Geology of Ladakh Himalayas in northern India: Discovery of Jurassic ammonoid from the Shyok Suture Zone and its significance

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The Shyok Suture Zone along the northern margin of the Ladakh Arc consists mainly of ophiolite (or ophiolite mélange?), and Cretaceous Dras Volcanics and Shyok Formation. Late Cretaceous-Eocene Ladakh Batholith and Khardung Volcanics intrude and/or cover them. In the area north of Chang La Pass, Ladakh, in northern India, ophiolitic rocks, sedimentary unit and granitic rocks of the Shyok Suture Zone are distributed, from south to north, on the north of the Ladakh Batholith. The last granitic rocks are cut on their northern margin by the dextral Karakorum Fault and strongly mylonitized. The sedimentary unit is several hundred meters thick, and mainly composed of massive or laminated mudstone, associated with sandstone and thin alternating beds of sandstone and mudstone. They are often intruded by dolerite, porphyrite or aplite dykes, and changed into hornfels. Some ammonoids were collected from this mudstone with some small pelecypods. Although the specimens are not well preserved, some of them are safely identified as Macrocephalites sp. mainly by its characteristic shell ornamentation. Species of the genus Macrocephalites are widely known from the Lower Callovian (Middle Jurassic) strata in the world. This is the first reliable Jurassic fossil from the Shyok Suture Zone, and provides new aspects for tectonic development of the Ladakh Arc and for the offset of the Karakorum Fault.

There are contradicting interpretations concerning the basement of the Ladakh Arc: oceanic or continental. The ammonoid-bearing Middle Jurassic of Chang La is terrigenous and deposited, prior to the arc formation, probably on a continental shelf. The Middle Jurassic shelf strata of the adjacent Tethys-Himalaya and Karakorum Zones are dominated by limestone facies and no clastic facies Middle Jurassic has been known from these terrenes. Therefore, the Chang La Jurassic is hardly a klippe derived from these terrenes, and is thought to be a part of the continental basement of the Ladakh Arc.

Two candidates have been proposed for the eastern extension of the Shyok suture zone, shifted southerly by the dextral Karakorum Fault: the Bangong-Nujian Suture Zone between the Qiantang and Lhasa Blocks, and the Shiquanhe Suture Zone to the south of the former. The association of basic to ultrabasic rock complex, Aptian fossil-bearing Cretaceous sedimentary unit and Tertiary red sandstones, all of which have been known from these three suture zones, has led to correlate the Shyok Suture Zone with the Bangong-Nujian or Shiquanhe Suture Zone. The clastic facies Jurassic is also widely distributed along and between the latter two suture zones. Although it is still an open question which zone to choose as an eastern extension of the Shyok Suture Zone, present discovery of Middle Jurassic of clastic facies from Chang La provides additional basis for correlating the Shyok Suture Zone with the suture zones along the northern margin of the Lhasa Block.