Turonian–Coniacian flora of the Okhotsk-Chukotka volcanogenic belt (North-eastern Russia)

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The Okhotsk-Chukotka volcanogenic belt (OChVB) formed in the middle-Late Cretaceous as a result of intense land volcanism extends along the northeastern margin of Asia. Volcanogenic and terrigenous deposits of the OChVB reflect depositional environments of intermontane valleys and volcanic plateaus. The Arman Flora comes from the Arman Formation in the Arman, Nelkandya and Khasyn rivers basins. Seventy-three plant fossil species belonging to liverworts, horsetails, ferns, caytonialeans, cycadaleans, bennettitaleans, ginkgoaleans, leptostrobaleans, conifers, gymnosperms incertae sedis and angiosperms are described. The Arman flora shows a unique taxonomic combination, with relatively ancient Early Cretaceous ferns and gymnosperms occurring alongside Late Cretaceous plants, primarily angiosperms. This flora is dated as Turonian and Coniacian due to its similarity with Penzhina and Kaivayam floras of Northwest Kamchatka and Tylpegryrgynai Flora of the Pekul'nei Ridge, with the latter floras being securely dated due to the correlation of plant-bearing beds with marine biostratigraphy. Turonian–Coniacian age of the Arman Flora is corroborated by isotopic (U-Pb SHRIMP and 40Ar/39Ar) age determination. Our estimates using CLAMP technique, GRIDMET3BR meteorological data and PHYSG3BRC set of foliar physiognomic scores (http://clamp.ibcas.ac.cn/) shows that the Arman plants experienced a humid temperate climate with warm summers, mild winters and a weak seasonality in precipitation. This climate was most similar to those experienced by the Penzhina, Kaivayam and Tylpegryrgynai floras existed in coastal lowlands east of the volcanic range. This implies that the elevation of the Arman Flora site was low and it had no effect on the Arman plants physiognomy. Using CLAMP-derived moist enthalpy value, the most probable elevation of the Arman Flora biotope is estimated to be 0.61 km above the sea level. The correlation of the OChVB plant-bearing beds with the adjacent Anadyr-Koryak Subregion phytosтратigraphy yields the uppermost Albian-Cenomanian-lower Turonian stratigraphic gap in the volcanites. This gap within the OChVB might be due to the following reasons: we have not found any fossil floras of this age within the OChVB yet, or we do not recognise the fossil floras of this age existed within the volcanic range at some altitude, or in the latest Albian–Cenomanian–early Turonian the volcanism of the OChVB ceased completely or significantly diminished.