Erosional surface at the Middle-Upper Callovian (Middle Jurassic) transition in the Greater Caucasus Basin (northern Neo-Tethys) and tracing its presence in Western Europe, North Africa and Arabia: the influence of regional tectonics

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Abstract: An inter-regional tracing of particular surfaces can help in reconstructions of basin evolution. The available data from the Greater Caucasus Basin, which was a large extending and subsiding basin on the northern margin of the Neo-Tethys Ocean, provide evidence of an erosional surface near the boundary between the E. coronatum and P. athleta ammonite zones, i.e., at the Middle-Upper Callovian transition. Ammonite re-working, hiatuses, and local accumulation of coarse siliciclastics indicate an erosion event across the northern shelfal periphery of this basin. The correlation of Callovian sedimentary sequences of the Greater Caucasus with those of some basins of Western Europe, North Africa, and Arabia suggest only a regional extent of the noted surface. Its analogues are reported from only a few domains such as the North Burgundy Platform. The erosional surface documented in the Greater Caucasus Basin at the Middle-Upper Callovian transition was formed when no global eustatic falls occurred and before the peak of the hypothesized (and yet to be proven) glacial episode. Moreover, the impossibility of inter-regional tracing of the surface precludes any eustatic mechanism for its formation. In fact, it is hard to find many analogues of the erosional surface at the Middle/Upper Callovian boundary in the basins of Western Europe, North Africa, and Arabia. Sediment supply was also not so strong as to shrink sedimentation in the basin. Thus, only regional (basin-scale) tectonic activity, which altered evolution of both active and "passive" margins of the "Tethyan" oceans in the Jurassic, may explain the formation of this surface. The latter occurs only on the northern margin of the Greater Caucasus Basin, and thus, its origin might have been linked with short-term uplifts on the Scythian Platform. In many other regions of Western Europe, North Africa, and Arabia, the tectonic control on basin evolution also remained important in the Callovian.

Keywords: erosional surface, correlation, Callovian, Greater Caucasian Basin, Western Europe.

Resumo: Um rastreio inter-regional de superfícies particulares pode ajudar na reconstrução da evolução de bacias. Os dados disponíveis da Grande Bacia do Cáucaso, que foi uma bacia larga, extendendo e subsidente na margem norte do Oceano Neo-Tétis, fornecem evidências de uma superfície erosiva perto da fronteira entre as biozonas de ammonite E. coronatum e P. athleta, i.e., na transição Calloviano Médio/ Superior. Retrabalhamento de amonites, hiato e acumulação local de fragmentos siliciclasticos grosseiros indicam um evento erosivo ao longo da zona periférica norte da bacia. A correlação das sequências sedimentares callovianas no Grande Cáucaso com as de algumas bacias na Europa Ocidental, norte de África e Arábia sugere apenas um caráter regional na superfície referida. Os seus analogos são relatados apenas em alguns domínios como a Plataforma Borgonhese Norte. A superfície erosiva documentada na Bacia do Grande Cáucaso na transição Calloviano Médio/Superior formou-se aquando da ausência de quedas eustáticas globais e antes do pico de um hipotético (e por provar) período glacial. Para além disso, a impossibilidade de rastrear inter-regionalmente a superfície afasta um mecanismo eustático para a sua formação. De facto, é difícil encontrar muitos análogos para a superfície erosiva na fronteira Calloviano Médio/Superior nas bacias da Europa Ocidental, norte de África e Arábia. O fornecimento de sedimento também não era abundante ao ponto de encolher a sedimentação na bacia. Assim, apenas atividade tectônica regional (escala da bacia), que alterou a evolução de ambas as margens activa e passiva dos oceanos Tétis no Jurássico, pode explicar a formação desta superfície. Esta última ocorre apenas na margem norte da Bacia do Grande Cáucaso, e assim, a sua origem tem sido associada com elevações a curto prazo na Plataforma Scythiana. Em muitas outras regiões da Europa Ocidental, norte de África e Arábia, o controlo tectónico na evolução de bacia também permaneceu importante no Calloviano.


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1. Introduction

The Callovian stage was the last stage of the Middle Jurassic Epoch; it started at 164.7 Ma and ended at 161.2 Ma, and, therefore, it lasted 3.5 Ma (Ogg et al., 2008). At that time, the Earth was dominated by the water masses of the Neo-Tethys and Pacific oceans, and the opening of the Atlantic Ocean already started; Gondwana still persisted (Scotese, 2004). During the Callovian, the global sea level changed significantly, although the available reconstructions of these changes differ (Haq et al., 1987; Hallam, 1988, 2001; Jacquin and de Graciansky, 1998; Haq and Al-Qahatani, 2005). Moreover, there was probably a short-term glaciation in the Late Callovian (Dromart et al., 2003), which might have enabled the operation of glacio-eustatic mechanisms.

As suggested by studies of other time intervals (e.g., Embry, 1997; Hallam, 2001; Ruban et al., 2010a), broad inter-regional correlation of geological data, which indicate shoreline shifts and
changes in water depth, can facilitate our understanding of the global sea-level fluctuations during the Callovian, their possible controls, and their signatures in particular sedimentary basins.

Knowledge on the Callovian deposits of the Greater Caucasus Basin (Fig. 1), which evolved on the northern active margin of the Neo-Tethys Ocean (Golonka, 2004; Ruban, 2006a), was earlier summarized and discussed by Rostovtsev et al. (1992), Kuznetsov (1993), and Ruban (2007a,b, 2010a), who established the regional lithostratigraphic framework, attempted facies interpretations, and made high-resolution palaeogeographical reconstructions. However, none of these previous studies paid any special attention to a peculiar erosional surface at the Middle-Upper Callovian transition. The present paper reviews briefly the stratigraphical information on the noted surface and attempts to trace it in some domains of Western Europe, North Africa, and Arabia. The results of this study will permit examination of the regional or inter-regional extent of this surface, which can be important for the understanding of the global sea level during the Callovian and its fluctuations affected the “Tethyan” margins (i.e., the margins of the “Tethyan” oceans, namely the Neo-Tethys and the Alpine Tethys).

Fig.1. Geographical and palaeotectonic location of the Greater Caucasus in the mid-Jurassic. Plate tectonic reconstruction is simplified from Scotese (2004).

Fig.1. Localização geográfica e paleotectônica do Grande Cáucaso no Jurássico médio. A reconstrução da tectónica de placas é uma simplificação a partir de Scotese (2004).

2. Geological Setting

The Greater Caucasus Basin is presently located along the border of Russia, Georgia, and Azerbaijan, and it stretches between the Black Sea and the Caspian Sea (Fig. 1). This basin evolved during Jurassic-Paleogene time on the northern active margin of the Neo-Tethys Ocean, and later its deposits were compressed and uplifted to form the present-day mountain ranges (LazKo, 1975; Ershov et al., 2003; Saintot et al., 2006; Ruban, 2006a; Tawadros et al., 2006; Adamia et al., 2011a,b). The Callovian deposits are distributed widely in the Greater Caucasus Basin (Rostovtsev et al., 1992). They are dominated by siliciclastics and carbonates with a total thickness varying between 50 m and 1000 m (Fig. 2). They overlie the Lower-Middle Jurassic and locally older deposits with a major unconformity (Ruban, 2007a). The large carbonate platform, which grew significantly in the Late Jurassic, started to form already in the Late Callovian (Kuznetsov, 1993; Ruban, 2006b). The regional biostratigraphic framework of the Callovian deposits is established on the basis of ammonites (Rostovtsev et al., 1992; Ruban, 2006a). A total of six biozones are recognized, which are in more or less good agreement with the standard Boreal biozones (Fig. 2). The Middle-Upper Callovian transition, considered in this paper, corresponds to the upper E. coronatum-lower P. athleta stratigraphic interval.

The Callovian strata were accumulated in the Caucasian Sea, which was a marginal sea of the Neo-Tethys Ocean (Ruban, 2006a). It was located between the land mass of the tectonically “stable” Scythian Platform (a southern periphery of the Russian Platform) in the north and the islands of the Transcaucasian Arc in the south (Jasamanov, 1978; Kuznetsov, 1993; Ruban, 2006a, 2010b). The sea retained connections with both the epicontinental seas of the Russian Platform and other marginal seas of the Neo-Tethys (Jasamanov, 1978; Ruban, 2006a). After strong tectonic re-organization in the Bathonian (Ruban, 2006a, 2010b), the Greater Caucasus Basin experienced extension and subsidence (Ershov et al., 2003; Saintot et al., 2006; Ruban, 2010b). As suggested by facies analysis (Ruban, 2007b), the northern part of the basin was a large shallow-water shelf, whereas its southern part was a relatively deep-water trench-like structure. Therefore, the Caucasian Sea had an asymmetrical bathymetric profile. The water was warm (20-240C) with a normal salinity (Jasamanov, 1978). The sea was populated by diverse marine invertebrates, including ammonites, belemnites, bivalves, brachiopods, foraminifers, corals, etc. (Rostovtsev et al., 1992; Ruban, 2006b, 2007b).

3. Materials and Methods

This study is based on a review of the available stratigraphical data on the Callovian deposits from the Greater Caucasus Basin. A significant part of these data was earlier summarized by Rostovtsev et al. (1992), whereas the current author's studies permitted some additions and improvements (Ruban, 2007a,b, 2010a). The present paper focuses only on the Middle-Upper Callovian transition. The large territory of the Greater Caucasus Basin is divided into 13 particular areas by Rostovtsev et al. (1992) and Ruban (2007b). Composite sedimentary successions of these areas are correlated (Fig. 2), and a presence/absence of erosional surfaces at the Middle-Upper Callovian transition is noted (Rostovtsev et al., 1992; Ruban, 2007b). An analysis of ammonite assemblages above and below this surface is used to establish the age in each area.

The documented erosional surface is further correlated with coeval surfaces or distinctive horizons in selected sedimentary basins of Western Europe, North Africa, and Arabia. The correlation is based on modern chronostratigraphy (Ogg et al., 2008) and also takes into account the detailed biostratigraphic framework developed by Cariou & Hantzpergue (1997). If an erosional surface is identified from both the Greater Caucasus Basin and many other domains, this is evidence of its inter-regional origin. Otherwise, the surface should be explained in terms only of regional basin evolution.

4. Regional Evidence of Erosional Surface
Middle-Late Callovian erosional surface

Fig. 2. Correlation of the Callovian lithostratigraphic units of the Greater Caucasus Basin. Chronostratigraphy after Ogg et al. (2008). Regional ammonite zones after Rostovtsev et al. (1992). Lithology and nomenclature of areas are based on Rostovtsev et al. (1992), Ruban (2007a,b), and the author’s field data. Areas: 1 – Lago-Nakskaaja, 2 – Labinskaaja, 3 – Malkinskaaja, 4 – Kabardino-Dagestanskaja, 5 – Jugo-Vostotchynj Dagestan, 6 – Sudurskaaja, 7 – Shakhdagskaaja, 8 – Abino-Gunajskaja, 9 – Novorossijsko-Lazarevskaja, 10 – Svanetsko-Verkhneratchinskaaja, 11 – Liakhvi-Aragvinskaja, 12 – Kakhetinskaaja, 13 – Dibrarskaja.

Fig. 3. Correlation of composite sections of the E. coronatum-P. athleta interval of the Labinskaaja, Malkinskaaja, Kabardino-Dagestanskaja, and Jugo-Vostotchynj Dagestan areas of the Greater Caucasus Basin (on the basis of data from Rostovtsev et al., 1992, Ruban, 2007a, and personal field observations). The Middle/Upper Callovian boundary is given in bold.


Fig. 3. Correlação das secções compósitas do intervalo E. coronatum-P. athleta das áreas de Labinskaaja, Malkinskaaja, Kabardino-Dagestanskaja e Jugo-Vostotchynj Dagestan da Bacia do Grande Cáucaso (na base de dados de Rostovtsev et al., 1992, Ruban, 2007a e dados pessoais de observação). A fronteira Caloviano Médio/Superior é dada a carregado.
This contact is abrupt and separates sandy shales with the ammonite assemblage typical for the E. coronatum regional zone (including the index species) from succeeding limestones with the mixed ammonite assemblage of the P. athleta and Q. lamberti zones (including the index species of the former) (Rostovtsev et al., 1992; Ruban, 2007a). Conglomerates and sandstones occur locally above this boundary and constitute up to 10 m of the lowermost part of the Gerpegemskaja Formation; these clastic layers contain re-worked Early-Middle Callovian ammonites (Rostovtsev et al., 1992). Locally, the clastic layer is absent (Ruban, 2007a), but re-worked Early-Middle Callovian ammonites occur also in the basal layers of limestones (Rostovtsev et al., 1992). In the Kabardino-Dagestanskaja area and the Jugo-Vostotchenny Dagestan area, the Middle/Upper Callovian boundary separates the Armkhinskaja Formation (Lower-Middle Callovian) from the Kionskaja Formation (Upper Callovian-Middle Oxfordian) (Rostovtsev et al., 1992) (Fig. 3). This boundary divides Lower Callovian black shales with Cadoceracae, Macrocephalites, and Keuplerites in the western part of the Kabardino-Dagestanskaja area and mixed siliciclastic-carbonate deposits with the ammonite assemblage typical for the E. coronatum regional zone (including the index species) in the eastern part of the Kabardino-Dagestanskaja area and the Jugo-Vostotchenny Dagestan area from limestones with the mixed ammonite assemblage of the P. athleta and Q. lamberti zones (including the index species of the former) (Rostovtsev et al., 1992). In the western part of the Kabardino-Dagestanskaja area, limestones above the boundary (up to 2 m) bear re-worked Early-Middle Callovian ammonites (Rostovtsev et al., 1992). In the eastern part of this zone, the Middle-Upper Callovian transition is gradual with no evidence of any particular hiatus surface; however, an erosional surface is traced between limestones and dolostones in the Jugo-Vostotchenny Dagestan area (Rostovtsev et al., 1992) (Fig. 3). In the Malkinskaja area, a non-depositional regime persisted from the Bathonian and until the Late Callovian, when an accumulation of conglomerates and sandstones and then limestones of the Gerpegemskaja Formation started (Rostovtsev et al., 1992) (Fig. 3).

The evidence of erosion at the Middle-Late Callovian transition is three-fold. Firstly, as noted above, the layers just above the boundary contain numerous re-worked Lower-Middle Callovian ammonites (Fig. 3). In the stratotype section of the Kamennomostskaja Formation studied by the author in the Labinskaja area (Ruban, 2007a), condensed Middle Callovian sandstones (see Fig. 2) contain a lot of ammonite specimens, but fewer ammonite specimens occur in the overlying sandy shales, which occur just below the surface (in the both cases, specimens belong to Early-Middle Callovian ammonites, including Hecticoceras, Kosmoceras, Macrocephalites, etc.). Moreover, these sandy shales (see Fig. 2) bear the only Middle Callovian (K. jason-E. coronatum zones) ammonites (Rostovtsev et al., 1992). If so, a significant, but local erosion event is required for re-working (i.e., elaboration, taphonomic re-working sensu Fernández López, 1991) of ammonites from the entire Lower-Middle Callovian interval to be replaced to the basal layers of the Gerpegemskaja Formation above the surface. Secondly, relatively deep erosion is recorded locally in the Kabardino-Dagestanskaja, where the entire Middle Callovian is absent (Rostovtsev et al., 1992). Thirdly, considering the basal Upper Callovian siliciclastics reported from the Labinskaja, Malkinskaja, Kabardino-Dagestanskaja, and Jugo-Vostotchenny Dagestan areas, the presence of shallow-marine (formed along the shoreline) sandstones and conglomerates also indicate erosion. In modern sequence stratigraphic terminology (Catuneanu, 2006), the examined erosional surface can be treated as a correlative conformity (where erosion was minimal or absent) or a subaerial unconformity (where erosion was substantial), i.e., as a sequence boundary.

Taking into account the spatial distribution of the Labinskaja, Malkinskaja, Kabardino-Dagestanskaja, and Jugo-Vostotchenny Dagestan areas (Rostovtsev et al., 1992) and the palaeogeographical outline of the Greater Caucasus Basin in the Middle-Late Callovian (Jasamyan, 1978; Ruban, 2010a), it is possible to record the extent of the erosional surface and to relate it to the dynamics of the Caucasian Sea. Erosion occurred in the northern part of the basin (Fig. 4). The spatial distribution of the surface is not linked with the territory affected by the tectonic activity in the south, where the island arc evolved. In contrast, the surface developed on shelf, between the “northern” island masses. This territory was drowned during the previous Early-Middle Callovian transgression, and the Caucasian Sea embraced it also during the Late Callovian (Ruban, 2010a). Therefore, the erosional surface at the Middle-Upper Callovian transition reflects a short-term, but broad regressive episode.

5. Inter-Regional Tracing of Erosional Surface

Sequence stratigraphic interpretations attempted by Jacquin et al. (1998) for several Western European basins suggest that hiatuses marked the Early-Middle Callovian transition in the “Boreal” domains; a local erosional surface is also reported from the P. athleta zone of the northern part of the North Sea. The same study (Jacquin et al., 1998) suggested an absence of any Callovian erosion in the “Tethyan” domains. Courville and Collin (1997) and then Collin et al. (1999) noted a significant hiatus, which embraced most of the E. coronatum zone on the North Burgundy Platform. Data from southeastern France presented later by de Graciansky et al. (2000) also imply discontinuity beneath the Middle/Upper Callovian boundary, i.e., within the upper part of the E. coronatum zone; particularly, this surface is traced locally in the Dauphiné Basin and on adjacent platforms (Fig. 5). In northwestern Germany, local non-deposition persisted in the Lower Callovian, whereas a broad hiatus embraced the Late Callovian; the same two hiatuses are reported from southern Germany, where local hiatuses also appeared near the Middle-Late Callovian transition (Deutsche Stratigraphische Kommission, 2002).

In the Lusitanian Basin, the Middle-Lower Jurassic transition is marked by a disconformity (Azerédó et al., 1998). The relevant hiatus was diachronous and its onset ranged from the end-Bathonian to the latest Callovian; deposition began again in the Oxfordian (Azerédó, 1998; Azerédó et al., 1998; Martins et al., 2001) (Fig. 5). Stratigraphical data from Spain (Vera, 2004) suggest that non-deposition occurred in the South Pyrenean Basin in the Early and Late Callovian, the Basque-Cantabrian Basin in the Middle-Late Callovian (Fig. 5), and the Iberian Cordillera in the end of the Callovian; a local disconformity is also reported from the base of the Callovian in the Subbetic domain. In the northern Iberian Basin, the hiatus took place at the Callovian-Oxfordian transition, and the Middle-Late Callovian was characterized by a sea-level fall (Ramajo and Aurell, 2008).

The Callovian deposition on the northern margin of Africa (with the exception of Morocco) occurred in two main domains, namely the Oued Mya Basin in the Algerian Sahara and the Nile Delta in northern Egypt (Guiraud et al., 2005). According to Guiraud et al. (2005), there were no major interruptions of sedimentation in the Oued Mya Basin, whereas a disconformity (growing eastwards to a significant hiatus) marks the Callovian-Oxfordian transition in the Nile Delta (Fig. 5). On the Arabian Peninsula and adjacent regions, local hiatuses are observed at the base of the Callovian (Sharland et al., 2001).
Middle-Late Callovian erosional surface

Fig. 4. Spatial distribution of erosional surface in the Greater Caucasus Basin at the Middle-Late Callovian transition. Palaeogeographical interpretation is modified from Ruban (2010a). Note, that the Caucasian Sea was likely wider in the Callovian than shown because of extensional regime. The numbers of areas correspond to those on Fig. 2.

For example, the only late Bathonian-early Callovian hiatus is reported from the Abu Dhabi area, whereas there were no any significant sedimentation breaks at the Middle-Late Callovian transition (Fig. 5). A subsequent update of the stratigraphic framework of Arabia does not indicate any regional sequence boundary within the Callovian or near the Callovian/Oxfordian boundary (Simmons et al., 2007). However, one previous study (Le Nindre et al., 2003) also reported the Bathonian-Middle Callovian and Early Oxfordian hiatuses from Central Arabia, although sedimentation lasted through the Middle-Late Callovian transition with no significant interruption. A correlation of the Callovian hiatuses and erosional surfaces mentioned above suggests that direct analogues of the erosional surface at the Middle-Late Callovian transition reported from the Greater Caucasus Basin exist, but only locally. For example, analogous surfaces can be traced in southeastern France, the North Burgundy Platform, southern Germany, and probably, in the Basque-Cantabrian and northern Iberian basins (see above). However, erosion at a time of the E. coronatum zone, which is documented in southeastern France (de Graciansky et al., 2000), occurred a bit earlier than that in the Greater Caucasus Basin (Fig. 5), and consequently, it is questionable whether these surfaces may be judged analogous. As for the Lusitanian Basin, the major disconformity established there corresponds to the strongly diachronous hiatus, and non-deposition peaked near the Callovian-Oxfordian transition (Azerêdo, 1998; Azerêdo et al., 1998; Martins et al., 2001). It is unlikely that this is an analogue of the surface established in the Greater Caucasus Basin (Fig. 5).

6. Discussion

Three possible mechanisms of formation of the erosional surface recorded in the Greater Caucasus Basin at the Middle/Late Callovian transition can be proposed. These include eustatic fall and subsequent seaward shoreline shift, increase in sediment supply, and regional tectonic activity. The eustatic mechanism should be rejected because of two reasons. First, none of the alternative global sea-level curves (Hallam, 1988, 2001; Haq and Al-Qahtani, 2005) indicate a fall near the Middle-Late Callovian transition; in contrast, there is evidence of a prominent sea-level
highstand (Fig. 5). The glacial episode proposed by Dromart et al. (2003) and later discussed by Cecca et al. (2005) postdated the noted transition. Moreover, Rais et al. (2007) noted even later climatic/oceanographic re-organization in the "Tethyan" domains, whereas Wierzbowski et al. (2009) rejected the idea of glaciation. Consequently, a glacioeustatic mechanism cannot be invoked in the explanation of the formation of the surface anyway. Second, the attempted inter-regional tracing of the erosional surface documented in the Greater Caucasus Basin implies its only regional extent, which is a strong argument against its relation to global-scale eustatic fluctuations.

The sediment supply was evidently not voluminous in the Greater Caucasus Basin during the Callovian as suggested by the relatively small thickness (Fig. 2). Consequently, it is unlikely that basins subsidence concurred with its filling by material derived from the surrounding land masses. However, one can hypothesize that a relatively-shallow basin would be filled quickly even with little portions of sediments. This was possible theoretically, but there were no large mountains to erode, either to the north of this basin, where plains located (Jasamianov, 1978), or to the south, where there were just islands (Ruban, 2006a, 2010a). In other words, there were no sources of that material for quick reduction of the accommodation space with a lot of sedimentary deposits (Jasamianov, 1978; Golonka, 2004). Therefore, the second of the possible mechanisms of the erosional surface formation should be also rejected.

Regional (=basin-scale) tectonic activity remains the only possible mechanism, which can explain the erosional surface at the Middle-Upper Callovian transition in the Greater Caucasus Basin. This is not unexpected, because sedimentation was altered tectonically in not only actively evolved basins of Western Europe (e.g., the Lusitanian Basin: Azeredo et al., 1998), but even on the "passive" margin of North Africa (e.g., the Oued Mya Basin: Guiraud et al., 2005). The analysis of the spatial distribution of the discussed erosional surface in the Greater Caucasus Basin reveals that only its northern, i.e., shelfal, part was affected (Fig. 4). Its southern part, which was "attached" to the Transcaucasian Arc (Ruban, 2006a, 2010b) was not affected by the erosion. If so, it is unlikely that any tectonic activity linked with the evolution of the noted arc was important. But what did occur with the northern margin attached to the Scythian Platform? As this was a shallow part of the basin (Fig. 4), even weak uplifts on the latter were enough to produce a significant seaward shoreline shift. According to Ershov et al. (2003), the central part of the so-called Northern Caucasus Basin (in fact, this is a central part of the Scythian Platform, which also formed the Ciscaucasian Peninsula: Ruban, 2010a) experienced a long-term uplift, which terminated near the end of the Early Cretaceous. Thus, one may hypothesize that any specific phase of this uplift, i.e., a short-term acceleration in upward vertical motion of the ground near the northern periphery of the study basin, occurred at the Middle-Late Callovian transition and led to the formation of the erosional surface on the northern shelf of the Greater Caucasus Basin. Such a tectonic episode would be enough to affect an area measured by a few hundred kilometers in length (as it was the spatial extent of the discussed erosional surface - see Fig. 4) during a short time measured by a few thousand years (the approximate time scale of erosion at the Middle-Late Callovian transition). It is possible that large-scale plate tectonic forces, which led to terrane and ocean reorganizations between Eurasia and Gondwana through the Middle-Late Jurassic (Stampfl and Borel, 2002; Golonka, 2004; Guiraud et al., 2005; Ruban, 2007a; Schettino and Turco, 2011), might have been responsible for the tectonic activity on the Scythian Platform. E.g., these forces might have induced deformations and differential vertical motions of relatively little blocks of the platform. Alternatively, any mechanism of dynamic topography would facilitate vertical motions. Anyway, establishing the true nature of the noted uplift(s) on the noted platform is a matter for the other study, which will require geophysical and structural geological investigations on the modern basis.

7. Conclusions

This brief review of the available knowledge on the Callovian stratigraphy of the Greater Caucasus Basin and some basins of Western Europe, North Africa, and Arabia permits three main conclusions:

1) the erosional surface occurs at the Middle-Upper Callovian transition in the Greater Caucasus Basin, and it embraces its northern shelfal periphery;
2) the documented surface is regional (=basin-scale) in extent, and coeval surfaces occur only locally in Western Europe;
3) the formation of this surface was linked with uplifts on the Scythian Platform, but it was not linked with glacioeustatic mechanisms.

Generally, the present study demonstrates an efficacy of the inter-regional tracing of particular surfaces for the understanding of the relative importance of eustatic and tectonic mechanisms in regional basin evolution. Further research in the Caucasus should answer whether uplifts on the Scythian Platform were linked with large-scale tectonic processes on the active "Tethyan" margin of Eurasia. This study has yet another implication. If sedimentation in many regions of Western Europe, North Africa, and Arabia as well as a rather "stable" Greater Caucasus Basin was tectonically affected, erosive reconstructions based on data from single regions (if even so large and apparently "passive" as Western Europe or Arabia) should be treated with caution. This echoes suggestions of Hallam (2001) and Müller et al. (2008), and thus forms an important basis for further debate. At least, it should be appreciated that the erosive curve proposed by Haq and Al-Qahtani (2005) was not based solely on their interpretations attempted in Arabia, but also involved some other datasets.

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