Paleoenvironmental evolution of the Vienna Basin during the Miocene

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The Vienna Basin (VB) is an about 200 km long and 55 km wide, rhomboid extensional basin, covering large parts of eastern Austria and extending northwards into the Czech Republic and eastwards to Slovakia. It originated during the Early and Middle Miocene and is composed of several horst and graben structures forming different subbasins. Each subbasin yields an own geodynamic evolution and deviating paleobathymetric developments during the Miocene marking the VB as one of the largest oil and gas fields in on shore Europe. During the last decades the OMV AG is leading in the investigation of the northern and central VB and numerous boreholes with up to 8,500 m depth (Zistersdorf ÜT 2a) were studied (mostly unpublished OMV internal reports). Still, the correlation of Neogene deposits throughout the basin remained ambiguous in regards of biostratigraphic correlation, paleoecological and paleobathymetrical reconstruction, due to the complex fault systems of the VB. To resolve persistent shortcomings in correlation of target horizons, a project was initiated covering 717 samples of 54 wells roughly aligned on a NNE to SSW transect. Micropaleontological data have been combined with core-log data, such as spontaneous potential, resistivity as well as modern 3D seismic data leading to the first continuous reconstruction of paleoenvironmental evolution of the VB from the Early Miocene to the Middle Miocene spanning 6.4 million years. Beside paleoenvironmental and biostratigraphic analyses, we applied transfer functions using benthic and planktonic foraminifers to analyze the water depth evolution and ecological trends like oxygen availability, salinity, trophic levels, bottom and sea surface temperature. Plankton-Benthos ratio was also applied to gather information of bathymetrical changes but showed troubling results. Hence, we propose not to use P/B ratio as main indictor for sea-level fluctuation reconstructions in highly active marginal areas like the VB. Using the transfer function of benthic foraminifers, dramatic changes in the depth profile with concomitant ecological changes through time, which coincide with shifts of prevailing tectonic regimes, could be observed. Bathyal conditions were established during the Early Miocene piggy-back stage and the early Middle Miocene extensional phase. A clear shallowing trend from upper bathyal to inner neritic conditions occurred during the Middle Miocene extensional tectonic phase. Bottom water temperatures indicate a cooling during the early and middle Badenian (Langhian), which seemingly contradicts the global warming of the Middle Miocene Climatic Optimum (MMCO) and a subsequent warming, which contrasts the expected trend following the cooling of the Middle Miocene Climatic Transition. Both trends are discussed as result of bathymetric evolution of the VB and intense upwelling during the early and middle Badenian. This project is financed by OMV-AG.