Post 30 m.y. Sequence Stratigraphy, Northeastern Gulf of Mexico*

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General Setting

A comprehensive grid of industry seismic data is used to develop a sequence stratigraphic framework for the northeastern Gulf of Mexico (Figure 1). Twenty Type-1 sequence boundaries (30 m.y. to 1.4 m.y.; SB20-SB1) identified by He et al. (1995, 1996, 2002) in the Main Pass area have been extended westward to the Mississippi Delta, in order to fully document the geological history and further investigate the roles of local geological controls; i.e., sediment supply, faulting, and sediment loading. Isopach maps of sequence depocenters (T to A) reveal that they are not uniformly distributed; this indicates one of the major rivers (Mississippi and Mobile) supplied more sediment than the other in certain time periods.

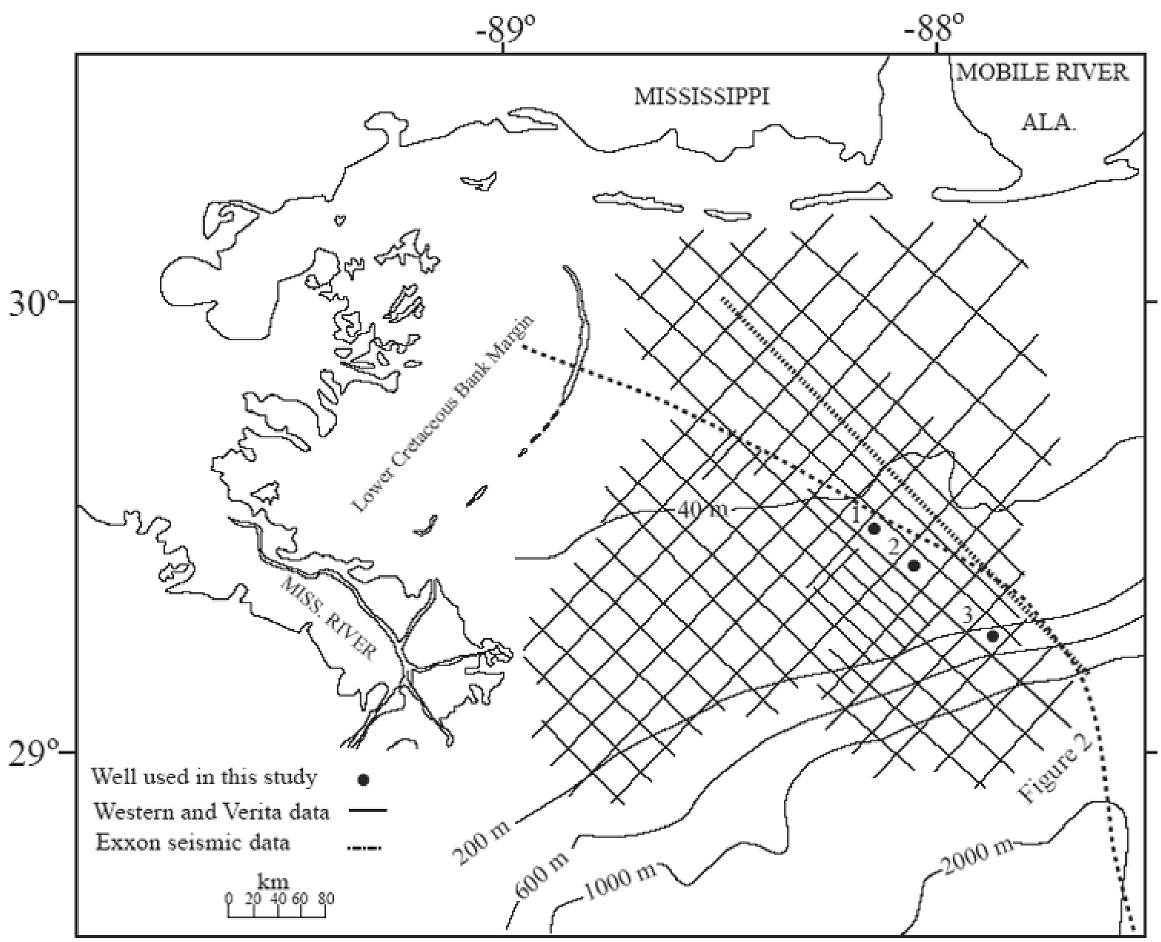

Figure 1. Location map. Wells used in this study are: 1) Main Pass Dominion 196; 2) Main Pass Dominion 217; and 3) Main Pass Seneca 256. The heavily dashed line, running NW-SE, is an Exxon seismic profile used by Greenlee (1988) and Wu and Vail (1990). The curved dashed line is the Lower Cretaceous Bank Margin. Location of Figure 2 is also shown.

Depisodes

A total of seven depositional episodes (Depisode) has been documented after 30 m.y. in the study area (Figure 2).

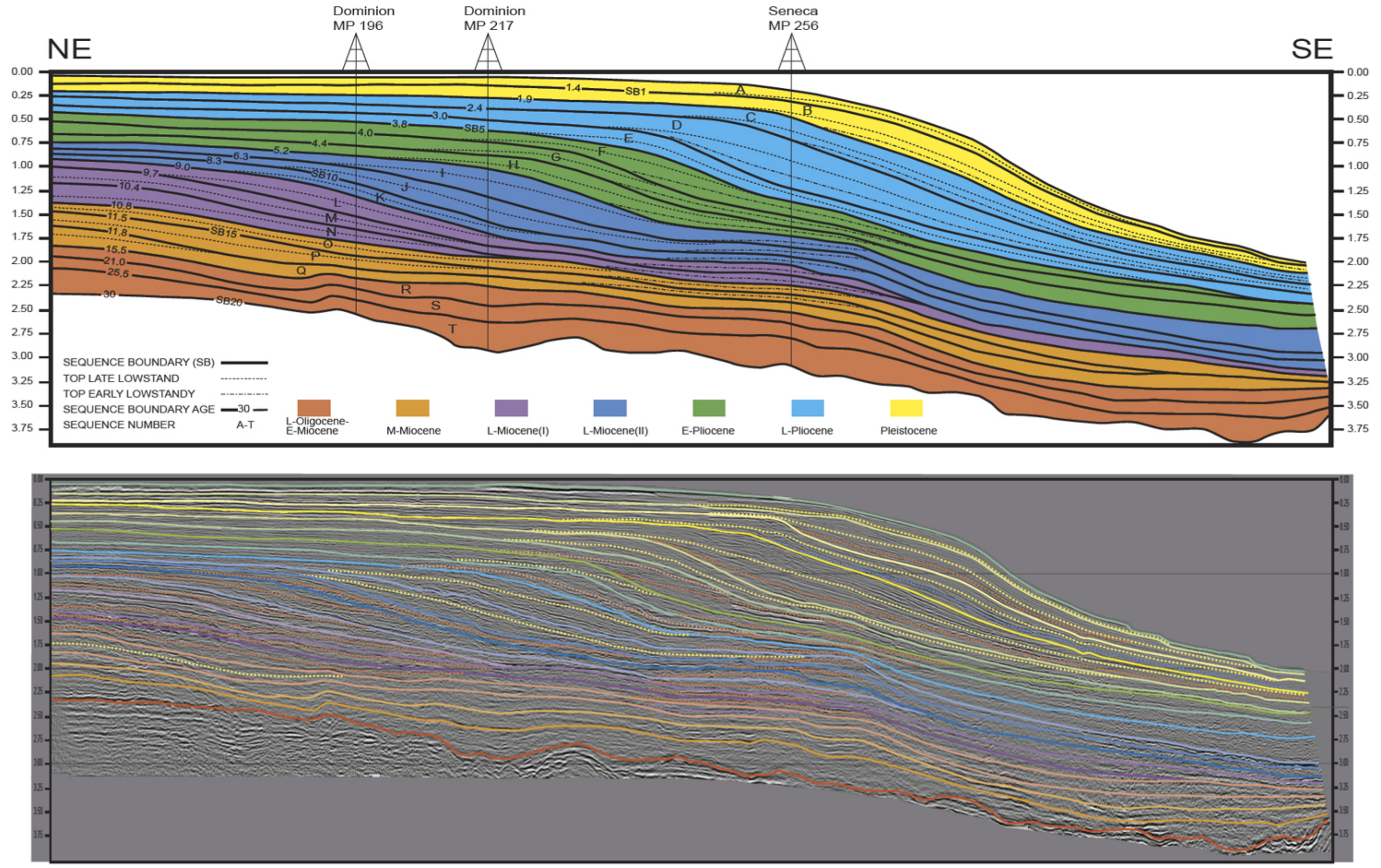

Figure 2. Line drawings of interpretation together with interpreted profile. Location of profile is shown in Figure 1. Sequences (A-T), sequence boundaries (1-20); systems tracts (ELST, LLST, and HST) and their boundaries are also shown.

1) Late Oligocene-Early Miocene (30-15.5 m.y.)

Sedimentation rate was very low (~0.016 cm/yr), and depocenters filled in the west and southwest, the paleo-geographic low, of the study area (Figure 3). The distribution of depocenters indicates that sediments mainly came from the northwest (Mississippi River) (Figure 3). Late Oligocene-Early Miocene consists of three 2nd order sequences (Figure 4).

2) Middle Miocene Depisode (15.5-10.8 m.y.)

The sedimentation rate increased dramatically; i.e., ~ 0.071 cm/yr. Rapid deposition of this depisode followed a long period of sea level fall and extremely low sedimentation (from15.5-11.8 m.y.). Depocenters also filled in the west and southwest (Figure 3). Middle Miocene Depisode is composed of 2nd, 3rd and 4th order sequence respectively (Figure 4).

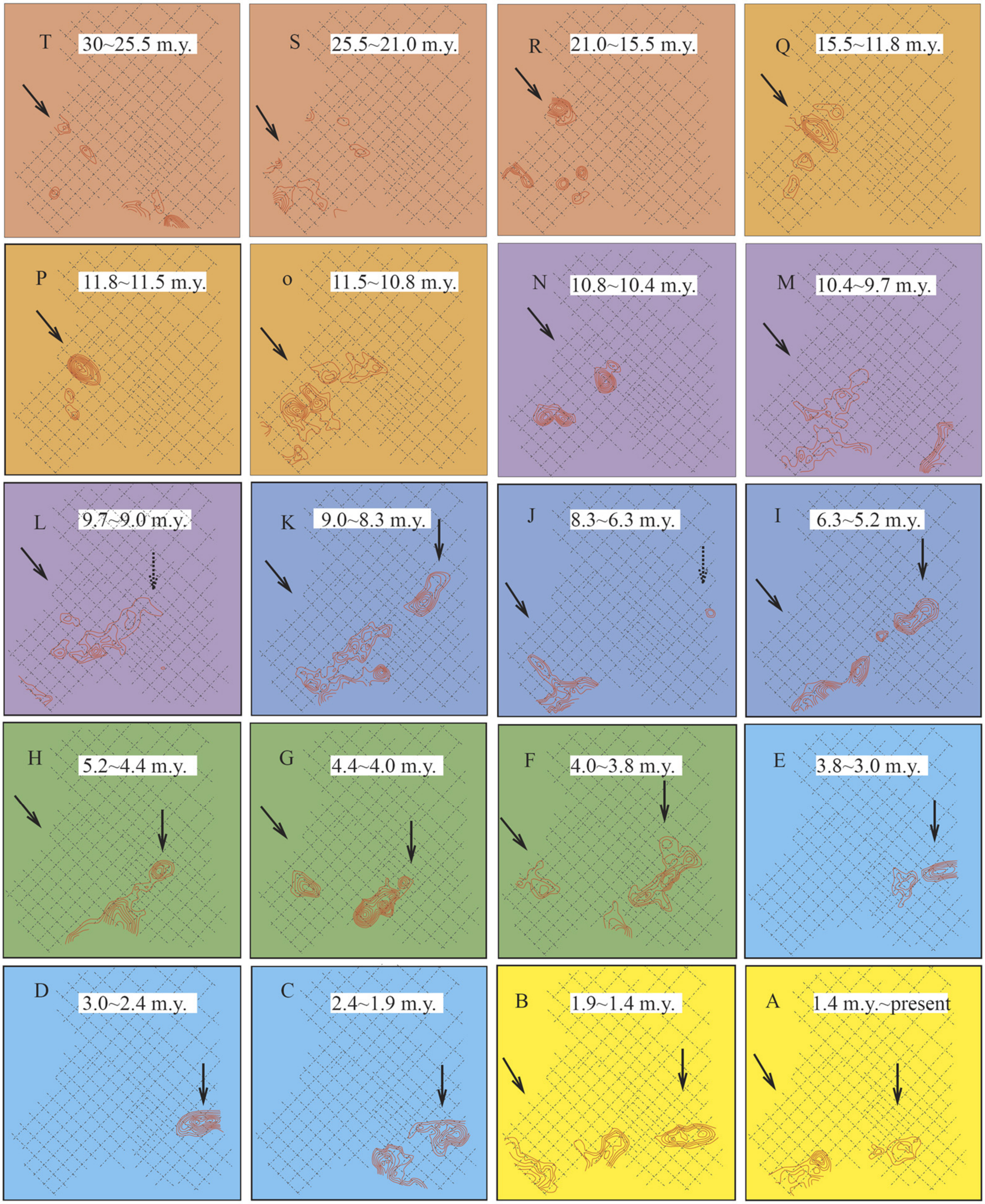

Figure 3. Summary of the major depocenters (T-A). Arrows indicated the inferred directions of sediment supply. Dashed indicate diminished sediment supply.

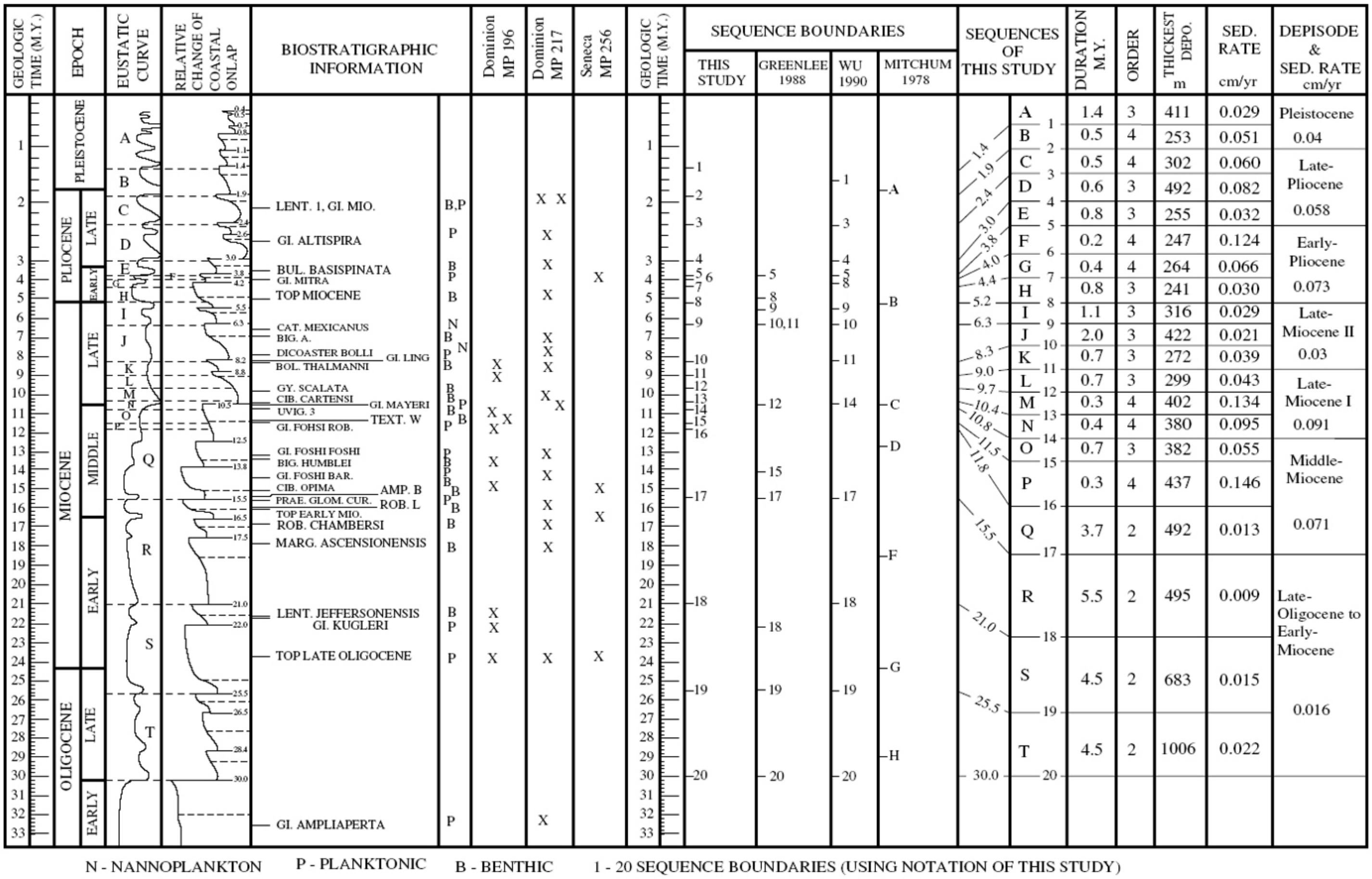

Figure 4. Chart showing biostratigraphic data (tops) available from industry wells in the Main Pass area and ages assigned to sequence boundaries of this study. Also shown are ages of sequence boundaries identified by Greenlee and Moore (1988) and Wu et al. (1990). Time scale and sea-level curve from Gulf of Mexico Chronostratigraphic Correlation Chart by Paleo-Data, Inc. and published by Schlumberger Geco-Prakla (1993). (Sequence order: 2nd 3 - 50 m.y.; 3rd 0.5 - 3 m.y.; 4th 0.08 - 0.5 m.y.; 5th 0.03 - 0.08 m.y.--Vail et al., 1991).

3) Late Miocene Depisode I (10.8-9.0 m.y.)

The sedimentation rate continuously increased to ~ 0.091 cm/yr. The depocenters moved toward the central and southern portion of the study area. However, the sediment sources in the northwest remain dominant (Figure 3). Late Miocene Depisode I comprises two 4th order and one 3rd order sequences (Figure 4).

4) Late Miocene Depisode II (9.0-5.2 m.y.)

A lower sedimentation rate of ~0.03 cm/yr occurred, and depocenters were displaced farther to the east and south. The northwestern source remained active, but the northern source (ancestral Mobile River) had been established (Figure 3). The early lowstand systems tract had moved from basin to slope. Seismic reflection patterns show changes from oblique to sigmoidal patterns, which probably reflect a transition from sandier to more muddy deposition (Figure 2). Late Miocene Depisode II was deposited during a period of long-term lowstand sea level, and is made up of all 3$_{rd}$ order sequences (Figure 4).

5) Early Pliocene Depisode (5.2-3.8 m.y.)

The sedimentation rate greatly increased ,reaching ~0.073 cm/yr, the second highest among the Depisodes. The depocenters migrated sightly southward, and sediment was derived from northern and northwestern sources, but the northern source seems to be more dominant (Figure 3). Early Pliocene Depisode was deposited in during period of highstand sea level, and consists of one 3rd order and two 4th order sequences (Figure 4).

6) Late Pliocene Depisode (3.8-1.9 m.y.)

The depisode has a relatively higher sedimentation rate of ~0.058 cm/yr. The depocenters were further displaced east and then southeast. Sediment was predominantly transported from the north, and the northwestern source became less important (Figure 3). Late Pliocene Depisode was formed during a period of sea level fluctuation that included two 3rd orders and one 4th order sequences (Figure 4).

7) Pleistocene Depisode (1.9 m.y.-present)

Depocenters had shifted slightly southward. The distributions of depocenters suggest that sediment was transported both from north and northwest, and the northwestern source regained its dominance (Figure 3). Pleistocene Depisode has a moderate sedimentation rate of ~0.04 cm/yr. The Pleistocene Depisode was deposited during a period of highly sea level fluctuation comprising 3rd and one 4th order sequences (Figure 4).

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