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Sedimentary environments and structural evolution of the Cretaceous Namyang Basin, Korea

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The Cretaceous Namyang Basin located in the mid-western part of Korean peninsula is an asymmetric rhomb-shaped, pull-apart basin with approximately 8 km in length and 4 km in width, which is bounded by the N-S-striking, dextral strike-slip faults. The entire sedimentary successions of the basin are more than 3 km in thickness and contain abundant dinosaur eggs and nests classified into Cretaceous age. A detailed facies analysis of the sedimentary successions indicates that the basin-fill sequences consist of 8 sedimentary facies, which can be organized into three facies association (FA) representing three distinctive depositional environments: (1) alluvial fans (FA I), (2) braided plains and channels (FA II), and (3) floodplain and lake (FA III) on the basis of the facies distribution, paleoflow directions, grain-size variation, and overall distributional pattern of each lithologic unit. The sedimentary sequences form a successive depositional system comprising alluvial fans along the eastern and southern basin margin and associated downstream fluvial and lacustrine system toward the basin. The eastern border fault has initially formed a releasing right bend and has acted as a master fault inducing the formation and northward-growth of the basin and deformation of the basin fills. The basin fills were consistently tilted to the NW and forms broad syncline and anticline with the axes plunge of 330° at 10°∼20°. The trend of fold is consistent with a dextral movement along the master faults and indicates that the folding occurred in a transpressional regime, as indicated by the acute angle 30° between the trends of fold axis and border fault. The calcite veins occurred along both conjugate extensional shear fractures with en echelon array and pure extension fractures within the sediments suggest a compressive stress field in which the maximum principal compressive stress 1 trends NW-SE∼E-W with the subvertical intermediate principal stress 2. The orientations of calcite veinlets are not consistent with a dextral movement along the border faults but imply the existence of another deformation phase after folding event. The ChRM (Characteristic Remanent Magnetization) obtained from the sedimentary sequence reveals that the direction was acquired at shortly after syntectonic folding event during Cretaceous Long Normal Superchron (KLNS, 124-84 Ma), because the high inclination value (60.5 deg) in situ agree with that of Cretaceous in Korean Peninsula. Based on the variation record of magnetic susceptibility and rock magnetic data, we interpreted that it had distinct dry and rainy seasons with high temperature during sedimentation.