



Visualization of Mesozoic - Cenozoic sedimentation and subsidence in the northern Perth Basin, Australia: Preliminary study for understanding the spatial-temporal basin evolution

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The Perth Basin is a large (c. 172,300 km²) north-south elongated sedimentary basin extending offshore and onshore for about 1,300 km along the southwestern continental margin of Australia. It is a relatively under-explored region, despite being an established hydrocarbon producing basin whose hydrocarbon potential has proven over the basin area. The Perth Basin was formed by multiple episodes of rifting and drifting of the Greater Indian, Antarctica and Australian plates since the Late Paleozoic. The basin is filled by up to more than 15 km of Paleozoic to Cenozoic sediments overlying the Proterozoic crystalline basement. Since the Eocene, warm-water to tropical carbonate sedimentation has prevailed, which is related to the long-term northward drift of the Australian plate. To understand the internal structure and subsidence evolution of the northern Perth Basin, this study reconstructs 2D and 3D models of the sedimentary infill and subsidence of a study area (200 x 70 km²) located in offshore southwestern Australia. The studied well data were acquired from fourteen industry wells and Site U1459 of the International Ocean Discovery Program (IODP). The results were analyzed and visualized using functions of a MATLAB-based modular open-source tool, BasinVis 2.0. An adopted method to reconstruct the surface in the study area is the Ordinary Kriging spatial interpolation. The sedimentary infill of the study area is visualized in 3D sediment distribution surface model, 2D isopach map and 2D sedimentation rate map of each sequence. To evaluate the realistic isopach and sedimentation rate during the time of deposition, this study analyzes the results based on initial thickness of each sequence which is decompacted using the onsite compaction trend. The compaction trend is estimated using porosity data of well Houtman-1 and Site U1459. The subsidence of the study area is visualized in 3D subsidence depth models and 2D subsidence rate maps of total subsidence and tectonic subsidence relative to seafloor. Various analysis techniques are applied to this study on the northern Perth Basin to visualize dimensionally the Mesozoic – Cenozoic sedimentation and subsidence. The results show that the sedimentation setting and subsidence evolution were coupled with changes of the regional tectonics, structural geometries, paleoclimate and paleoenvironment. This visualization task is a preliminary study, which is the basis of further studies to understand the spatial-temporal evolution of the Perth Basin.