trachyte-basalt magmatism preceded a Pliocene alkaline basaltic volcanic activity. This presentation focuses mainly on the LHPVF.

The Sarmatian trachytes have clear intraplate affinities and differ from the SVF trachyandesites and latites. The Early Pannonian basalts generated in the asthenosphere and show a remarkable similarity to the basalts of Oberpullendorf and Pauliberg (western LHPVF). Sr and Nd isotopic ratios of these volcanic products reflect more depleted character than the Pliocene alkali basalts of the central Pannonian Basin. Early Pliocene mafic volcanics of the southern LHPVF have dominantly primitive composition and show a wide variability in chemistry. Trace element and Sr and Nd isotopic signatures reflect different degrees of partial melting and a heterogeneous mantle source for the southern LHPVF magmas. Partial melting could have occurred either in the garnet stability field or in the garnet-spinel transition zone. A two-component mixing model is suggested for the generation of the LHPVF mafic volcanics. One of these components might be located in the asthenosphere or in the TBL (Thermal Boundary Layer) and has some features of St Helena-type mantle. The other component might be located at the lower part of the MBL (Mechanical Boundary Layer) and is considered to be the result of aqueous fluid metasomatism related to the Miocene subduction along the Carpathian arc.

Alkaline volcanism in the LHPVF postdated the main extensional phase of the Little Hungarian Plain and is supported predominantly by asthenosphere-derived melts. The trachytic volcanism occurred at the centre of the basin during the short-term aborted narrow-rift stage when β could have exceeded 2. The post-extensional basaltic volcanism might be related to the moderate raise of the mantle potential temperature due to an influence of a mantle plume ('thinspot' effect?).

Although geochemistry of the Badenian SVF latites shows some subduction influence, it cannot be stated that they have a direct subduction-related origin. Moreover, a recent study has pointed out a strong genetical relationship between the Gleichenberg latite and the ultrapotassic rocks of Balatonmária (central Pannonian Basin). They could be generated in a syn-rift phase when lithospheric extension reactivated K-rich metasomatic veins in the lower part of the MBL and caused decompressional partial melting.

Remote sensing, structural geology and 3D-seismic: an integrated approach to explore tectonic structures in the Vienna Basin

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Tectonic interpretations in the Vienna Basin and, likewise, in other prospective and hydrocarbon bearing sedimentary basins are substancially hindered by the very limited outcrop conditions in basin areas. The correct evaluation of the structural geometry and evolution of such basins, however, is of crucial importance for hydrocarbon exploration and production, e.g., for assessing reservoir geometries, for reconstructing fluid pathways through active or abandoned faults, and for evaluating the sealing capacity of faults. With kind permission, technical and finacial support of OMV, a detailled R&D study is carried out in the Vienna Basin and its surrounding which integrates the interpretation of multitemporal and multisensoral satellite imagery, 3D-seismic data, and structural geology.

Remote sensing interpretations use images of sensors showing different imaging geometries and spatial resolutions to rule out effects inherent in satellite data which lead to a suppression of lineaments parallel to the sensor look direction. Additionally to data of line scanners, mapping the visible and infrared electromagnetic spectrum (SPOT-Panchromatic, LANDSAT Thematic Mapper), Synthetic Aperture Radar Data (SAR) operating in the microwave range (ERS-1, Japanese ERS-1) are interpreted. Due to the high sensitivity of microwaves to surface roughness and soil moisture and their capability to penetrate the surface to a certain extent, they proved to be a useful tool for the mapping of morphology and lineaments. The data sets are geocoded using a digital elevation model (DEM) with a grid spacing of 50 meters to enable the overlay and the synoptic interpretation of the different data sets (sensor merge) and to correct for terrain induced geometric distortions (e.g., foreshortening and layover in radar scenes which hinder the thematic interpretation). DEM is also used to create perspective views to facilitate the extraction of lineaments. After the execution of atmospheric corretions in the case of Landsat TM and the suppression of the speckle noise in the radar scenes by the application of additive filters (e.g., Frost filter), different directional filter kernels have been used to enhance the edges in the scenes. A first evaluation of the resulting image products revealed that the Vienna Basin and the adjacent areas are characterised by lineaments which dominantly trend N-S, NE-SW and NW-SE.

OMV's 3D-seismic surveys offer the possibility to check the significance of lineaments and to correlate faults to lineaments derived from remote sensing data. Lineaments correlate to fault patterns which can be identified in 3D-seismic sections using advanced software packages for 3D-visualisation and interpretation. En-echelon N(NE)-striking faults and connecting NE-striking faults have been identified in time slices through Badenian to Pannonian strata (c. 2000 to 400 ms TWT) in the northern Vienna Basin. In cross section, faults display significant normal offsets. Synsedimentary faults are characterised by listric geometries and the stratigraphic patterns within fault-bounded blocks show growth strata and rollover geometries. Coverage of seismic data is limited to depths below 400 ms TWT (c. 400 m). To find possible tectonic surface expressions, faults are traced upwards to check for correlation to morphologic features and lineaments. By comparison to structures in surface outcrops, the fault patterns mapped in seismics were identified as oblique-sinistral faults which bound rhomb-shaped divergent fault duplexes. Arrays of several such duplexes define major sinistral shear zones within the basin which were active from the Karpatian to the Pannonian stage (c. 17-8 Ma). Microtectonic field observations show that the divergent sinistral shear zones are cut by conjugate NW-SE striking normal faults. Older faults were overprinted and moved as oblique-normal faults during correlate NE-SW directed extension. The NW-striking normal faults have a marked morphological expression in paralleling the dominant trend of the drainage system. They are correlated to NW-SE trending lineaments depicted by remote sensing data.

The detailed fault geometries revealed by remote sensing and seismic mapping are combined with results of structural geology surveys in order to acess timing and kinematics of faulting in the Vienna Basin area. Detailed tectonic analyses of surface outcrops allow to establish a deformational and paleostress history which, in turn, can be used to predict the timing and the direction of movements along subsurface faults.

The lateral extrusion of the Eastern Alps: fact or fiction?

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During the last decade, many models dealing with the Neogene tectonics of the Eastern Alps have postulated an eastward extrusion of the Central Alps towards the Pannonian Basin. One main requirement of these models is a large-scale sinistral displacement along major faults at the southern margin of the Northern Calcareous Alps. Such sinistral sense of movement has never been proven for the Salzach and Ennstal Faults. Because of the following arguments, even the opposite seems to be true:

(1) The hydrographical pattern of the Salzach and Enns fluvial systems is incompatible with a young sinistral displacement at the northern border of the Tauern Window.

(2) A hypothetic fault segment at the southern edge of the Mandling Wedge - as has been postulated by the extrusion models - does not exist in nature. Field investigations have shown that the eastward prolongation of the Salzach fault is situated exactly Nof that Mandling Wedge and not S of it. Therefore, the E-W trending Salzach and Ennstal Faults do not belong to one contious fault system.

(3) The Tertiary of Wagrain (lower Miocene) was subjected only to dextral sheer (WANG, pers. comm.). A post-depositonal sinistral displacement can be excluded.

(4) Extrusion tectonics should have caused a counterclockwise rotation of individual segments of the Northern Calcareous Alps with respect to the Central Alps. But palaeomagnetic investigations clearly show that just the opposite did happen.

(5) The assumption of a dextral displacement along the Salzach-Mandling Fault yields an explanation of the arcuate structure of Weyer (Weyerer Bögen) which then was created by an E-W convergence resulting from the opposite sense of movement along theSalzach-Mandling Fault to the W and the Mariazell-Puchberg and Trofaiach Lines to the E (dextral and sinistral, respectively).

Therefore, any tectonic models which require a sinistral Neogene displacement along the northern border of the Tauern Window are simply wrong. A continuous sinistral SEMP Line (Salzach- Ennstal-Mariazell-Puchberg) does not exist. If at all, a lateral extrusion of the Eastern Alps towards the Pannonian Basin could only occur previous to the deposition of the Miocene sediments of Wagrain.