaxis transformation of tectonic motion deformation partitioning layered rheology flow of lower crust

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