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The Callovian-Kimmeridgian (Jurassic) Carbonate Platform Phase of northern and east-central Iran

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The Iran Plate as a part of the Cimmerian continent collage collided with the Turan Plate during the Late Triassic (Early Cimmerian Orogeny), thereby closing the Palaeotethys in the area of present-day Iran. However, despite its accretion to Eurasia, the Iran Plate remained a structurally highly mobile zone, characterized by strong synsedimentary tectonism as well as abrupt lateral facies and thickness changes. Late Triassic/Jurassic sedimentary basins formed in northern Iran close to the former suture (present-day Alborz and Koppeh Dagh mountains) and on the so-called Central-East Iranian Microcontinent (CEIM), a highly mobile structural unit of the Iran Plate consisting of three N/S-elongated blocks, the Lut, Tabas, and Yazd blocks (from E to W). Sedimentation in northern and east-central Iran was predominantly siliciclastic from the Upper Triassic to Bajocian (Shemshak Group), terminated by a phase of tectonic instability known as the mid-Cimmerian tectonic event. During the Late Bajocian, a pronounced transgression connected with crustal extension following the mid-Cimmerian event flooded vast areas of the Iran Plate, initiating a Late Bajocian-Late Jurassic phase of carbonate sedimentation (Dalichai and Lar formations of the Alborz; Chaman Bid, Kashafrud and Mozduran formations of the Koppeh Dagh; Esfandiar Subgroup of east-central Iran). After deposition of thick Upper Bajocian-Bathonian deep water successions (ammonite-bearing silty claystones, silty marls and marls), subtropical shallow water carbonate systems were established in the Callovian at the northern margin of the Iran Plate (Lar Formation) and in the Koppeh Dagh (Mozduran Formation) as well as on the Lut and Tabas blocks of the CEIM. The formations of northern Iran represent attached, rimmed platforms with low terrigenous input from the hinterland. Lagoonal sediments consist of shallow subtidal biowacke-

stone and inter-/supratidal fenestral mud- and peloidal pack-/grainstones. Platform margins are composed mainly of bioclastic and oolitic grainstones, and slope settings document large-scale gravitational redeposition of shallow water sediments (debris flows, olisthostromes, slump-folds). Siliceous sponge-microbialite mounds occurred widespread, especially in mid-slope settings. The basins received large amounts of peri-platform muds and allodapic limestones. Accommodation space and carbonate productivity were very high as is indicated by generally thick platform successions, highstand shedding and pronounced progradational geometries of the platform margins. On the CEIM, a large-scale barrier platform-shelf lagoon system developed on the Tabas Block, accompanied by an isolated platform on a structural high (?horst) on the Lut Block. At the Bathonian/Callovian boundary, uplift of a W-vergent fault block at the eastern margin of the Tabas Block resulted in the development of a juvenile carbonate system on the N/S-trending swell area, evolving into a mature shelf-lagoon/carbonate platform/slope-basin system during the Callovian-Kimmeridgian (Esfandiar Subgroup). The platform and slope system of the Esfandiar Subgroup (Esfandiar Limestone and Qal-eh Dokhtar Limestone formations) is broadly similar to those of the platforms of northern Iran. However, the large-scale shelf lagoon on the Tabas Block behind the barrier platform, represented by the fine-grained, pectinid-rich marly limestones of the up to 1,200 m thick Kamar-e-Mehdi Formation, forms an important difference. The presence of this large shelf lagoon is related to the structural setting of the CEIM, probably consisting of an array of large tilt blocks. The development of the different Callovian-Late Jurassic carbonate systems was supported by a general sea-level rise and a climate change: Numerous coal beds in the Shemshak Group indicate humid conditions until the Bajocian; later on, decreasing terrigenous input and evaporites in lagoonal settings of the platform systems indicate semi-arid to arid conditions. Starting with the Kimmeridgian, the carbonate systems were affected by strong synsedimentary faulting (onset of tectonic activity of the late Cimmerian tectonic event), causing partial drowning or uplift and erosion. Their final demise is indicated by the widespread deposition of limestone conglomerates, red beds and evaporites of the Garedu and Shurijeh formations which occur across the Iran Plate.