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Paleobotany**CORRELATION OF SECTIONS OF MAYKOP SERIES BY THE PALYNOLOGY DATA FOR SOUTH-EASTERN PART OF THE GREATER CAUCASUS****Sh.Sh. Bayramova**

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The palynological complexess of Maykop series selected from the sections of Shemakha-Gobustan region, are evidencing of spreading of the polydominant forest formations developed in humid climatic conditions with the average winter temperatures of at least 15 °C in the foothills. The biggest changes in composition of flora are observed in the palynocomplex of the middle layer of Hutt level and corresponds to lowering of the annual average temperatures. At the beginning of early Miocene (Caucasian age) the climatic conditions are stabilized, however the tendency for increase in composition of deciduos vegetation of moderate flora is preserved.

Keywords: Maykop series, spore-pollen spectra, Oligocene, Miocene, palynology

Formation of fossil reserves fields depends on the favourable combination of geotectonic, physical-chemical and paleographic conditions. Genetic problems in formation and accumulation of the oil and gas bearing thicknesses are still remaining open with the discussions going on up to date. Maykop series of rocks in Azerbaijan are deemed the source rocks, hence even today the interest for study of litho-stratigraphy and bio-stratigraphy of Maykop sediments of Azerbaijan is high.

The subject of study

Maykop series comprises stratigraphic division on the verge of Paleogene and Neogene. In the Pontic-Caspian scale, it corresponds to Oligocene and lower Miocene, subdividing into two subsections and various number of suites and horizons [4]. The lower subsection corresponds to Oligocene (Stamp or Rupel and Hutt levels – 36.5-31.5-24.0 million years ago), whilst upper matches lower miocene (between 24 and 16.5 million years ago).

Early Miocene in the Pontic-Caspian relates to upper subsection of the Maykop suite (series). It has the same age (from the Pre-Caucasus) – 23.3 million years ago [5] and subdivides into three levels (from the bottom up) – Caucasian, Sakaraul and Kotsakhur. The periods for those are identified but they are well matching Egeriyev, Eggenburg and Ottnangiy

levels of western Parathetis with the timings of 24-22, 22-19 and 19-17.5 million years ago [1, 2, 3].

Results of the surveys

Maykop sediments in the territory of Azerbaijan are widely developed on the South-Eastern ending of the Greater Caucasus – Shemakha-Gobustan regions. We have studied the known sections here, Perekyushkyul, Shixzagirli and Khilmili. The correlation and comparison of the spore-pollen spectra of those sections allowed to select the palynological complexes for each chronological profile and trace the changes in the vegetation biota as well as the paleographic conditions of sedimentation throughout entire late Paleogene in this region.

The section for Perekushkul encompasses the stratigraphic units of Khadum, lower and upper Maykop. The similar sediments are characteristic for the section of Islamdag mountain and Khilmili, exept the Khadum horizon is not present there. The Shixzagirli section characterizes upper subsection of the Maykop series (Caucasian, Sakaraul and Kotsakhur levels).

In all spore-pollen spectra of the general composition pollen group dominates the pollen of the tree species with singular observations in presence of the grass plants pollen and spores.

The basis of Maykop suite is Khadum horizon. Characterised by the palynozone I

(samples 1, 2) of the Perekyushkyul (fig. 1) section with the prevalence in the pollen of beech, hornbeam, nutwood. The pollen of the gymnosperm plants in the group of the tree species constitutes up to 26-18%, with *Tsuga*, *Cedrus* selected among those. The pollen of *Pinus* and *Picea* are not present. At that time several types of poly-dominant forest formations had been widely spread: 1) humid broad-leaved nutwood-beech forests with the presence of oak trees, hickory, chestnut, beech; 2) mixed coniferous-broadleaf forests with the presence of *Cedrus*, *Abies*, *Tsuga*, *Larix*; 3)

humid subtropical forests with the presence of evergreen elements of *Laurus*, *Magnoliaceae*; 4) lowland and riverside forests consisting of *Taxodium*, *Carya*, *Ulmus*, *Morus* on the well moistened and drained soils and with presence of palms along sea coast. Relatively low absolute height of the landscape and small quantity of the gymnosperm plants pollen evidences of the fact that purely coniferous forests had not formed in Khadum. The presence of the elements of subtropical and tropical flora (*Magnoliaceae*, *Palmae*) in the spectra indicates high temperature and humidity regime at the time.

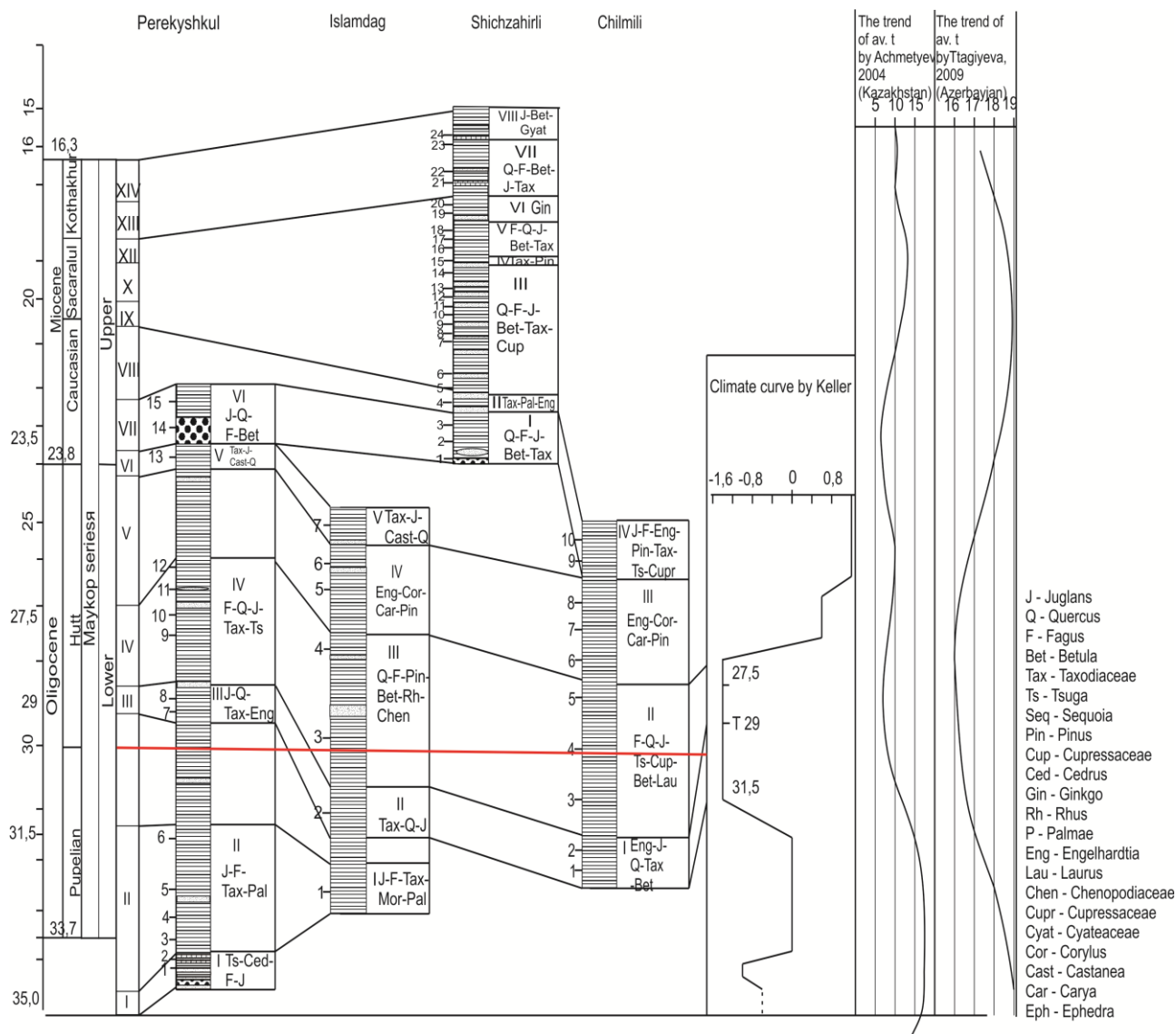


Fig. 1. Correlation of palynologically studied sections of Shemakha-Gobustan regions taking in account the climatic data for adjacent regions.

Lower Oligocene – Rupel level is represented in the sections of Perekyushkyul, palynozone II (samples 3, 4, 5, 6) and Islamdag, palynozone I (sample 1). The pollen of nutwood, oak and beech trees continues to dominate. The percentage ratio of the gymnosperm in the wooden plants group is preserved (up to 14-25%), however the diversity of those increases. The pollen of *Taxodiaceae*, *Tsuga*, *Cedrus* is prevailing.

In the poly-dominant coniferous-broadleaf forests increases the diversity of Eastern-Asian and tropical species (*Sarococca*, *Engelhardtia*, *Cyatheaceae*), and among the gymnosperms are fir, cedar, sequoia, glyptostrobus, cypress, ginkgo. There are emerging pangolarctic representatives of moderate flora - birch, alder, pine trees that are not present in the Khadum horizon. For the first time are observed the xerophyte representatives – sumac, pistachio, ephedra plants naturalizing on the dry open spaces. The palms grew on the sandy coasts.

Upper Oligocene – Hutt level. *Lower Hutt layers* (their top parts) are represented by palynozone III (samples 7, 8) in Perekyushkyul section, palynozone II (sample 2) in the Islamdag section and palynozone I in Khilmili section. This zone is characterised by the increase in the pollen of gymnosperm in the wood plants group up to 22-30% due to the *Taxodiaceae* pollen. The main types and composition of the forest formations are remaining the same. In this background there is observed the expansion of the swampy taxodiaceae associations with the presence of *Glyptostrobus*. In the composition of poly-dominant coniferous-broadleaf forests is decreasing the share of *Betula*, *Corylus*. With increase in the role of *Engelhardtia* – the inhabitant of the evergreen humid forests. The composition of spectrum in the late Oligocene is characterized by more humid conditions compared to the preceding phase of Oligocene.

It is noteworthy that palynozone II (sample 2) in Islamdag section stratigraphically corresponds to the upper parts of Rupel level (end of early Oligocene). However, by the ratio and composition of the pollen and spores it does not correlate with palynozone III of Perekushkul section. Accordingly, the interface between

Rupel and Hutt in Islamdag section is possibly slightly overestimated and it should be drawn below the sediments represented in sample 2.

The middle layers of Hutt are represented by palynozone IV (samples 9, 10, 11, 12) in Perekushkul sections, palynozone III (sample 3, 4) in Islamdag section and palynozone II in Khilmili section. They are characterized by relative reduction in the pollen of coniferous trees (up to 4-16%) due to the pollen of *Taxodiaceae* and increase in the pollen of *Pinus* with the presence of *Larix*, *Thuja*, *Juniperus*. There is also sporadic presence of the pollen of *Cedrus*, *Sequoia*, *Glyptostrobus*, *Cupressus*, *Ginkgo*, *Tsuga*, *Ephedra*.

The change in dominants occurred in the coniferous-broadleaf forests. The mesophyll nut is replaced by moderate and more cold-resistant mountainous species of beech and oak trees. New small-leaved representatives of pangolarctic geographical group (nutwood) appeared while already existing (birch, pine, bayberry trees) are taking stronger positions, which evidences of decrease in the average annual temperatures. The decrease in humidity is indicated by the reduction of the swampy taxodiaceae formations and increase in xerophyte bushes (juniper, ephedra, sumac) and grasses (the goosefoot).

Upper layers of Hutt level – palynozone V (sample 13) in Perekushkul section and palynozone III in Khilmili section. The characteristics are again the increase in the pollen of coniferous in the wood plant group due to the pollen of *Taxodiaceae* (up to 28%), with the presence of the pollen of *Pinus*, *Glyptostrobus*, *Sequoia*, *Cupressaceae*, *Nissa*, *Ginkgo*, *Tsuga*, *Ephedra*. In the humid poly-dominant forests, the nutwood continues to dominate along with oak, beech and the mixture of coniferous trees (ginkgo, sequoia, tsuga). The nutwood remains the core element in the undergrowth of those forests. The role of pangolarctic elements – birch and pine trees, that emerged during the cooling period, is significantly reduced. The swampy formations with the presence of the marsh cypress are extending. The presence of glyptostrobus, tupelo (*Nyssa*) indicates the conditions of high humidity, both in the soil and air. The general composition and

distribution of species in the group of Magnoliophyta and gymnosperm plants is similar to the early Oligocene phase (lower Rupel) evidencing of increase in the average annual temperatures and humidity in comparison with the late Oligocene (middle Hutt).

Lower Miocene (upper Maykop) – is represented in Perekushkul section (lower Caucasian levels) by palynozone VI (samples 14, 15), in Khilmili section by palynozone IV and in Shikhzagirli section, in the spore-pollen spectrum of the latter there are identified eight palynozones. The characteristic peculiarity of the spore-pollen spectrum is alteration of the zone with high content (palynozones I, III, V, VII) and low content of the pollen, in which the pollen grains are pertaining exclusively to the gymnosperm (*Taxodiaceae*, *Pinus*, *Ephedra*, *Ginkgo*) and the palms (palynozones II, IV, VI, VIII). Same as in the Oligocene, the palynocomplexes are characterised by the prevalence of the pollen of the wood plant species, among which dominating are the pollen of nutwood, oak and beech trees. The special difference of the upper Maykop spectra is increase in the pollen of birch (up to 8-21%) and alder (up to 9-12%) in the group of Magnoliophyta and the pollen of cypress species (up to 8-11%), pine (up to 5%) and ephedra (up to 8%) in the gymnosperm group.

The prevailing type of vegetation were the poly-dominant forests, main kinds of which are repeating the Oligocene formations. Rather humid conditions are evidenced by the hygrophites – *Taxodiaceae*, *glyptostrobus* and hickory. The presence of some indicator species with narrow distribution areal (*ginkgo*, palms, *Cyathea* species) evidences of the warm conditions with average winter temperatures in the foothills at least 15°C. Along with this increases the role of deciduous moderate and xerophile elements in ability to withstand the dry periods. The humid subtropical forests are gaining bigger resemblance with the contemporary hard-leaved forests. The singular presence of the grass pollen indicates yet insignificant role of the open spaces.

Conclusions

The vegetation of Maykop series was represented by a combination of 'Poltava' paratropical Eocene flora (palms, *Cyathea* species), Mediterranean elements (*magnolia*, cypress, chestnut, nutwood) and moderate deciduous forms of 'turgay' type (beech, hornbeam, elm, linden, nutwood). The appearance of birch and alder in the Rupel age indicates both increase in the mountainous landscape and the initial process of cooling and decrease in the average temperatures. The biggest changes in composition of the palynocomplexes are observed for the middle layers of Hutt level, when the amount of moderate pangolarctic and xerophile Mediterranean flora increases. In the beginning of early Miocene (Caucasian age) the climatic conditions stabilized, however the tendency for increase in vegetation composition of the deciduous moderate flora preserved. Content of the birch pollen up to 20%, alder (up to 9%) and cypress up to 11% in the sediments of Mykop series along with the presence of the pollen of Poltava and Mediterranean flora may serve as a palyno-stratigraphic criterion of the upper Maykop (lower miocene) sediments and their difference from those of the Oligocene.

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**BÖYÜK QAFQAZIN CƏNUBİ-ŞƏRQ HİSSƏSİNİN MAYKOP SERİYASININ KƏSİLİŞLƏRİNİN
KORRELYASIYASI PALİNOLOJİ MƏLUMATLAR ƏSASINDA****Ş.Ş. Bayramova**

Şamaxı-Qobustan rayonun maykop seriyasının kəsilişlərindən ayrılan palinokomplekslər dağətəyində orta qış hərarəti 15°C-dən aşağı olmayan nəm iqlim şəraitində formalaşmış polidominant meşə formasiyalarının yayılmasını təsdiq edir. Bitki örtüyünün tərkibinin dəyişilməsi və illik hərarətin aşağı düşməsi ən çox orta hatt yarusunun qatlarının palinokomplekslərində müşahidə olunur. Erkən miosendə (qafqaz əsri) iqlim şəraiti stabilləşir, ancaq bitki örtüyünün tərkibində yarpağıtökülən mülayim floranın artması tendensiyası qalır.

Açar sözlər: maykop seriyası, spor-tozcuq spektrləri, oliqosen, miosen, palinologiya

**КОРРЕЛЯЦИЯ РАЗРЕЗОВ МАЙКОПСКОЙ СЕРИИ ЮГО-ВОСТОЧНОЙ ЧАСТИ БОЛЬШОГО
КАВКАЗА ПО ДАННЫМ ПАЛИНОЛОГИИ****Ш.Ш. Байрамова**

Палинологические комплексы майкопской серии, выделенные по разрезам Шамаха-Гобустанской области, свидетельствуют о распространении полидоминантных лесных формаций, формировавшихся во влажных климатических условиях со среднезимними температурами в предгорье не ниже 15°C. Наибольшие изменения состава растительности фиксируются в палинокомплексе среднего слоя хаттского яруса и соответствуют снижению среднегодовых температур. В начале раннего миоцена (кавказский век) климатические условия стабилизируются, но тенденция увеличения в составе растительности листопадной умеренной флоры сохраняется.

Ключевые слова: майкопская серия, спорово-пыльцевые спектры, олигоцен, миоцен, палинология