

Full Length Article

Sedimentary characteristics of turbidite fan and its implication for hydrocarbon exploration in Lower Congo Basin

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ABSTRACT

The turbidite is favorable for accumulation of oil and gas and it is the most important reservoir in the deepwater area of West Africa. Currently, some commercial discoveries in such the deepwater area generally belong to turbidite sandstone reservoirs. Based on comprehensive analysis of lithology, lithofacies and configuration of the turbidite, and combined with changes of seismic attributes and sedimentary cycle, the turbidite in the deepwater area of West Africa can be classified into by-pass channel (including the constructive by-pass channel and the erosive by-pass channel), confined channel complex, weakly confined channel complex, and lobe. Different types of turbidite reservoirs have different physical property, so there are differences in hydrocarbon exploration potential; the sandstone in the weakly confined channel complex is the key exploration target in the deepwater area of the Angola Sea.

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1. Introduction

The deepwater turbidite reservoir is an important target for oil and gas exploration and development in the world. Currently, there are more than 60 countries in the world to carry out oil and gas exploration in the deepwater areas (the depth >300 m), with the proved reserves of about 30×10^9 t. In the West Africa sea, a hot-spot area, great oil and gas exploration and development achievements have been obtained in deepwater areas of the Niger Delta, Gabon Coastal Basin, and Lower Congo Basin since the early 1960s. So far, the West Africa sea is still one of the most active and promising areas in the world. In recent years, as more and more Chinese petroleum companies enter into the West Africa sea for oil exploration and development, the Chinese researchers gradually carry out some studies of deepwater fans in this area, and some macroscopic characteristics are conclude and discussed (Gan and Chen, 2000). Based on the drilling and seismic practices, this paper further summarizes the sedimentary structure and model of deepwater fans in the study area.

2. Geological backgrounds

The Lower Congo Basin is located in the Angola and Congo sea areas in West Africa with an area of 0.3×10^6 km² (Fig. 1), its formation and development are closely related to separation and drift of the African Plate and the South American Plate. As a typical passive continental margin basin, the Lower Congo Basin is characterized by vertical stratification and east-west zoning.

2.1. Basin structure

In respect of structural evolution, the Lower Congo Basin experiences three evolution stages: rifting stage, transition stage and passive continental margin stage, it is vertically divided into the pre-salt rift tectonic deformation layer, the salt structure detachment layer and the post-salt gravity gliding tectonic deformation layer. The tectonic deformation characteristic and pattern of the upper deformation layer is characterized by obvious zoning horizontally, showing the extension zone, transition zone and compression zone from east to west (Fig. 2).

2.2. Sedimentary filling

The Lower Congo Basin basement is the Precambrian crystalline

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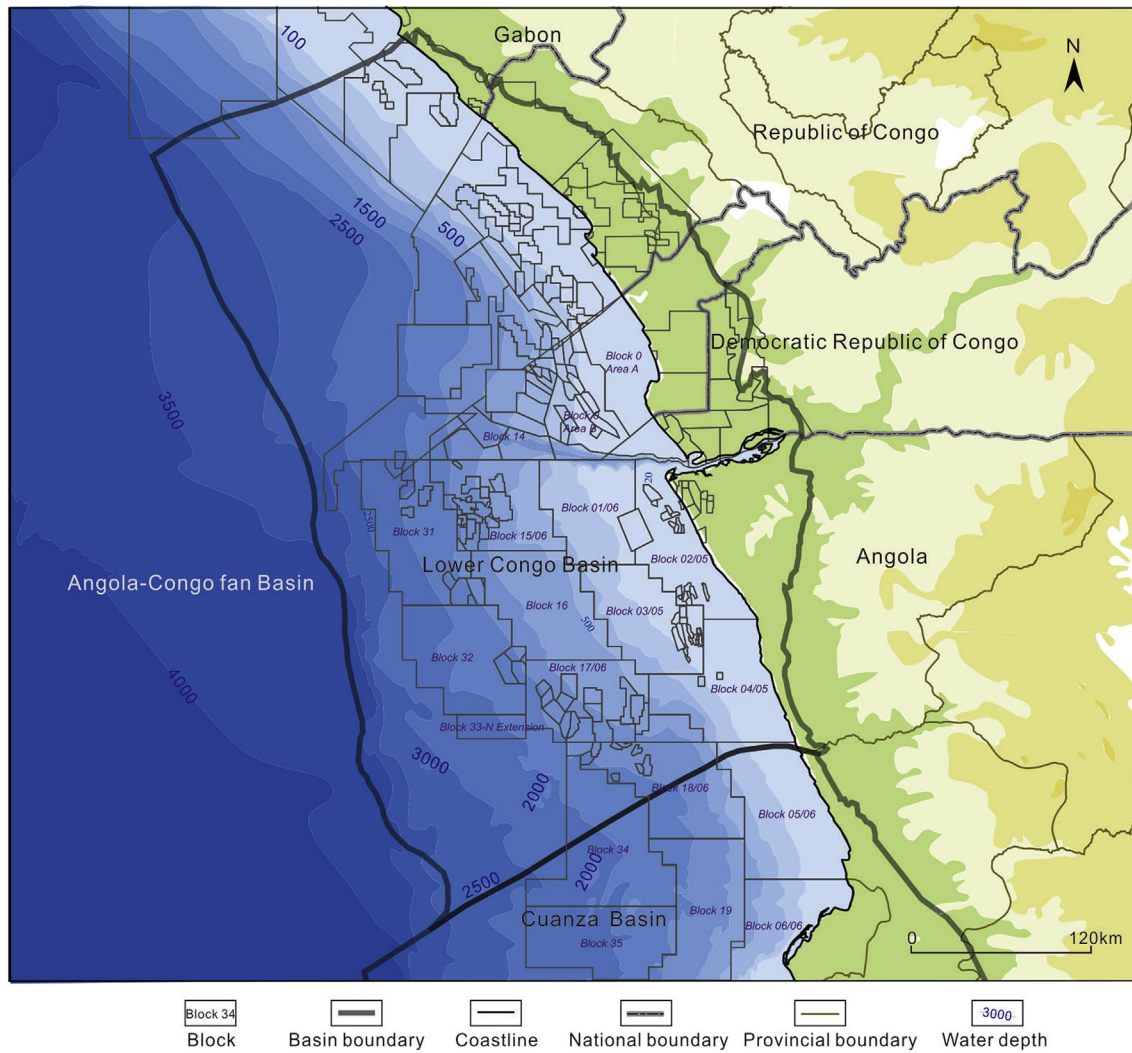


Fig. 1. Location of the Lower Congo Basin showing that the Lower Congo Basin is located in the Angola and Congo sea areas in West Africa

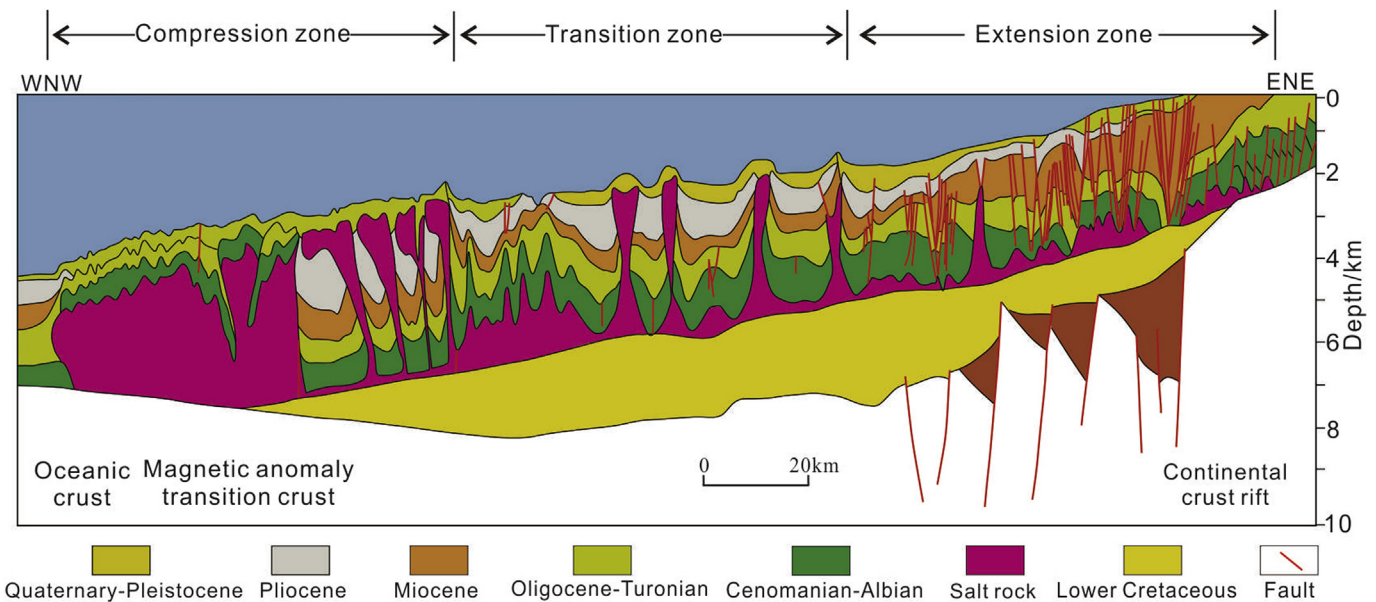


Fig. 2. The structure of the Lower Congo Basin showing that the Lower Congo Basin is characterized by vertical stratification and east-west zoning.

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