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Main features of Meso-Cenozoic Tectonic Subsidence of the Odessa Shelf (NW Black Sea) with 1D-modelling

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Introduction 1D modelling has been carried out to study the evolution of the NW Black Sea shelf (Odessa Shelf). The modelling is based on well data and a vast set of regional seismic reflection profiles. The study has been done in the framework of the Ukrainian national scientific programmes and international MEBE project. The detailed analysis of Meso-Cenozoic tectonic subsidence of Odessa Shelf with 1-D (backstripping and forward) modelling for Odessa shelf was carried out for the first time. The three main stages of the Meso-Cenozoic tectonic evolution of Odessa shelf were revealed from analysis of regional seismic profiling: 1) rifting stage due to extension of the study area (Early Cretaceous - beginning of Late Cretaceous; 2) post-rift thermal subsidence (middle of Late Cretaceous - Middle Eocene); 3) inversion stage. 28 wells and pseudo-wells were used for 1D backstripping and forward modelling for to confirm these stages. Results of backstripping modelling The tectonic subsidence curves allow recognizing five time slices in the tectonic evolution of Odessa shelf from Senomanian to Middle Miocene. Aptian and Albian sediments of Lower Cretaceous are penetrated by the only well. Behaviour of tectonic subsidence curve of the well for that time indicates a quiet tectonic condition. It means that during Cretaceous and Tertiary the Kraevaya step, where the well is located, was the southern margin of the Karkinit rift, which is the major tectonic unit of the Odessa Shelf. The tectonic subsidence curves allow demonstrating main peculiarities of the Odessa Shelf evolution as follows. I time slice - Senomanian to Santonian. High rates of tectonic subsidence are typical for this slice (20-40 m/Ma). The maximum rate was close by the Sulina-Tarhankut Fault. Rates reduce towards north and south of this fault. It means that the

axis of Karkinit rift basin was along the present day of the basin as well as nearby the uplifted Gubkin Swell. II time slice - Campanian to Middle Eocene. The slice is characterised by the considerable decreasing of tectonic subsidence. Average tectonic subsidence rates were 5-10 m/Ma. It was time of post-rift thermal subsidence. III time slice - Late Eocene. It was a short period. But it is very well determined on the tectonic subsidence curves and characterised by high tectonic subsidence rates (up to 30 m/Ma) that was caused by a compression event. IV time slice - Oligocene - Early Miocene. The average tectonic subsidence rates were 5-10 m/Ma. It was time of isolation of the western part of the Odessa shelf (Gubkin swell, Sulina depression, Zmeynuy Uplift and Predobrodgea depression). IV time slice - Middle Miocene. It was time of uplifting of the whole territory of the Odessa shelf. Results of forward modelling Forward modelling data indicate the rifting stage (I time slice) with delta factor of 1,2. During the post-rift thermal subsidence stage second (II) time slice delta factor was about 1,0. The next time slices are characterised by delta factor 0,9. It means the effect of compressional tectonic events. Conclusion The behaviour of tectonic subsidence curves and calculated delta factors clearly demonstrate three main stages of Odessa shelf evolution: 1) rifting stage (middle Early Cretaceous (?) - Santonian), 2) stage of post-rift thermal subsidence (Campanian - Middle Eocene), 3) stage of compression (Late Eocene - Middle Miocene). Reference 1. Harland W.B., Armstrong R.L., Cox A.V., Craig L.E., Smith A.G., Smith D.G., 1990. Geologic Time Scale 1989. Cambrige University Press. 263 p. 2. Cloetingh S.A.P.L., Kooi H., Reemst P.H.M., Beek P.A., 1992. Tectonic modelling of sedimentary basins. Practical course. Vrije Universiteit, Amsterdam. 3. McKenzie D., 1978. Some remarks on the development of sedimentary basins. Earth Planet. Sci. Lett. ź 40, p. 25-32