6. The Loser panorama road

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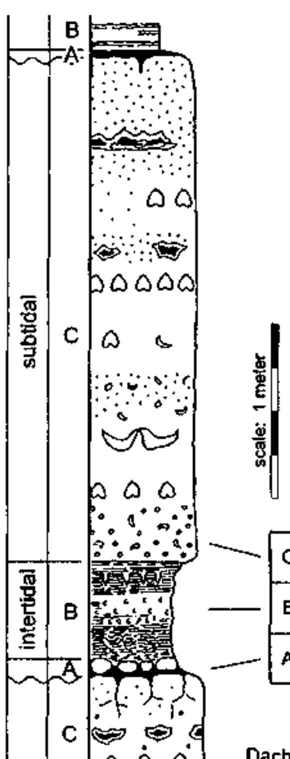
6.1. Cyclicity of the Dachstein Limestone - the dominant feature of the Dachstein landscape

A characteristic morphological feature of the southern parts of the NCA is the distinct meter-sized bedding of the Dachstein Limestone, well visible along the steep slopes as well as on the karstified top of the large plateau mountain ranges.

First attention from a sedimentological point of view has been drawn to this sedimentary structure by SANDER (1936) and SCHWARZACHER (1949, 1954). ZAPFE (1959) supposed a very shallow depositional environment, based on biota and similarities to the recent carbonates of the Bahamas.

FISCHER (1964) has given a still classical description of this phenomenon called "Lofer cycle", based on sequences from the plateaus of Dachstein and Loferer Steinberge. The cyclicity is caused by an interbedding of lagoonal limestones, thin layers of variegated argillaceous material and intertidal/supratidal dolomites and dolomitic limestone.

An ideal representation of the Lofer cycle is shown in Fig. 6.1.: The main sediment is a generally unbedded light limestone (layer C), containing oncoids, dasycladacean and codiacean algae, *foraminifera*, bryozoa, gastropoda, large megalodontid and other bivalves. A weathered and solution-riddled surface of this limestone is overlain and/or penetrated by reddish or greenish argillaceous limestone (layer A), which may include limestone clasts and which is interpreted as a former terrestrial soil. Layer B consists of intertidal carbonates of a variety of rock types like "loferites" or birdseye limestone of laminated



Layer	Lithic composition						Biota														Shrinkage structures		
	Homogenous carbonate lutites	Laminated carbonate lutites	Pellet lutites	Algal mats	Carbonate arenites	Intraformational conglomerates	*Filamentous algae in mats and crusts*	Filamentous algae in oncoids	Rhodophytes, dasycladaceans, codiaceans	*Foraminifera*	Porifera	Corals	Bryozoa	Brachiopoda	Gastropoda	Pelecypoda	Cephalopoda	Ostracoda	Echinodermata	Fecal pellets	Prism cracks	Sheet cracks	Shrinkage pores
C	+				+			+	++	++	+	+	+	(+)	+	++	(+)	+	+	+	+	+	
B	+	+	+	+		+	++			+					+			+		++	++	++	++
A	+		+			+												+		++		+	

Dachstein Limestone, lagoonal facies - idealized "Lofer cycle" according to A.G. FISCHER 1964.

Fig. 6.1.: Dachstein Limestone, lagoonal facies - idealized "Lofer cycle" according to FISCHER (1964).

or massive type, nonloferitic lutites and intraclasts. The flat or crinkled lamination represents filamentous algal mats, characteristic also for modern tidal flats. Fenestral pores and mud cracks seem to be the result of shrinkage of unconsolidated sediment due to desiccation. All types of layer B are more or less dolomitic, some of it formed as contemporaneous brittle surface crusts as shown by intraclasts demonstrating the intertidal/supratidal setting.
A theoretical complete sequence of such a transgressive-regressive cycle might be expected to show a succession A-B-C-B-A. The real Lofer cycle generally lacks the regressive phase of B, probably because of the succeeding erosion. If a phase of total emergence is missing, the succession is C-B-C-B. Layer A is commonly not developed as a distinct bed, because of its erosional origin; however, remnants of A are abundant fillings in veins, cavities and biomoldic pores (gastropod and megalodontid shells).
FISCHER explains the formation of the cyclothems by periodic fluctuations of the sea-level which is superimposed on the general subsidence. An amplitude of up to 15 m and 20.000 to 100.000 years is assumed for one cycle. Because this model does not explain the gradual lateral transition into the Hauptdolomit Formation and the lateral wedging of intertidal and supratidal sediments on short distance, ZANKL (1971) proposed an alternative model: Current activity and sediment producing and binding algae produced mud mounds and tidal mud flats. Subsidence and eustatic sea-level fluctuations of centimeter amplitudes and in several hundred years may have modified growth pattern and shape of the tidal flats by erosion and transgression.
Along the upper part of the Loser panorama road Dachstein Limestone of lagoonal facies is well exposed. The "Megalodontid Limestone" is the main sediment type containing a variety of biota like large shells of *Conchodon, Rhaetomegalodon, Dicerocardium* and other molluscs as well as echinoderms, calcareous algae, rare corals, hydrozoans, bryozoans and some problematic organisms like *Cheilosporites tirolensis.* Components are sometimes black stained - "black pebbles" - indicating subaerial exposure prior to redeposition. The sediment is characterized dominantly by grainstones and biomicrites.
The foraminiferal fauna contains *Involutina*-associations. The algal flora consists of *Heteroporella crosi* (OTT), *Heteroporella zankli* (OTT), *Macroporella* sp., *Palaeodasycladus* sp., *Cayeuxia alpina* FLÜGEL, *Garwoodia* sp., *Solenopora endoi* FLÜGEL.

Fissure fillings

A very interesting phenomenon are neptunian dikes and sills within the Dachstein Limestone, filled by Lower Jurassic limestones and coquina of brachiopods. The fissures occur both diagonally and parallel to the bedding planes of the host rock. Diagonal fissures sometimes display an interaction of submarine sedimentation and of vadose origin (calcareous sinter). Several types of fissure fillings can be seen - red micrites (Adnet facies), crinoidal limestones (Hierlatz facies), grey brachiopod limestone, grey micrites and others - up to 13 generations of sediment have been recognized within the fissures.

6.2. Panoramic view: Dachstein glaciers, the Pleistocene basin of Aussee and Upper Jurassic limestones of Trisselwand and Tressenstein.

The view from the mountain Loser toward south shows Upper Triassic Dachstein Limestone of the Totengebirge nappe in the foreground.
At the opposite side of Lake Aussee the impressive steep cliff of Trisselwand and the small peak Tressenstein expose Upper Jurassic limestones, which are covering the contact between Totengebirge nappe and the Hallstatt unit of Ischl-Aussee. Evaporites and siliciclastics of the latter one are expected to form the floor of the Aussee basin - a deep depression, glacially eroded during the Pleistocene and filled by a thick sequence of glacial and periglacial sediments. A recent drilling for salt prospection has penetrated more than 600 meters quaternary gravel, covered by morains of the youngest glaciation (Würm). According to the spatial distribution of morain deposits, the valleys have been filled by an ice-stream, more than 1000 meters in thickness during the maximum extent of Würm glaciation about 20.000 years BP. The quaternary history of the Traun valley is documented in detail by VAN HUSEN (1977, 1987).
The background of the panorama is built by Triassic platform carbonates of the Dachstein nappe.
The Dachstein Limestone of the Loser Mountain is covered by Jurassic rocks, formig its characteristic summit. East of the Loser Hütte outcrops of red radiolarites and thin-bedded micritic limestones with radiolaria and sponge spicules can be seen above Lower Jurassic red limestones. The siliceous sediments are overlain by a sequence consisting of bedded limestones with chert nodules and layers - the Oberalm Formation. The lower part is characterized by sedimentary structures indicating synsedimentary slidings. Intercalations of pelsparites demonstrate the transition between this deeper-water facies and the superimposing shallow-water facies of the Tressen Limestone and Plassen Limestone (Loser summit). Bioclastic intercalations near the locality Augstsee contain also aptychus fragments.
These limestones are mainly Upper Jurassic in age, according to the occurrence of the algae *Clypeina jurassica* (FAVRE), *Muniera baconica* DEECKE and *Salpingoporella annulata* CAROZZI.
The panorama view exposes also the type locality of Tressenstein Limestone (HÖTZL, 1966), at the southern side of Lake Aussee. Oberalm transition facies with carbonate-detritic intercalations of Barmstein beds interfinger with and are overlain by shallow-water Tressenstein limestone. The latter consists of intraclasts derived from high-energy environments with hydrozoans, corals, calcareous algae and partly near-coast lithoclasts. The summit of Tressenstein and the Trisselwand consist of micritic as well as sparry Plassen Limestone. The transition platform to slope is disturbed by several subvertical faults.
For additional information about Jurassic sedimentary history see chapter 4.2.

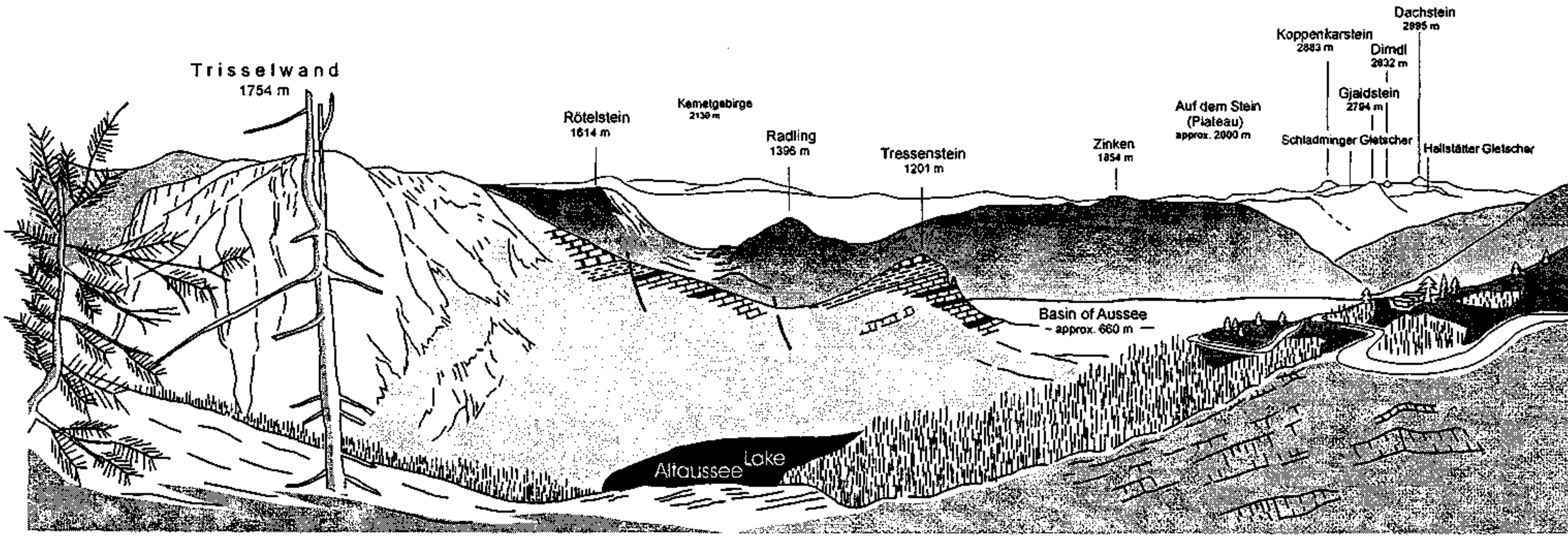
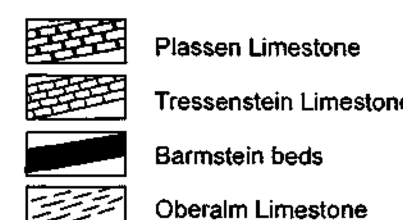


Fig. 6.2 : Loser Panorama road; view toward south:

In the foreground right: Late Triassic Dachstein Limestone, lagoonal facies with Lofer cycles.
Middle part: The Trisselwand is built up by Late Jurassic to Earliest Cretaceous Plassen Limestone (shallow platform facies), prograding over slope facies of Barmstein-/Tressenstein Limestone (type locality !) and basinal facies of Oberalm Limestone.
The basin of Aussee is a glacial eroded depression in rocks of the Ischl-Aussee Hallstatt Zone (limestones, sandy shales, evaporites) filled by thick glacial deposits (fluviatile gravel, moraine of Würm-glaciation).
The Mt. Rötelstein is an other tectonical outlier of Hallstatt rocks, resting on Triassic to Jurassic rocks of the Dachstein-Warscheneck Nappe.
Radling, Zinken, Kemetgebirge, the plateau "Auf dem Stein" and the central Dachstein massif belong to the Dachstein Nappe, consisting mainly of Triassic platform carbonates.



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