Chapter 25
Existence of the Reversal Polarity Zones in Turonian-Coniacian from the Lower Volga (Russia): New Data

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Abstract The detailed magnetostratigraphic study of the Turonian-Coniacian sections from the Volga right-bank region was conducted. The results on magnetic polarity from the Nizhnyaya Bannovka section (Saratov Region) (about 18 m thick) agree with the traditional data on exclusively normal regime of geomagnetic field polarity in the Cenomanian-Santonian ages. In the Kamennyi Brod section (Volgograd Region) between two zones of normal polarity an interval (about 16 m thick) occurs with no reliable paleomagnetic data due to extremely low magnetization of rocks. In the composite section Ozerki-Lipovka (Saratov Region) a long (thickness not less than 13 m) zone of reverse polarity is recorded. This contradicts the paleomagnetic structure as established in the Geomagnetic Polarity Time Scale (Ogg et al. 2016) but is partly consistent with the General Magnetostratigraphic Scale (Supplements … 2000) which records existence of a prolonged reversed-polarity epoch (R) in the Coniacian age (the Klyuyevskaya R-zone).

Keywords Magnetostratigraphy · Petromagnetism · Turonian · Coniacian Santonian · Geomagnetic polarity

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2000) which records existence of a prolonged reversed-polarity epoch (R) in the Coniacian age (the Klyuyevskaya R-zone).

Introduction

Currently, there is no universally accepted idea of the geomagnetic field behavior in Late Cretaceous: in the Geomagnetic Polarity Time Scale (GPTS) (Ogg et al. 2016), the Cenomanian-Santonian corresponds exclusively to normal (N) polarity (the upper part of the C34 magnetic chron), while the General Magnetostratigraphic Scale (GMSS) (Supplements … 2000) records a prolonged reversed-polarity epoch (R) in the Coniacian age (the Klyuyevskaya R-zone). There is an abundant evidence on the presence of reversed magnetozones within the Cenomanian-Coniacian from various regions (Eremin et al. 1995; Fomin 2003; Fomin and Eremin 1993; Fomin and Molostovskiy 2001; Krumsiek 1982; Makarova and Tsapenko 1971; Montgomery et al. 1998; Nairn et al. 1981; Pechersky 1970). Regretfully, a substantial part of the data does not comply with the current requirements to the magnetic data quality: some of the earliest publications provide only magnetic polarity columns without any information on paleomagnetic directions, magnetic cleanings, etc. In some cases R-magnetozones are either substantiated with insufficient number of samples or their recognition is based on paleomagnetic data of poor quality generally associated with extremely weak natural remanent magnetization values, at the threshold sensitivity level of available equipment. Sometimes, the stratigraphic ages assigned to the respective sedimentary formations seem dubious. Therefore, acquisition of reliable magnetostratigraphic data on the reference sections from various geostructural and paleobiogeographic areas is necessary to prove the reality of prolonged reverse-polarity epochs in the Cenomanian-Coniacian.

Integrated bio- and magnetostratigraphic explorations of the Turonian-Coniacian sections from the Volga right-bank region have been aimed at refining the magnetic structure of the Cretaceous Normal superchron by testing the hypothesis of the presence of reversed polarity epochs in the Turonian-Coniacian. On the whole, 3 sections were examined. Two of those (Ozerki-Lipovka and Nizhnyaya Bannovka) are situated in the Saratov Region and one (Kamennyi Brod) in the Volgograd Region (Fig. 25.1). According to the stratigraphic chart of the Upper Cretaceous in the East European Platform (Stratigraphic scheme … 2004), the Turonian-Coniacian in the Volga right-bank region in the vicinity of Saratov and Volgograd comprises a carbonate formation represented by marls and chalk, from 5 to 60 m thick, enclosed between the Cenomanian terrigenous rocks and the condensed (the so-called "sponge") horizon [base of Santonian, according to (Stratigraphic … 2004)]. In the Ozerki-Lipovka composite section, beside the carbonate formation, the siliceous-carbonate beds above the "sponge" horizon have been sampled (Figs. 25.2 and 25.3). Those beds have been traditionally referred to as Santonian (Stratigraphic … 2004), but the microfauna that is characteristic for Coniacian stage has been recently found there (Guzhikov et al. 2017b; Pervushov et al. 2017a, b). Until

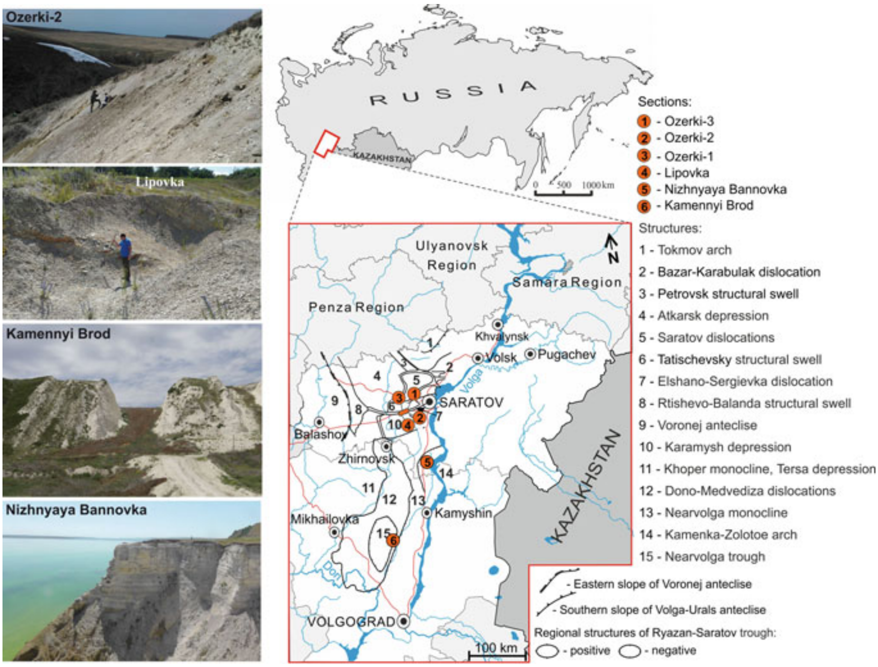


Fig. 25.1 The photos of the studied sections and their locations in the tectonic scheme of the Ryazan-Saratov trough (Shebaldin 2008; State Geological … 2009)

recently, there were practically no magnetostratigraphic descriptions of the Turonian-Coniacian either from the Volga right bank region or from the whole of the Russian Plate. This is primarily accounted for by weak magnetic properties of the rocks that were unmeasurable by means of the available equipment.

In terms of tectonic regionalization, the studied sections are situated in Ryazan-Saratov through (Fig. 25.1), the most part of plicative structures (flexures, brachyanticlines) within it are inherited and develop since Paleozoic to date. In all studied outcrops it was determined, the subhorizontal bedding, except for Lipovka, where layers dip to the north at an angle of 23 degree.

Research Technique and Investigation Results

The field study consisted of sample collection for various types of analyses according to the “sample-to-sample” system with concurrent geologic description and layer-by-layer macrofauna collecting. In all, 257 oriented hand samples from 256 stratigraphic levels have been collected. In the Ozerki-Lipovka section, 29 levels have been sampled from the 5.5 m-thick carbonate formation, and 26 levels from the sequence above the “sponge horizon” (Fig. 25.2). In Kamennyi Brod and

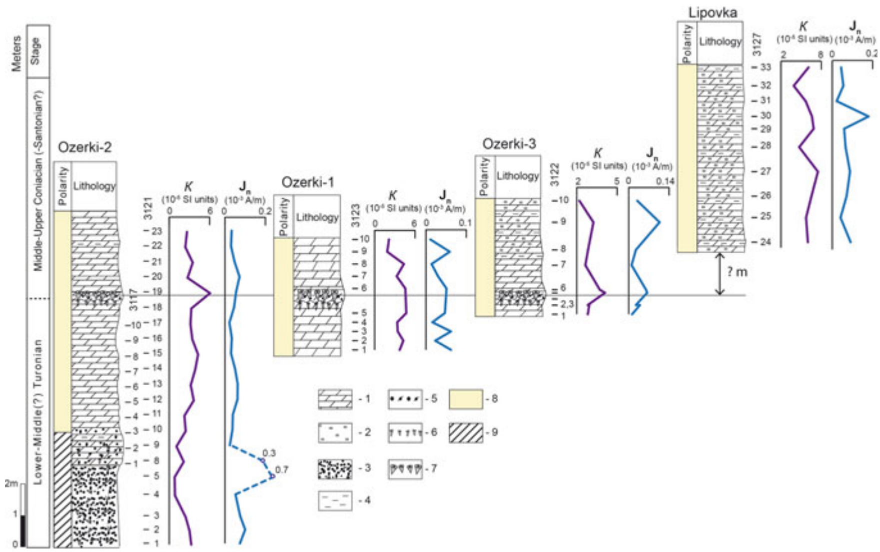


Fig. 25.2 Paleomagnetic and rock-magnetic characteristics of the sections Ozerki-1, -2, -3 and Lipovka. 1—marls, 2—siliceous rocks, 3—sandstones, 4—clays, 5—phosphorites, 6—bioturbation zones, 7—sponge fossils; geomagnetic polarity: 8—reversed (R), 9—anomalous directions

Nizhnyaya Bannovka sections, 109 and 87 levels have been sampled, respectively (Figs. 25.4 and 25.5). Each hand sample was sawn into 3–4 cubic specimens with 2 cm edge; these specimens were subsequently subjected to paleomagnetic and petromagnetic examinations.

The petromagnetic study consisted of examining magnetic susceptibility (K) and its anisotropy (AMS), measuring natural remanent magnetization ($\mathbf{J_n}$), experiments on magnetic saturation with determinations of remanent saturation magnetization ($\mathbf{J_{rs}}$) and remanent coercivity ($\mathbf{H_{cr}}$). K measurements were made with a MFK1-FB kappabridge, those of $\mathbf{J_n}$—with a JR-6 spinner magnetometer and a 2G-Enterprises cryogenic magnetometer (at the Schmidt Institute of Physics of the Earth of the Russian Academy of Sciences (IPE RAS), Moscow). The studies of the magnetic susceptibility dependences on temperature were conducted on the MFK1-FA kappabridge with a CS3 furnace (Trofimuk Institute of Petroleum Geology and Geophysics of Siberian Branch of Russian Academy of Sciences, Novosibirsk). The analysis of AMS data was carried out by means of the Anisoft 4.2 software.

All the examined samples were weakly magnetic: $K = 0–6 \times 10^{-5}$ SI units, $\mathbf{J_n} < 0.2 \times 10^{-3}$ A/m, with rare exceptions (Figs. 25.2, 25.4 and 25.5). From the magnetic saturation results, only a magnetically soft phase is found ($\mathbf{J_{rs}}$ is nearly saturated in the fields about 100–200 mT, while remanent coercivity is typically 20–40 mT) (Fig. 25.6a). This is characteristic of finely dispersed magnetite. In a number of samples a small but consistent increase in the magnetization up to 700

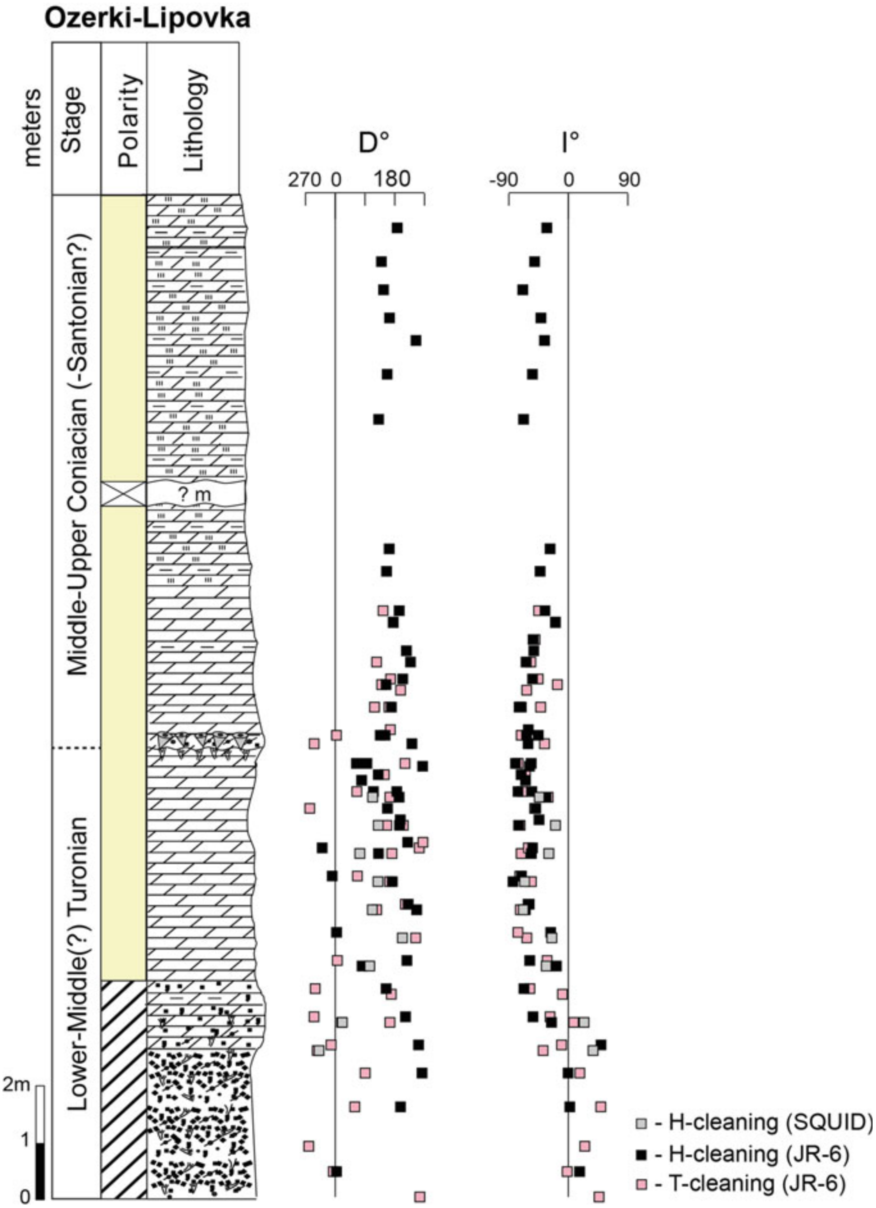


Fig. 25.3 Composite paleomagnetic section of Turonian-Coniacian (-Santonian?) from the Ozerki-1, -2, -3 and Lipovka. For legend see Fig. 25.2

mT was observed (Fig. 25.6a, sample 3124/3). A small increase, accounting for a few percent of the magnetization, reached at 100–200 mT is probably related to the presence of some amount of magnetically hard hydrous ferric oxides.

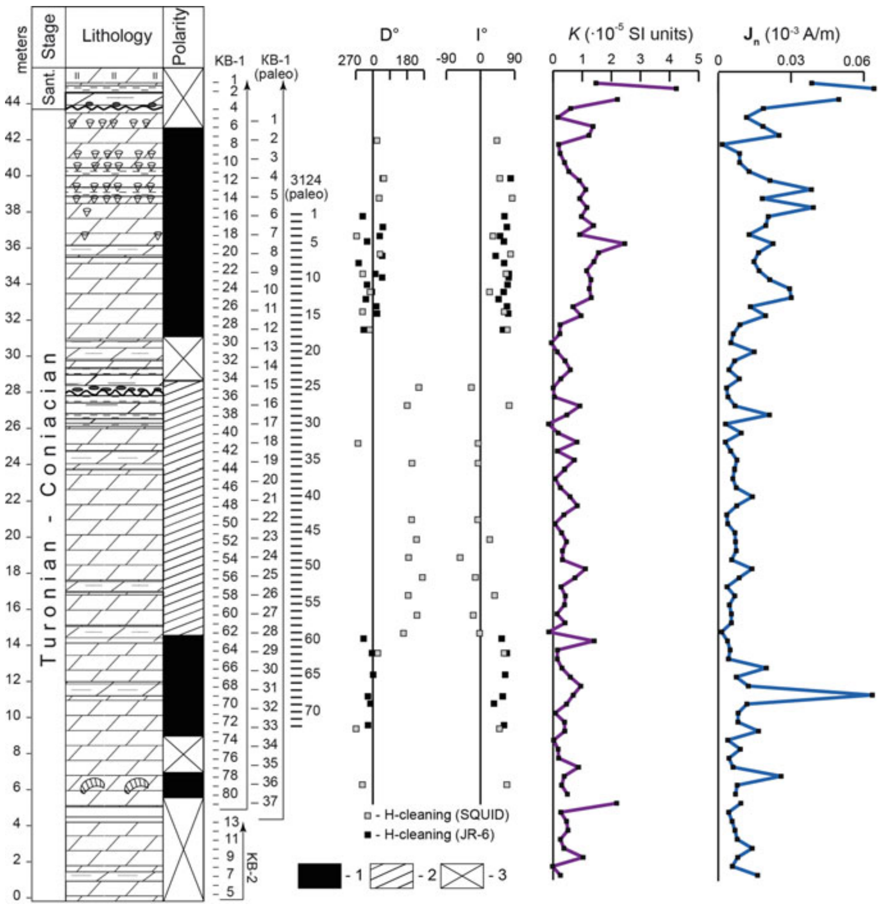


Fig. 25.4 Paleomagnetic and rock magnetic characteristics of the Kamennyi Brod section. Geomagnetic polarity: 1—normal (N), 2—anomalous directions, 3—missing polarity data. For other explanations see Fig. 25.2

The curves of dependence of *K* on *T* show that the magnetic susceptibility decreases significantly at relatively low temperatures (up to 400 °C) (Fig. 25.6b). The Curie point on the heating and cooling curves is expressed very weakly, down to its non-existence. Similar behavior of the samples during thermomagnetic analysis is also characteristic for finely-dispersed magnetite present in very low concentration (Burov and Yasonov 1979).

At a first glance, anisotropy of magnetic susceptibility in the deposits appears random (Fig. 25.7a). In the strongest magnetic varieties, however, it is close to a classic sedimentary magnetic texture, with the short axes of magnetic ellipsoids (K3) positioned vertically, and directions of the long (K1) and medium (K2) axes distributed over the stereogram margin (Fig. 25.7b). This would give some support towards the reliability of obtained paleomagnetic results. In the rest of samples,

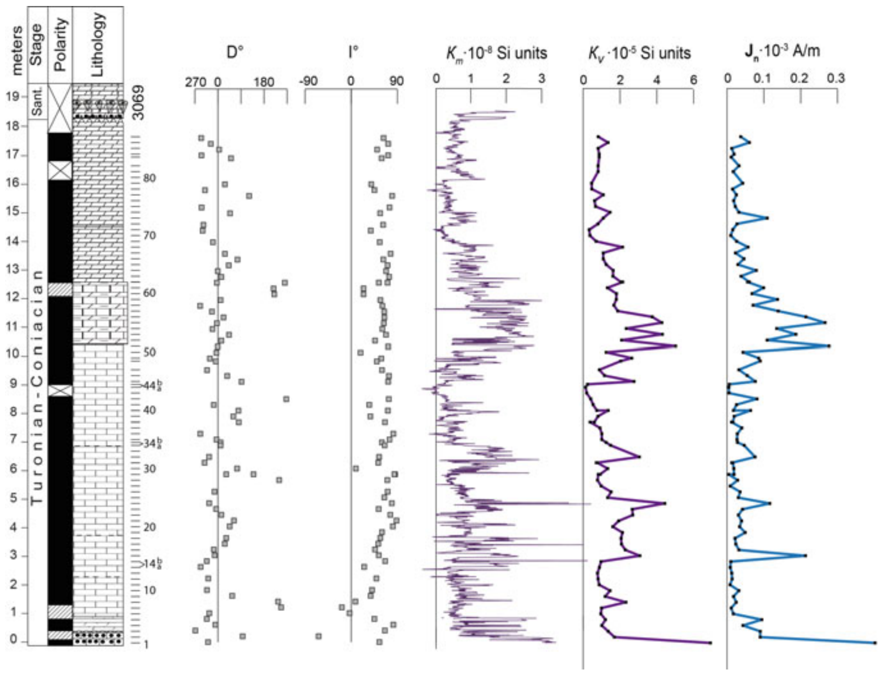


Fig. 25.5 Paleo- and petromagnetic characteristics of the Nizhnyaya Bannovka section. For legend see Figs. 25.2 and 25.4

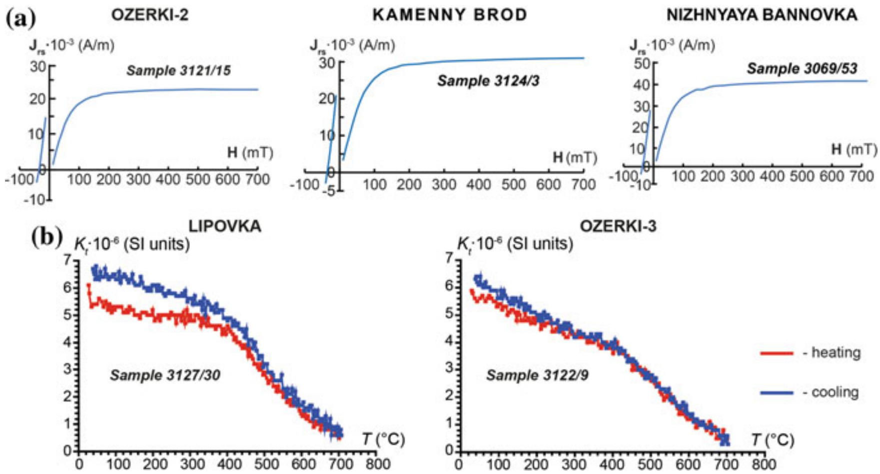


Fig. 25.6 Results of magneto-mineralogical analysis. **a** Curves of magnetic saturation and destruction, **b** curves of dependence of K on T

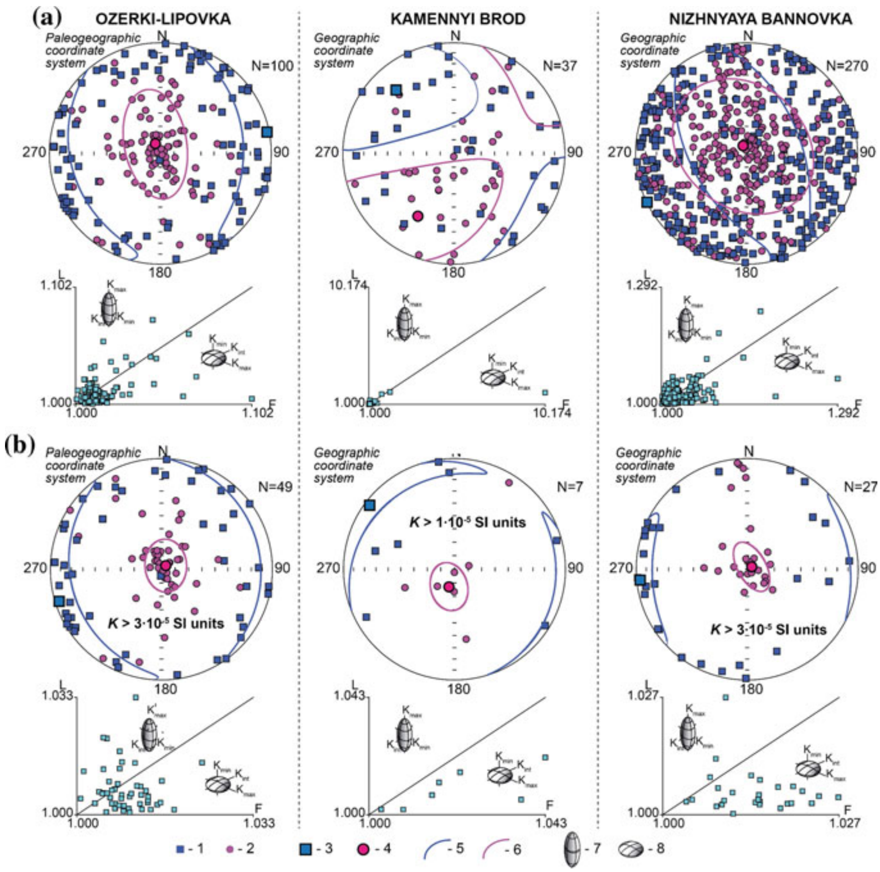


Fig. 25.7 Data on anisotropy of magnetic susceptibility for all samples (**a**) and for samples with the largest magnetic susceptibility (**b**): stereograms of long (K1) and short (K3) axes directions and L–F diagrams (Flinn 1965) (F = K2/K3, L = K1/K2). Axes directions: 1—long (K1), 2—short (K3); 3, 4—mean directions of K1 and K3, respectively; 5, 6—confidence ellipses for K1 and K3, respectively; 7, 8—schematic images of elongate and flat magnetic particles, respectively

however, a large variance of the directions of AMS axes is observed caused by small values of *K* comparable with the instrument sensitivity level. Therefore, most of the AMS data is apparently not informative.

Paleomagnetic examinations were carried out through the standard procedure (Molostovsky and Khramov 1997): the sample $\mathbf{J_n}$ values were measured with a JR-6 spinner magnetometer after a series of successive magnetic cleanings with alternating field (mostly up to 30–60 mT, in 2–5 mT increments) in a LDA-3 AF device and a 2G-Enterprises cryogenic magnetometer (SQUID) in IPE RAS. In the Ozerki-1, 2, 3 sections, temperature cleanings (from 100° to 200–350 °C in 25 °C increments) were made in a home build furnace constructed by Aparin. Thermal cleaning above 350 °C was impossible since the $\mathbf{J_n}$ values became lower than the

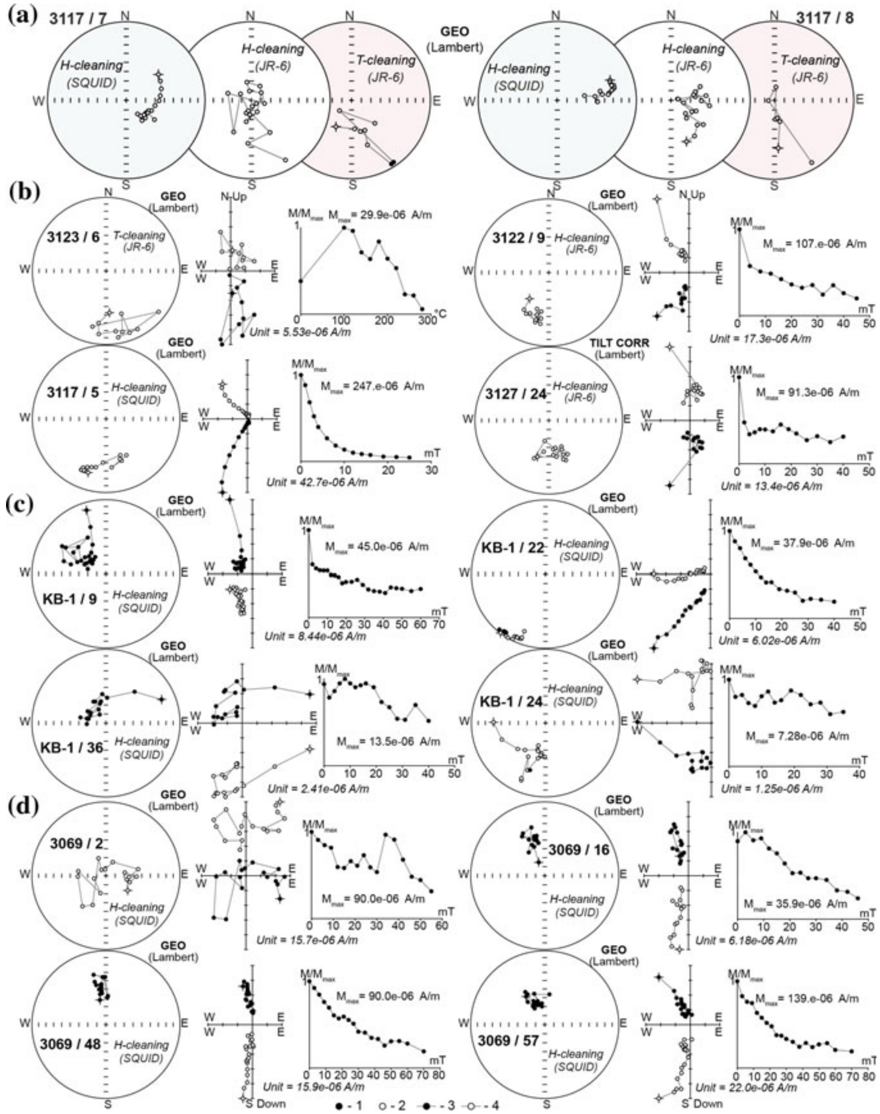


Fig. 25.8 Results of paleomagnetic studies. **a** comparison of H- and T-cleanings on a spinner magnetometer JR-6 and on a cryogenic magnetometer 2GEnterprises. The results of component analysis (left to right: stereographic presentation of $\mathbf{J_n}$ changes in the process of magnetic cleaning, Zijderveld diagrams, sample demagnetization plots) of samples from Turonian-Coniacian for sections Ozerki-Lipovka (**b**), Kamenniy brod (**c**), Nizhnyaya Bannovka (**d**). 1,2 - Projection of $\mathbf{J_n}$ on the lower hemisphere and upper hemisphere, respectively; 3,4 – Projection of $\mathbf{J_n}$ on the horizontal and vertical plane, respectively

threshold sensitivity of the spinner magnetometer. Possible phase transformations of the minerals upon heating were controlled through measuring the sample *K* values after each thermal cleaning step. The Remasoft 3.0. software was used for component analysis.

Low-temperature and low-coercivity components of $\mathbf{J_n}$ (determined up to 100 °C or up to 5–10 mT, respectively) of different directions have, most likely, viscous nature and were formed in the field, that present in the laboratory lodgment (Fig. 25.8a–d). High-temperature and high-coercivity components in most cases are determined with an acceptable quality (MAD < 10°–15°) even in the most weakly magnetic samples ($\mathbf{J_n} < 30\text{–}40 \times 10^{-3}$ A\m) (Fig. 25.8c, samples KB1/22 and Fig. 25.8d, 3069/16) and considered as characteristic (**ChRM**). In some cases full demagnetization in an alternating magnetic field did not occur (Fig. 25.8c, samples KB-1/9, KB-1/24, KB-1/24 and etc.). It is probably connected with the presence of magnetically hard hydrous ferric oxides, whose presence is consistent with the data on magnetic saturation.

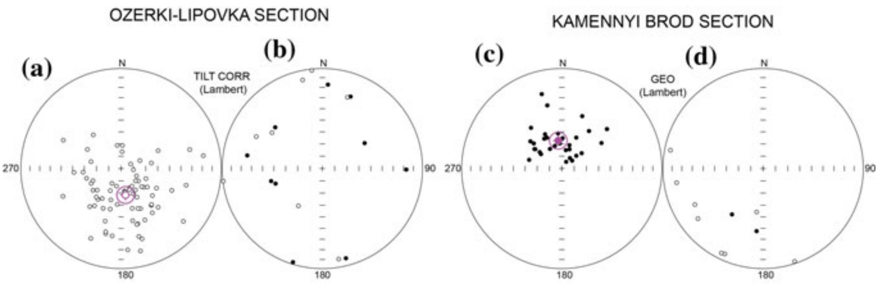
The Ozerki-Lipovka composite section was studied in a series of 4 outcrops: Ozerki-1, Ozerki-2, Ozerki-3 and Lipovka, with roughly equal spaces of 2 km between them (coordinates: 51° 31′ 36.4″N, 45° 14′ 0.6″E, 51° 33′ 2.6″N, 45° 17′ 7.9″E, 51° 34′ 34.5″N, 45° 19′ 39.4″E and 51° 30′ 17.6″N, 45° 09′ 35.8″E, respectively). The outcrops lie close to the villages of Ozerki and Lipovka in the Lysye Gory district.

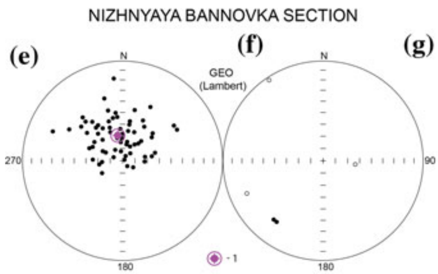
The Ozerki-2 outcrop has been already studied paleo- and petromagnetically (Pervushov et al. 2017a). Samples from 10 of its levels were used to produce a wide spectrum of petromagnetic characteristics and paleomagnetic directions that have established the existence of an R-zone on the basis of sampling from 7 levels. In a subsequent study, this magnetozone has been substantiated by examination of samples from 45 levels, collected in the Ozerki-2 outcrop and in other outcrops as well (Figs. 25.2 and 25.3).

Irrespective of the type of magnetic cleaning and the equipment used to measure magnetization, results from the four outcrops are in accord with each other (Fig. 25.8a). In most samples, characteristic components with the maximum deviation angles less than 15° have been reliably distinguished (Fig. 25.3). **ChRMs** are regularly grouped in the southern bearing of the upper hemisphere, which allows to interpret them as corresponding to the reverse (R) polarity of geomagnetic field (Fig. 25.9a). Terrigenous and carbonate-terrigenous rocks from the Ozerki-2 section (samples 3117/1–3117/3 and 3121/1–3121/9) are peculiar for low paleomagnetic quality, and the paleomagnetic vectors obtained there have anomalous directions preventing reliable determination of the polarity sign (Fig. 25.9b).

The Kamennyi Brod section lies close to the village of the same name in the Olkhovka district of the Volgograd Region (49° 44′ 16.6″N, 44° 23′ 11.3″E). The section is composed mostly of carbonate rocks (marl); its thickness is about 45 m (Fig. 25.4).

In most cases, neither a characteristic nor any other magnetization components could be distinguished from the results of sample measuring with a JR-6 spinner magnetometer. According to the results of measuring with a cryogenic





(g)

Section	Polarity	n	D°	I°	k	α_{95}°
Ozerki-1	R	13	179.6	-65.9	8.9	14.7
Ozerki-2	R	41	162.7	-69.6	6.45	9.6
Ozerki-3	R	12	181.3	-72.2	5.72	19.9
Lipovka	R	8	170.3	-52.4	8.64	20
Ozerki-Lipovka (composite section)	R	74	170.4	-68.1	6.59	7.0
Kamennyi Brod	N	31	352.8	67.1	14.64	7.0
Nizhnyaya Bannovka	N	65	349.3	69.0	11.15	5.5

n – number of samples in the selection; D, I – average paleomagnetic declination and inclination, respectively; k – paleomagnetic precision parameter; α_{95} – radius of 95% confidence circle.

Fig. 25.9 Results of paleomagnetic studies. Stereographic projections of $\mathbf{J_n}$ components of the studied sections: Ozerki-Lipovka (**a** magnetozone of reverse polarity in carbonate and siliceous-carbonate rocks, **b** intervals with anomalous directions of magnetization in sandy rocks in the bottom of the section), Kamennyi brod section (**c** magnetozone of normal polarity, **d** intervals with anomalous directions of magnetization), Nizhnyaya Bannovka (**e** magnetozone of normal polarity, **f** intervals with anomalous directions of magnetization). **g** Statistic paleomagnetic characteristics of the Turonian-Coniacian from the studied Sections. 1—average paleomagnetic direction and confidence circle; For other explanations see Fig. 25.8

magnetometer, **ChRM** directions corresponding to normal polarity were isolated in many samples (Figs. 25.4, 25.8c and 25.9c). N-zones have been recognized in the uppermost and lowermost parts of the section (Fig. 25.4). Between these two zones, an interval occurs where $\mathbf{J_n}$ components either cannot be resolved or have anomalous directions, or, in rare instances, **ChRM** corresponding to reversed polarity is recorded (Figs. 25.4, 25.8c and 25.9d). One may suppose that this section interval was formed during the reversed polarity epoch, but the substantiation of this hypothesis with reliable paleomagnetic data is still beyond the limits of current equipment.

The Nizhnyaya Bannovka section lies on the Volga right bank, 1–2.5 km southwards from the village of the same name in the Krasnoarmeisk district, Saratov Region. The outcrop coordinates: 50° 43′ 22.6″N, 45° 39′ 17.5″E. The thickness of the interval of Turonian-Coniacian age is 18.2 m (Fig. 25.5).

All the samples from the Nizhnyaya Bannovka section have been measured with a cryogenic magnetometer (Fig. 25.8d). In the vast majority of samples, the **ChRM**, characterized with the maximum deviation angle less than 15°, have been reliably isolated (Figs. 25.5 and 25.9e, f). Paleomagnetic directions are grouped in

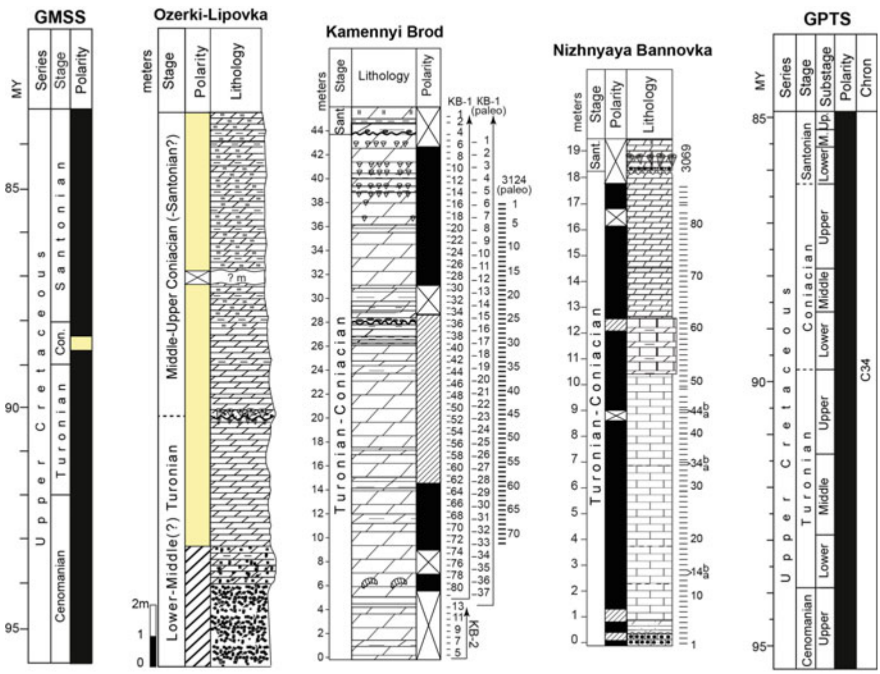


Fig. 25.10 Differences of the Turonian-Coniacian paleomagnetic interval in Geomagnetic Polarity Time Scale (GPTS) (Ogg et al. 2016) and in General Magnetostratigraphic Scale (Supplements … 2000), and the studied sections. For legend see Figs. 25.2 and 25.4

the northern bearings of the lower hemisphere (Fig. 25.9e), which makes it possible to interpret them as corresponding to the normal polarity (N) of geomagnetic field. Thus, the Nizhnyaya Bannovka Turonian-Coniacian section, unlike other coeval section sampled in the Volga region, is peculiar for dominating normal polarity.

Discussion

The results on the magnetic polarity from Nizhnyaya Bannovka and Kamennyi Brod sections (except for the interval with no reliable paleomagnetic data) agree with the existing data which indicate the exclusively normal polarity of geomagnetic field in Cenomanian to Santonian as recorded in the Geomagnetic Polarity Time Scale (Ogg et al. 2016) (Fig. 25.10). Presence of a reversed polarity interval in the Ozerki-Lipovka section however contradicts to this implying that reversed **ChRM** in these rocks has been acquired in some later geologic epochs.

The following circumstances, however, do not support remagnetization:

1. A reversed-polarity nagnetozone is traced in various rock types (marls, siliceous marls) in 4 sections, spaced by as much as 6 km (Fig. 25.2). Such lateral persistence makes a strong argument in favor of primary magnetization (Opdyke and Channell 1996; Supplements … 2000).
2. The reversal test performed for the samples from Ozerki-Lipovka and Nizhnyaya Bannovka sections (Fig. 25.9a, e, respectively), is positive: angle between average N and R vectors (γ) = 179.0°, critical angle (γ_c) = 9.0°, classification after (McFadden and McElhinny 1990)—B. The positive reversal test is in accord with primary magnetization, but theoretically, this may be accounted for by rock remagnetization, e.g. by remagnetization of the Ozerki section in the Matuyama epoch and that of the Nizhnyaya Bannovka section—in the Brunhes epoch. Practically, however, such selective remagnetization seems unlikely.

Mean directions of **ChRM**, corresponding to normal polarity of the field (Fig. 25.9g) are statistically undistinguishable from the direction of modern field in the study area (I = 67.7°–68.3°) (during the statistical testing of the vectors difference as a function of α_{95} (Debiche and Watson 1995) an average amplitude of secular geomagnetic variation—10°—was adopted as a α_{95} value for the modern field). But this circumstance does not contradict the hypothesis of primary nature of magnetization because the directions of late Cretaceous and modern field for the territory of lower Volga region are close. The obtained **ChRM** statistically coincide with the Campanian-Maastrihtian directions, obtained from the sediments in Saratov region (Guzhikov et al. 2017a) and also with directions for the study area, calculated from the coordinates of Turonian-Coniacian (90–80 Myr) paleomagnetic poles for the stable Europe (Besse and Courtillot 2002).

The sediments of the lower parts of Ozerki and Nizhnyaya Bannovka sections, for which the anomalous directions of magnetization are characteristic, represent the condensed horizons, complicated by coarsely sands and nodular phosphorites. In the condensed sediments $\mathbf{J_n}$ vectors are usually significantly different from the directions of geomagnetic field, synchronous to the formation of rocks because of mechanical displacement of rudaceous particles during the constant rewashing, numerous sedimentary gaps, and other factors (Baraboshkin et al. 2016; Guzhikov et al. 2017a). Therefore the anomalous character of magnetization in such sediments is more consistent with the hypothesis of old age of magnetization, rather than with the remagnetization of rocks. In the Kamenniy Brod section the anomalous character of paleomagnetic directions is, most likely, connected with exclusively small values of $\mathbf{J_n}$ (few 10^{-6} A/m), that are comparable with instrument sensitivity level.

3. The acquired data partially agree with a view on the existence of a reversed polarity interval within the Coniacian stage. This is reflected in the General Magnetostratigraphic Scale (Supplements … 2000).

In the Ozerki-Lipovka section the absence of upper Turonian and lower Coniacian is reliably established (Pervushov et al. 2017a, b). A reversed polarity zone covering middle-upper Coniacian may be acknowledged as a probable analogue of Kluevskaya zone. To accommodate all obtained bio- and magnetostratigraphic information on the studied sections it is also necessary to allow the presence of a reverse polarity epoch in the first half of Turonian age. Similar data, based on the of results obtained in different regions do exist (Eremin et al. 1995; Fomin 2003; Fomin and Eremin 1993; Guzhikov et al. 2007; Molostovsky and Khramov 1984; Nazarov et al. 1987; Montgomery et al. 1998; Pechersky 1970). From this point of view in the Nizhnyaya Bannovka section the lower part of Turonian and middle-upper Coniacian are absent, that does not contradict existing information on the biostratigraphy of the section.

The duration of Kluevskaya R-zone, on the basis of its correspondence to middle-upper Coniacian cannot be more than 2.3 Myr, based on the modern views on the duration of Coniacian age (Ogg et al. 2016) and equal time volume of Coniacian substages. Maximum duration of a hypothetic reverse polarity epoch in the first half of Turonian, calculated in a similar way, has the same range ($\sim$2 Myr). The minimal duration of Kluevskaya zone may be estimated as few hundreds of thousands of years, based on that several microfaunistic zones correspond to it. Turonian interval of reverse polarity is situated within the benthic foraminifers subzone (LC3b) (Pervushov et al. 2017a), and so it is entirely possible that it may be quite short-term (less than 10^5 years).

The data about the existence of the reverse polarity epochs definitely contradict generally accepted views about the monopolar regime of normal polarity in Turonian-Coniacian (Ogg et al. 2016), that are based on the magnetostratigraphic data (obtained, in the most part, from the carbonate formations of the Northern Mediterranean) as well as on the analysis of linear magnetic anomalies (LMA). However, it is important to note that the Northern Mediterranean data are not without faults as a source of information about the polarity of geomagnetic field in Turonian-Coniacian neither are the data on LMA (Guzhikov et al. 2003, 2007; Guzhikov 2011). For example, in the Mediterranean sections there is a high chance of regional remagnetization and/or missing of R-zones because of gaps in geological records. The LMA succession may be distorted by the domination of chemical magnetization over the previous thermoremanent magnetization in basalts (Gorodnitskii et al. 1996) and/or the reorganization of spreading patterns, that took place in the middle Cretaceous and the other factors (Larson and Olson 1991). Short epochs of reverse polarity (less than 10^5 years) may not be present in the LMA record bearing in mind insufficient resolution of marine magnetic surveys.

Conclusions

The main result of current study is the detection of a relatively long magnetozone of reverse polarity in the Turonian-Coniacian of Lower Volga region. Paleomagnetic data that form the basis for its determination in the sections Ozerki-1, -2, -3 and Lipovka satisfy the most part of confidence criteria, accepted for the estimation of reliability and quality of magnetostratigraphic materials: 7 out of 8 possible according to (Supplements … 2000) and 8 out of 10 according to (Opdyke and Channell 1996). This is why they cannot remain unnoticed despite the contradiction with the views about normal regime of polarity in Turonian-Coniacian generally accepted at the present time (Ogg et al. 2016).

In the Turonian-Coniacian section Nizhnyaya Bannovka a dominating normal polarity was obtained. In the Kamennyi Brod section on the background of predominantly normal polarity an interval with anomalous directions of magnetization that do not show the definite sign of polarity was detected.

Available biostratigraphic materials and new magnetostratigraphic data may be adjusted under the hypothesis about primary nature of magnetization assuming that the detected R-zone is in fact a superposition of two magnetozones: the lower, associated with the lower part of Turonian, and the upper corresponding to middle-upper Coniacian. The lower magnetozone, probably corresponds to a short (less than 10^5 years) reversed interval, while the upper magnetozone has a much longer duration, about 10^6 years, and represents an analogue of so called “Klyuyevskaya” R-zone, as present in the General Magnetostratigraphic scale (Supplements … 2000).

Substantiation of the idea of a prolonged reversed polarity epoch(s) in the Turonian-Coniacian would be of primary importance for both geophysics and stratigraphy. Acquiring refined information on the regime of the Late Cretaceous field is urgent for the theory of geomagnetic dynamo. Stratigraphically, new reversed polarity zone(s) would make most valuable reference levels of isochronous nature for inter-regional and global correlations.

Further magnetostratigraphic research is necessary for the ultimate solution of the problem relevant to the nature of reverse magnetization revealed in the Turonian-Coniacian sections from the Lower Volga Region.

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