

The Forebulge Migration and Its influence on Sequence Stratigraphic Architecture of Back-bulge in Triassic, Tarim Basin*

Wu Tang^{1,2}, Yingmin Wang^{1,2}, and Lei Zhang³

Search and Discovery Article #30268 (2013)

Posted June 12, 2013

*Adapted from extended abstract prepared in conjunction with poster presentation at AAPG Annual Convention and Exhibition, Pittsburgh, Pennsylvania, May 19-22, 2013, AAPG©2013

¹State Key Laboratory of Petroleum Resource and Prospecting, China University of Petroleum (Beijing), Beijing 102249, China (tw_geology@yahoo.com.cn)

²College of Geosciences, China University of Petroleum (Beijing), Beijing 102249, China

³PetroChina Coalbed Methane Company Limited, Beijing 100028, China

Abstract

The Tarim Basin is the largest petroliferous basin of inland China and has experienced a complex tectonic evolution. In the Triassic, the Tarim Basin became a foreland basin as a result of the strong subduction of the paleotethys ocean, and a series of typical tectonic units (e.g. foredeep, forebulge and back-bulge) formed. Using a broad database comprising outcrops, well-log and seismic data, the current study qualifies the forebulge migration and assesses its influence on sequence stratigraphic architecture of the back-bulge. Our results suggest that the Triassic forebulge experienced three stages of reciprocating migration (stages 1, 2, and 3 roughly corresponding to Early, Middle and Late Triassic respectively) ([Figure 1](#), [Figure 2](#), [Figure 3](#)). Many unconformities were developed in the back-bulge area, with maximum unconformity located at the bottom ([Figure 2](#)).

Three Tectonic Stages

Stage 1: At the beginning, the strata of the back-bulge are characterized by a northward decrease in thickness. When thrusting activities became active, the forebulge migrated northward to Tianshan Mountain and then was overlapped by back-bulge successions, forming a narrow foredeep. At the end, the study area was characterized by quiet tectonic activities, the forebulge stepped southward and the back-bulge successions were extensively eroded. Meanwhile, the foredeep and back-bulge zones were separated by the forebulge, with a series of alluvial fans developed in front of the foredeep.

Stage 2: Compared with Stage 1, the general characteristics of forebulge migration were similar. However, the forebulge migrated northward for a larger distance, leading to the back-bulge showing a southward decrease in strata thickness. Similarly, the back-bulge and foredeep were still two isolated depressions, separated by the forebulge.

Stage 3: As Tianshan Mountain activated again, the forebulge stepped towards it and was overlapped by back-bulge strata. At the end, the orogenic belts were subjected to erosion and unloading, with the lithosphere rebounding. The forebulge then migrated and uplifted toward the back-bulge again. Thus, the uplift amplitude was relatively small, leading the forebulge to migrate under lake level and then sediments crossed it. This sedimentary process, in turn, healed the back-bulge and foredeep.

Additionally, episodic tectonic activities of the forebulge had a profound influence on the sequence stratigraphic architecture. Each sequence shows an overall fining-upward trend, consisting mainly of coarse deltaic and fluvial sandstone or sandy conglomerate in the lower part, and muddy deposits in the upper part ([Figure 1](#)). This trend is similar to a meandering river, whereas different from the typical sequence stratigraphic architecture, comprising a lower fining-upward section and upper coarsening-upward section.

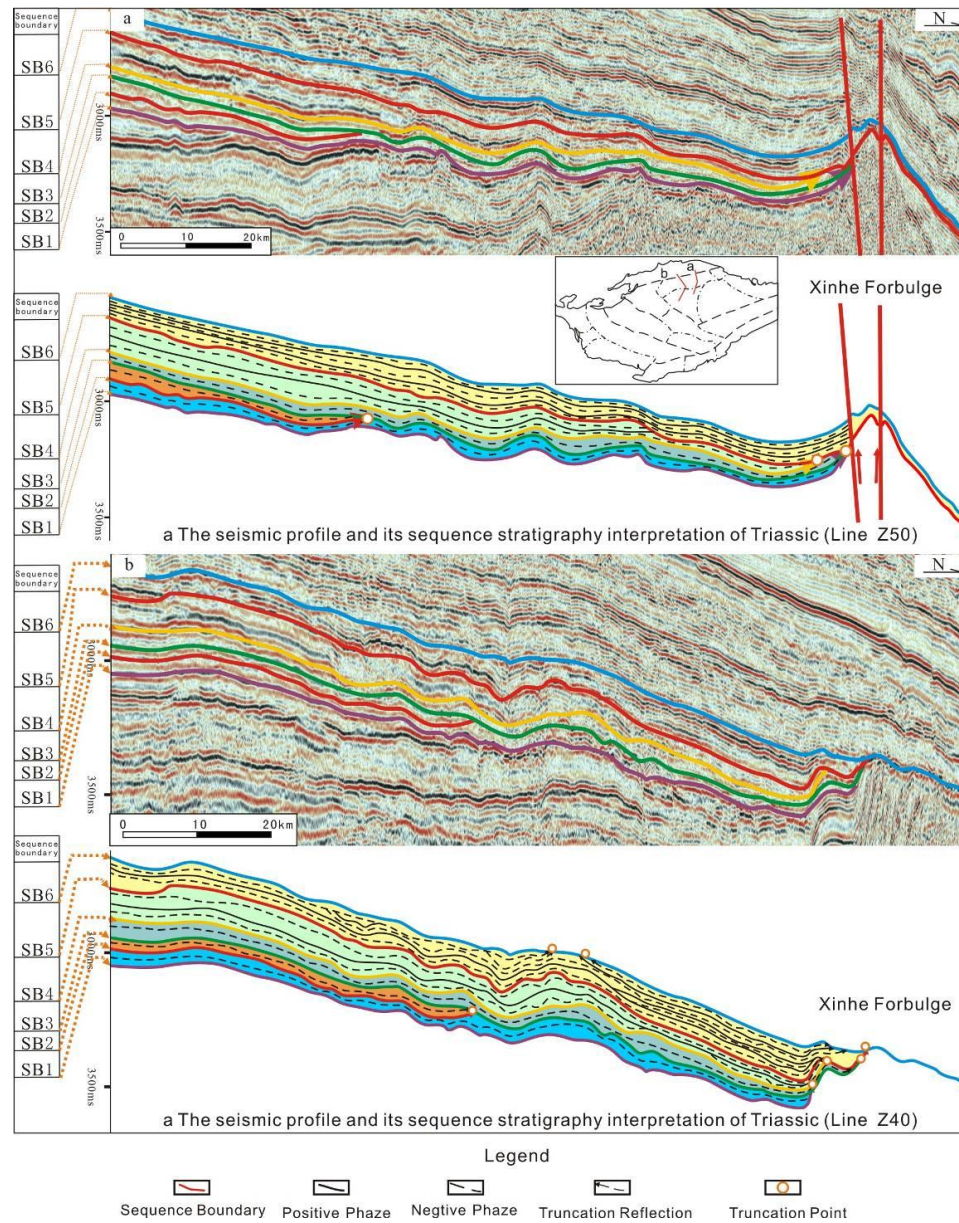


Figure 2. Typical seismic profiles and corresponding sequence stratigraphy explanation across the Triassic forebluge in Tarim Basin.

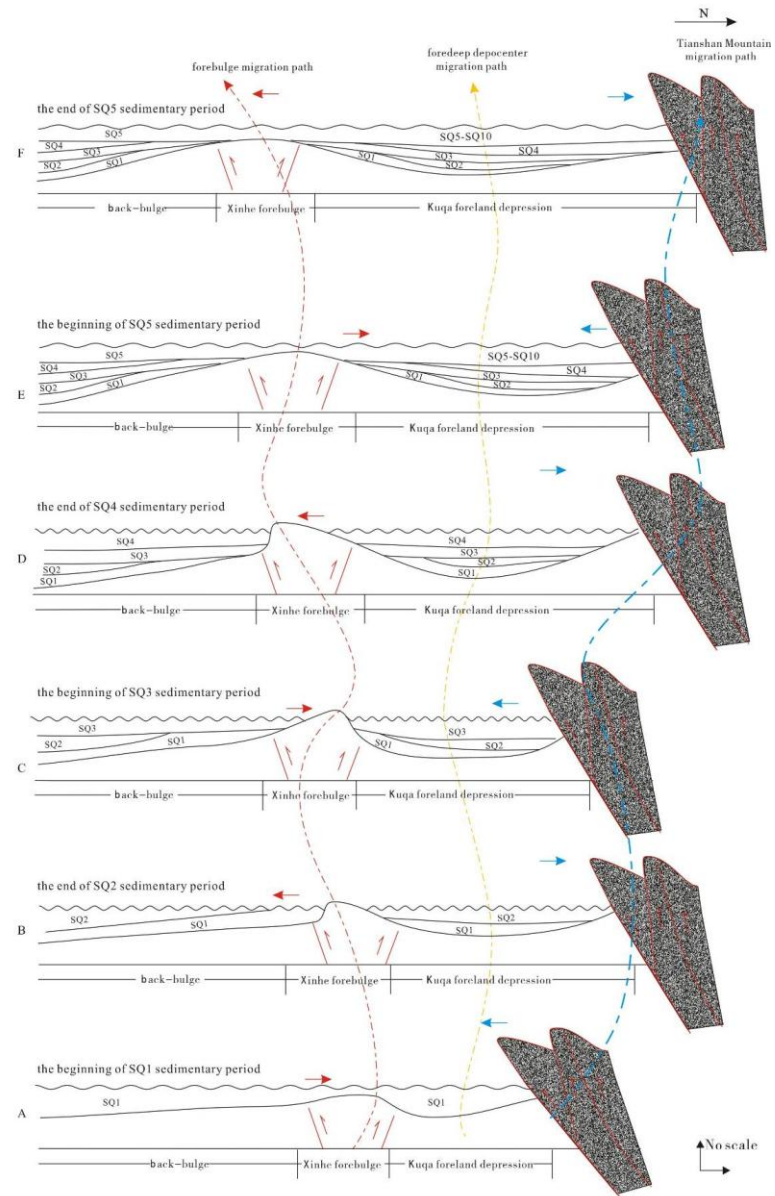


Figure 3. Forebulge migration model of the Triassic in Tarim Basin.