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BASE LEVEL CHANGES AS A CONSEQUENCE OF TECTONIC, EUSTATIC AND AUTOGENIC PROCESSES IN LATE CRETACEOUS AND PALEOCENE STRATA, WESTERN WILLISTON BASIN

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Late Cretaceous and Paleocene strata in western Williston basin comprise marginal marine Fox Hills, fluvial Hell Creek and fluvio-deltaic Fort Union Fms. The latter intertongues eastward with its marine Cannonball and Bullion Creek Mbrs. Recent work suggests that this succession contains unconformities and that marine conditions prevailed farther to the west than previously recognized. A 2 Myr unconformity (U1) separates the Fox Hills and Hell Creek Fms and youngs eastward from western Wyoming into the Williston basin (Hicks, 1993; Belt, Hicks and Murphy, 1996). Base level dropped during this interval. A second unconformity (U2) at the base of the newly-defined Ekalaka Mbr of the Fort Union Fm incises into the Ludlow and Hell Creek near Ekalaka. This unconformity coincides with a SE to NE paleoflow shift, possibly due to uplift of the Black Hills and the Miles City arch. The Ekalaka Mbr formed in an estuarine setting as U2 was flooded due to rising base level. A third unconformity (U3) near Ekalaka is marked by mature paleosols recording as much as 1 Myr of nondeposition while the shore prograded eastward and formed a low-gradient coastal plain. Paleodrainage subsequently became less organized during Tongue River time. The Tongue River contains newly discovered marine ichnofossils (*Skolithos linearis*, *Teichichnus*, *Thalassinoides*) interbedded on a cm to dm-scale with similar strata containing freshwater fauna. Such an association occurs in the Three V Tongue in the School Section Creek of the Brown Ranch area of North Dakota.

U1, U2 and U3 extend east from Ekalaka to the Cave Hills of South Dakota. However, in a transect east from Miles City to central North Dakota, only U1 is evident. Nonetheless, changes in facies, paleoflow and clay mineralogy are similar, suggesting that base level changes affected both regions and that U2 and U3 are correlative conformities in the northern transect. The succession documents long term eustacy with short term base level changes controlled by shifting depocenters and tectonic upwarping of arches.