

Der Dogger der Zentralschweizer Klippen

Doctoral Thesis

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DER DOGGER DER ZENTRAL -
SCHWEIZER KLIPPEN

A B H A N D L U N G

zur Erlangung des Titels eines

DOKTORS DER NATURWISSENSCHAFTEN

der

EIDGENOESSISCHEN TECHNISCHEN HOCHSCHULE ZUERICH

vorgelegt von

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SUMMARY

1) Stratigraphy and facies

The variable Middle Jurassic sequences in the Préalpes Médianes nappe (Briançonnais s.l.) of central Switzerland are subdivided into 3 formations and 8 members:

Stanserhorn Formation

The bituminous Posidonia shales of early Toarcian age (Posidonienschiefer) are dated by a rich ammonite fauna. Their base is remarkably synchronous with the similar Posidonienschiefer of southwestern Germany.

A major stratigraphic gap is represented by the pelagic Spis-Kalk limestone (condensation: middle to late Toarcian; omission: Aalenian to Bajocian?). Limonitic mega-oncoids built up by sessile Foraminifera (Tolypamina) and porostromate blue-green algae (Girvanella) correspond to an euphotic depositional environment on seamount-like platforms. The Spis-Kalk has a large extension - previously unknown - in the Buochserhorn/Stanserhorn/Alpoglerberg region. Emergence of islands in the eastern Buochserhorn area (Aalenian to early Bajocian?) is documented by caliche phenomena and dripstone cement.

The epibathyal facies of the Zoophycos beds (Zoophycos-Schichten) is best developed in the southern Stanserhorn area (up to 500m) and was found for the first time in the Klewenalp/Musenalp region too. The Bajocian ammonite zones from *laeviuscula* up to *parkinsoni* zones are well established by rich Mediterranean faunas, whereas beds of late Aalenian age were found only in the basal Zoophycos beds of the Musenalp klippe. Sedimentation rates of the Zoophycos beds (4.3-7cm/1000y) agree well with those calculated for beds of the same age and facies in the Dauphiné domain of the Western Alps.

Gibel Formation

Oolitic grainstones of Bathonian age contain siliciclastic and rhyolitic detritus (Gibel-Schichten). They form an autochthonous shallow marine facies and are an equivalent of the siliciclastic calciturbidites in the most external Zoophycos-Dogger domain of the eastern Préalpes Médianes. At their base an ammonite fauna of latest Bajocian age is reworked from the top of the slightly condensed Zoophycos beds.

In the internal klippen domain Arvigrat/Musenalp/Klewenalp the Gibel-Schichten are replaced by silty to sandy marls and limestones representing a more basinal facies (Musenalp-Schichten). A lagoonal and beach-rock facies association is documented by the transgressive Rämsi-Konglomerat (late Bathonian) of the external Mythen group. A characteristic feature within these oncolitic conglomerates are numerous pebbles of Paleozoic(?) rhyolites and a single gneiss pebble. In contrast to this the similarly composed Steinberg-Konglomerat of the same age in the Stanserhorn area is interpreted as a tempestite bed.

Griggeli Formation

The Griggeli formation of Callovian to middle Oxfordian age comprises two members. The depositional environment was below the high energy level. At the base of the Griggeli formation

a condensation bed with phosphoritic ammonites (Griggeli-Kondensationshorizont; gracilis zone, early Callovian) is typically developed only in the northern Mythen group. As a resedimented (tempestite?) bed it was also found in the Klewenalp/Musenalp/Stanserhorn/Rotspitz area, where it was previously unknown.

The neritic siliceous limestones (Mythen-Kieselkalk) gradually pass into the pelagic nodular limestone ("Knollenargovian", middle Oxfordian) only in the northwestern klippen area Rotspitz/Stanserhorn/Buochserhorn. In the southeastern block Arvirglat/Musenalp/Klewenalp/Mythen, the uppermost part of the Mythen-Kieselkalk is extremely condensed and cut along an important cartographic discordance by the pelagic and calciturbiditic "Malmkalk" formation, producing thereby a major stratigraphic gap (late Callovian to middle Oxfordian?) at the Middle/Upper Jurassic boundary. The peculiar ankeritization at this boundary is interpreted as a synsedimentary to late diagenetic, metasomatic phenomenon, resulting from synpaleotectonic block faulting in early Oxfordian times.

2) Paleogeography and paleotectonics

The klippen domain of central Switzerland is a northeastern extension of the Subbriançonnais facies belt from the external Préalpes Médiannes Plastiques of western Switzerland. In contrast to this typical Subbriançonnais domain it is characterized by unstable paleogeographical configurations in space and time as well as by often incomplete and condensed stratigraphic sequences. An important continental ridge from Early to Middle Jurassic times (MMM-Schwelle) has been recognised in the external ("northern") strip of the klippen domain (Rotspitz/northern Stanserhorn/Mythen).

Facies analogies to the Briançonnais facies belt proper are found only in the thick Middle Triassic sequence of the Giswilerstöcke and in the pebbly, shallow marine Callovo-Oxfordian sequence on top of the Rotenflue, which was previously interpreted as Liassic limestone.

Block faulting along hypothetical synsedimentary faults in the klippen domain resulted from the distension along the northern passive continental margin of the Middle Jurassic Tethys.

On the basis of floral and phytogeographical characteristics of the Middle Jurassic klippen flora ("Tethys flora") we suppose a comparatively more internal ("southern") and possibly "intraoceanic" situation for the klippen domain of central Switzerland, in contrast to the classical Subbriançonnais-Briançonnais section of the French Alps.

The Sulzfluh nappe of eastern Switzerland is supposed to have a middle Penninic ("Briançonnais s.l.") origin, aequivalent to that of the Klippen Nappe of central Switzerland. This conclusion is based upon analogous sedimentary record and paleogeographical evolution from the Middle Jurassic to the Early Tertiary and especially upon a rhyolitic conglomerate of Bathonian(?) to Callovian age, so far unknown, in the Sulzfluh nappe, which contains the same volcanic pebbles as the Gibel formation in the external Klippen Nappe.