Seismic Activity around and under Krakatau Volcano, Sunda Arc: Constraints to the Source Region of Island Arc Volcanics

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There exists a general agreement that calc-alkaline volcanic rocks at convergent plate margins are genetically related to the process of subduction. However, the opinions on the mode and site of generation of primary magma for island arc volcanism substantially differ. The site of generation of calc-alkaline magma is thought to be either in the mantle wedge or in the subducting slab. The presented letter aims to bring seismological evidence in favour of the latter concept. The intense shallow and intermediate seismic activity in the mantle wedge below the Krakatau volcano excludes large-scale melting of the mantle material and witness to brittle character of the continental lithosphere. The aseismic gap, interpreted by us as a partially melted domain, occurring in the subducted slabs in practically all active subduction zones reaching depths greater than 100 km, is used as an argument for the localization of the source region of island arc volcanics in the subducting plate.

Palaeotopography and Base-Level Change as Controls on Fluvial architecture: Horoušany-Brník Palaeovalley Evolution (Cenomanian, Bohemian Cretaceous Basin)

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Conceptual sequence stratigraphic models have emphasized mainly regional basinal (subsidence/uplift, sediment supply) and extrabasinal (eustasy) controls. Local controls such as valley topography have received less attention. Many recent case studies, however, document the importance of local controls, especially of valley-coastal plain topography (i.e., specific stream profile).

Non-marine strata of Cenomanian age located east of Prague (Central Bohemia, Czech Republic) were examined in outcrops and boreholes with the aim to interpret the controls on the temporal and spatial changes in regional depositional geometries as well as local fluvial styles. The overall vertical succession of the Peruc-Korycany Formation shows a marked drowning-upward pattern, passing from the fluvial deposits through tide-influenced, estuarine strata, to wave-influenced, shallow-marine facies. However, the long-term relative sea-level rise was punctuated by short-term falls of varying magnitude, which were recorded in both marine and non-marine strata.

The non-marine part of the Peruc-Korycany Fm. was deposited in fluvial to tidally influenced fluvial environment and is interpreted as a series of complex valley fills which recorded several cycles of base-level rise and fall in three adjacent palaeovalleys of different paleogeographical and tectonic settings.

Regional correlation of borehole data allowed correlation of the local stratigraphic succession with the regional sequence stratigraphic framework and the reconstruction of the large-scale architecture of the palaeovalley fill. The palaeovalleys situated on Barrandian basement followed the dominant ENE-trending linear structures, whereas the Brník palaeovalley was partly aligned along the N-S trending Kouřim Fault, and in its lower part it joined the NE-trending palaeovalley system.

Laterally extensive exposures in quarries, up to several hundred meters in width, enabled interpretation of temporal changes in fluvial style, and although the exposures do not show the complete succession of the valley fills, they were very important for our interpretations. In the lowermost part of the exposures in Horoušany and Brník quarries, sandstone belts with dominant lateral accretion occur, interbedded with floodplain deposits and palaeosols and interpreted as sediments of meandering rivers. They are overlain by floodplain deposits with more isolated channel bodies, interpreted as coastal plain with possible anastomosed channels. A major change in fluvial style is represented by the overlying unit, characterized by braided--stream deposits in the Brník palaeovalley, filling a palaeo valley with up to 10 m vertical relief, and by tide-influenced fluvial deposits filling shallowly incised channels in the Horoušany area.

According to borehole data, stratal units dominated by a suite of variable channel sandstone bodies and floodplain mudstones are interbedded with units dominated by sandstones and conglomerates, which are interpreted as low-sinuosity (braided) stream deposits. Detailed reconstruction of topography of the palaeovalleys and interpretation of their infills reveals two cycles of base-level rise and fall, probably driven by eustasy, and subsequent base-level rise which resulted in establishing tide-dominated, estuarine conditions in the area.

Apart from the changes in base level, the fluvial style and depositional geometries were also controlled by changes in stream profile due to gradual filling of the palaeovalleys. This induced changes of the courses of main fluvial systems between the early stage (when rivers were generally confined within the basement-controlled valleys), and the final stage, characterized by flat coastal plain above the filled valleys, with channel courses dominated by the regional slope and locally active tectonic elements, such as the Kouřim Fault.