of the *C. zhangi* Zone. (3) Sudden facies change at the base of the Boundary Clay which is accompanied by a strong extinction event of the warm water fauna (and therefore related to a strong climatic change) which did not much affect the eurytherm benthos (small foraminifers, ostracods),. Whereas the base of the Boundary Clay is a synchronous event which indicates rapid drop in biogenic carbonate production (most probably because of blocking of sunlight), the extinction of the warm water faunas is diachronous, and lies at the tropic of capricorn (Abadeh section) at the base of the *C. hauschkei* Zone, 1000 km closer to the palaeoequator and at the palaeoequator themselves at the base of the *C. meishanensis-H. praeparvus* Zone. (4) Strong climatic change at the base of the Boundary clay (see 3). (5) High energy event at the base of the Boundary Clay which can be also observed in the several 1000 km away Bükk Mountains. It is probably related to huge tsunamies. (6) Rapid, but stepwise extinction of the eurytherm benthos in the interval from the base of the *M. ultima-S.*? *mostleri* Zone up to the very base of the *H. parvus* Zone, which occurs in the southern sections earlier than in the northern sections closer to the palaeoequator. (7) Maximum of microbialites, in shallower sections also large stromatolite or thrombolite bodies in the *H. aprvus* Zone which begins already in the *M.ultima-S.*? *mostleri* Zone. (8) Presence of an about 300 000 years long interval with more frequent than average microsphaerules with a first maximum in the cool water horizon of the lower *C. zhangi* Zone (mostly volcanic microsphaerules) and a second strongest maximum in the lower but not lowermost Boundary Clay (cosmic and volcanic sphaerules). Except event 6 all events can be traced also in other marine and continental sections.

Especially important is the fact that the PTB in the investigated Iranian sections lies in red sediments or, if it lies in light grey sediments as in Abadeh, the ostracod fauna indicates high oxygen content in the bottom water. Therefore, the anoxia cannot be the reason for the extinction event but they only locally or regionally overprint the extinction event, where they are present.

Correlation of the Continental Uppermost Permian and Lower Triassic of the Germanic Basin with the Marine Scale in the light of New Data from China and Iran

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The correlation of pelagic sediments with high-resolution biostratigraphic control with continental beds belongs to the most difficult stratigraphic questions. For detailed correlation not only interfingering of marine and continental beds must be used but also abiotic events. Yin Hongfu and co-workers made very important and excellent studies on the eventostratigraphy around the Permian-Triassic boundary (PTB) in Meishan and other South Chinese pelagic sections, and correlated all events very precisely with the high-resolution biostratigraphy of these sections (e.g. Yin Hongfu & Zhang Kexin, 1996, Yin Hongfu et al., 1996a, b, 2001). All events around the PTB can be found also in Iran, where they were correlated very detailed with the conodont biostratigraphy (Kozur, 2004 and in press, Korte et al., 2004 a, b, c). The detailed conodont zonation is shown in Fig. 1. All these events are also present around the PTB in continental beds of the Germanic Basin, and allow a very precise correlation of the PTB and eventostratigraphic markers below and above this boundary (Fig. 2). Detailed bio- and eventostratigraphic data were also published around the Olenekian base from the proposed GSSP of the Olenekian base at Chaohu (Tong et al., 2004, 2005). Further important data about the Gangetian to Smithian ammonoid and conodont chronology were reported by Bhargava et al. (2004) and Krystyn et al. (2004) from extremely ammonoid- and conodont- rich sediments of Spiti (India).

The PTB in continental beds of the Germanic Basin lies at the top of the *Falsisca postera* Zone. It is confirmed by a minimum in $^{13}C_{carb}$ and $^{13}C_{org}$ in the same bed and the same event succession as in Meishan and the Iranian sections. The boundary between the *F. postera* and the *F. verchojanica* Zone can be also found in Dalongkou close to the LOD of *Dicynodon*. The co-occurrence of *Dicynodon* with *Lystrosaurus* is therefore uppermost Permian and not lowermost Triassic. Most of the Lystrosaurus fauna (without Dicynodon) is, however, Triassic in age and coincides with the Gangetian Substage. The Gangetian-Gandarian boundary in continental beds is characterised by the disappearance (LOD) of *Falsisca* and the roughly contemporaneous LOD of *Lystrosarus* and the first occurrence (FAD) of spined conchostracans (*Molinestheria*, *Vertexia*, *Cornia*). It lies in the uppermost Calvörde Formation in the middle of magnetozone 1r (both in marine and continental beds). The base of the Olenekian in continental beds of the Germanic Basin was mostly placed at the base of the Hardegsen Fm. (Menning, 1995) or at the base of the Volpriehausen Fm. (Menning, 2000), but this was not supported by biostratigraphic or magnetostratigraphic evidences. Szurlies (in press) and Szurlies et al. (2003) used the magnetostratigraphic data of Scholger et al. (2000) from the Southern Alps and put the base of the Olenekian inside the Volpriehausen Fm., but such magnetostratigraphic correlations made only a sense, if not only reliable magnetostratigraphic data are used but also the correlation of the magnetozones within the marine Triassic must be checked in the sections, where they were measured. The palaeomagnetic data of Scholger et al. (2000) are reliable, but these authors did not regard the well known biostratigraphic data summarised in Farabegoli & Perri (1998) from the same Pufels (Bulla) section, where the magnetostratigraphic investigations were made. The top of the normal zone 2n is close to the base of the Olenekian (Tong et al., 2005) and not in the middle Gandarian (Dienerian) as shown by Scholger et al. (2000). The top of magnetozone 2n in Pufels (Bulla) is close to the top of the upper Gandarian *Claraia aurita* Zone and about 3 m below sample Bu 45 of Farabegoli &

My		Stage/Substage		Ammonoid Zone		Conodont Zone		M
	MIDDLE TRIASSIC	ANISIAN		Aghardandites ismidicus		Paragondolella bulgarica	Nicoraella germanica	
				Nicomedites osmani				
				Lenotropites caurus				
			Aegean	Pseudokeyserlingites guexi		Neogondolella ? regalis		
247				Japonites welteri		Chiosella timorensis		
	LOWER TRIASSIC = SCYTHIAN	OLENEKIAN	Late Olenekian (Spathian)	Neopopanoceras haugi		Chiosella gondolelloides		
						Triassospathodus sosioensis		
				Prohungarites-Subcolumbites		Triassospathodus triangularis		
				Procolumbites		Triassospathodus homeri		
				Columbites parisianus		Icriospathodus collinsoni		
249				Tirolites cassianus		Triassospathodus hungaricus		4n
			Early Olenekian (Smithian)	Anasibirites kingianus		Neospathodus waageni-Scythogondolella milleri		3r
				Meekoceras gracilitatis				3n
251				Flemingites flemingianus		N. waageni-Scythogond. meeki		2r
		BRAHMANIAN (INDUAN)	Gandarian (Dienerian)	Rohillites rohilla		Chengyuania nepalensis		2n
				Gyronites frequens		Neospathodus cristagalli		
						Neospathodus dieneri		
251.6				"Pleurogyronites" planidorsatus		Sweetospathodus kummeli		
			Gangetian	Discophiceras		Clarkina krystyni	H. postparvus-H. sosioensis	1r
				Ophiceras tibeticum		Isarcicella isarcica		1n
252.5				Otoceras woodwardi				
252.6				Otoceras fissisellatum	T. pascoei	Hindeodus parvus		
	LOPINGIAN	DORASHAMIAN	Upper Dorasham.	Hypoph. changxingense	Otoceras boreale	Merrillina ultima-Stepanovites ? mostleri		
252.7						Clarkina meishanensis -H. praeparvus		
				Pleuronodoc. occidentale		Clarkina hauschkei		
				Paratirolites kittli, pars		Clarkina iranica		
						Clarkina zhangi		0r
						Clarkina changxingensis-C. deflecta s.s.		

Figure 1. Ammonoid and conodont zonation of the pelagic marine Lower Triassic
Numerical scale calculated from radiometric data (normal numbers) and astronomic calibration (in italics). Palaeomagnetic data from Zakharov & Sokarev (1991), Muttoni et al. (1996), Scholger et al. (2000), Szurlies & Kozur (2004), Tong et al. (2005). Dating of the magnetozones partly strongly changed (Scholger et al., 2000) or slightly changed (Muttoni et al., 1996). Grey interval: No reliable palaeomagnetic data or no detailed correlation.

Perri (1998) with the lower Olenekian *Pachycladina obliqua* conodont fauna, which begins in a limestone bed immediately below the top of 2n. Thus, in contrast to the correlation by Scholger et al. (2000), also in the Pufels (Bulla) section the top of the magnetozone 2n is close to the base of the Olenekian confirming the data by Tong et al. (2005). On the base of conchostracans, which are well correlated with the marine scale, Kozur (e.g., 1993, 1999) placed the base of the Olenekian inside the Lower Buntsandstein upper Bernburg Fm. The position of the magnetostratigraphic zone 2n in the Chaohu GSSP candidate and after biostratigraphic correlation also in the Pufels (Bulla) section confirms this position of the Olenekian base.

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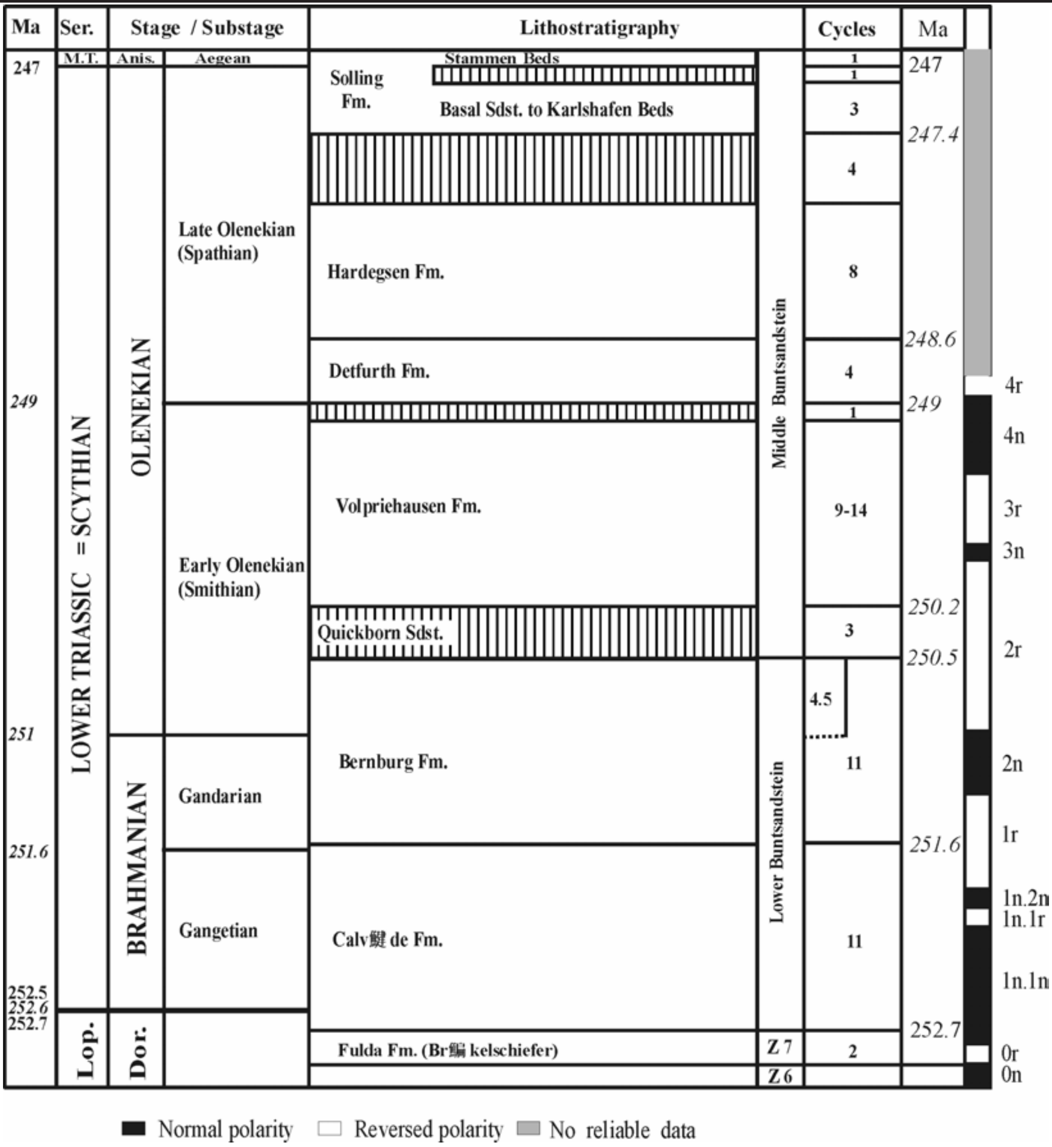

Figure 2. Correlation of the uppermost Permian and Lower Triassic (uppermost Zechstein to Middle Buntsandstein) of the Germanic Basin with the international scale. Slightly modified cycles and palaeomagnetic data after Geluk & Röhling (1999), Röhling (1991), Szurlies (1998, 2004). Numerical ages calculated from radiometric data and astronomic calibration after Kozur (2003a,b).

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Muth (Spiti, Indian Himalaya) – A Candidate Global Stratigraphic Section and Point (GSSP) for the Base of the Olenekian Stage.

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Southern Tibet and the High Himalayan Range are now located in the Tibetan Zone known as the highest tectonic element of the Himalayan orogen. During the Lower Triassic time this zone was part of the tropical Indian Gondwana margin and formed a large deeper-neritic basin close to or below storm wave base with long-term stable environmental conditions. In this basin, pelagic fossils such as ammonoids, specific bivalves and conodonts were widespread deposited in fine-grained carbonates (distal tempestites or bioclastic wackestones). These are now found in prolifically in many places of northern India, Nepal and Tibet. The original low palaeolatitude, a high preservation potential and good fossil extractability are the fundamentals of an extraordinary pelagic faunal diversity record (Diener, 1897, Krafft & Diener, 1909, Waterhouse, 1996, Bhatt et al., 1999) and underline the past and present importance of the region for the chronostratigraphic subdivision of the Lower Triassic and for high-resolution fossil zonations. Waterhouse has recently proposed a new detailed ammonoid subdivision of the entire Lower Triassic for Nepal, and Spiti data with special reference to the Induan-Olenekian boundary are presented herein. A more recent geological monograph of Spiti has been published by Bhargava and Bassi, 1998.

The Muth section is situated in Lahul & Spiti district, northern Himachal Pradesh State of India in the Western Himalayas and is formerly proposed as candidate GSSP for the Induan-Olenekian boundary (Lower Triassic). It is reachable from Shimla (or Manali) through the main road along the Sutlej and Spiti valleys till Lingti and, from there up the Pin valley road up to the village of Muth (3800 m). Due to high altitude, access to the outcrop may be hindered by snowfall during the winter months but is principally unrestricted all year long. The travel to Spiti and Muth is open to persons of all nationalities.

Sediments representing the Lower Triassic in Spiti are found in the Mikin Formation (formerly Tamba Kurkur Fm.), subdivided recently into three members (Bhargava et al., 2004). Varying lithologies within the middle member allow discrimination of three intervals named for their diagnostic ammonoids from base to top as: 1) two to three meters thick *Gyronites* beds (the former *Meekoceras* beds of Krafft), 2) two meters thick *Flemingites* beds and 3) up to 10 m thick *Parahedenstroemia* beds. As for the