Abstract

Investigation into the ribbon continents has started since the 1980s; however, most studies focued on oceanic closure phase, involving the subduction, accretion, and collision. The formation of ribbon continents has received little attention, perhaps because it has less recent examples. This thesis is designed to address several possible scenarios for the formation of ribbon continent by investigating the tectonics, magmatism, and sedimentation of the former Avalonian–Cadomian belt during the break-up of the peri-Gondwana terranes and transition from the active- to passive-margin settings. The data originated from three different locations within the Bohemian Massif, the Czech Republic, which can also be viewed as a Cambro–Ordovician crustal evolution from the lower crust to the surface level: (1) intermediate to felsic of the Kdyně pluton in the Plzeň region, (2) the continental Příbram–Jince basin in the Central Bohemian region, and (3) metagranites and granitic orthogneisses of the Moldanubian zone in Pardubice and Vysočina regions. The methods used involve the integration of structural mapping, microstructural analysis, stratigraphic and sedimentological analysis, and in particular the anisotropy of magnetic susceptibility (AMS) accompanied by an examination of magnetic mineralogy using thermomagnetic measurements. Moreover, the third location contains geochronologic dating (U–Pb on zircons) measured using laser ablation–inductively coupled plasma–mass spectrometry (LA–ICP–MS).

The most important results from each study case can be summarized as follows. (1) The Kdyně pluton was an apical part of a domal structure in the upper crust and was primarily controlled by magma buoyancy rather than tectonic deformation through rapid (at ca. 524–523 Ma) and multiple emplacement processes (magma wedging and lateral expansion with minor stoping mechanism). The deformation during the pluton emplacement was partitioned into simple shear-dominated zones that delimited pure shear-dominated belts. This rapid heat input into the former accretionary complex of Blovice was perhaps due to slab break-off, indicating the initial stage of extension in the Teplá–Barrandian unit. (2) The Příbram–Jince basin was influenced mainly by synsedimentary faulting (a series of horsts and grabens) and dominated by continental conglomerates, coarse-grained sandstones, and thin tuffaceous layers deposited in alluvial fans, flood plains, and river channels. The tectonic setting evolved from pure shear dominated with the sediment sourced from pre-Cambrian terranes to a pull-apart dextral transtension with its source coming from the local material of Blovice accretionary complex during ca. 511 Ma. This tectonic setting was coeval with the separation of the Avalonian–Cadomian belt from the northern Gondwana margin and the initial opening of the Rheic Ocean. (3) The slab break-off in the Teplá–Barrandian unit was followed by lithospheric thinning that caused emplacement of granitic magma in the Moldanubian zone (Moldanubian orthogneisses) due to basalt underplating in the extended crust. This event was coeval with the Avalonia ribbon terrane's rift–drift transition and opening of the Rheic Ocean (at ca. 485 Ma).

In summary, using the above mentioned case examples, it can be shown that the formation of a ribbon continent is mainly governed by the thermal budget within the lithosphere. In the Bohemian Massif, it was shown that the lower crust was weakened first due to slab break-off, followed by stretching of the upper crust. This inference is compatible with the Type III-A/C extension model. Furthermore, the break-up and drift of a ribbon continent is also highly dependent on the presence or absence of an inherited suture or discontinuity.