Wedges and buffers: a new structural perspective on the Dnieper-Donets basin, onshore Ukraine

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The onshore Ukraine Dnieper-Donets basin (DDB) is partially inverted late Palaeozoic intra-cratonic basin. The basin is large measuring around 500 by 100 km, and very deep, with a sedimentary column reaching 19km. Rifting began in the late Devonian when two evaporite sequences were deposited, and Carboniferous extension was accompanied by sag. Seismic imaging of the basin has not traditionally been of the highest quality, and although important quantities of Devonian salt are calibrated by wells and diapirs have been documented, classic halokinetic forms are probably not as common as suggested by the literature. Four important tectonic events have been consistently documented over the DDB; Tournaisian to Lower Visean and middle Serpukhovian 'extensional' events, and Hercynian equivalent (upper Permian) and Alpine (lower Tertiary) events which are recognised as being compressional.

As part of a Ferrexpo/RDS multi-license project, reprocessing of seismic data over several parts of the DDB has enabled a new structural interpretation of the basin to be considered. It is proposed that basin margin extension, facilitated by thin skinned decollement on Devonian salt and expressed by sedimentary wedges, is linked to thick skinned partial inversion of some important basement extensional faults, which acted as buffers. These linked tectonic events may have been caused by sag, perhaps driven by pulses of basin opening during the lower Carboniferous. Towards the basin centre, good images are also seen of thick skinned partial inversion where basin centre verging monoclines and anticlines previously described as salt diapirs, appear to be linked to partially inverted basement faults. These interpretations are consistent with Tournaisian to Lower Visean and middle Serpukhovian movements, for which there are specific examples complete with appropriate seismic facies. This interpretation is also consistent with axial salt wall features described in the literature, where opposing thin skinned decollement would meet and cause contraction in the middle of the DDB.

The identification of similar monoclines and anticlines throughout the basin should lead to the extrapolation of this new structural perspective on the DDB.