PULSED CHANGE IN COMPOSITION OF FLORAS DURING THE PALEOCENE-EOCENE TRANSITION.

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The Paleocene-Eocene transition is marked by widespread warming at middle and high latitudes, and by the spread of more seasonally dry climates in the interior of western North America. These climatic changes are associated with a nearly complete turnover in the species composition of faunas and floras from western North America over a period of about 3 million years (m.y.), and with a period of reduced floral diversity and accelerated extinction lasting about 1.5 m.y.

The tempo of change in floral composition can be visualized by performing an ordination analysis of Paleocene-Eocene floral assemblages and then plotting the Axis I score of each assemblage against its age. Results reveal that despite considerable variation in species composition that is related to local edaphic conditions and taphonomic effects, the most dramatic shifts in floral composition are confined to relatively brief (<0.5 m.y.) periods of accelerated turnover separated by somewhat longer intervals (up to 1.2 m.y.) of bounded variation. The single biggest change in floral composition is associated with the regional disappearance of floodplain backswamp habitats. When this habitat type reappeared after a hiatus of approximately 0.4 m.y. the floral assemblages preserved in it were different in composition, dominant species, and diversity.

Overall, the pattern of change in floral composition can be described as "messy" stasis broken by periods of accelerated change. These changes are associated with clustered appearances of new taxa, many of which belong to lineages that probably migrated into the region from other continental areas. In several cases it can be demonstrated that the first appearance of a migrant lineage and its rise to numerical dominance are separated by 1-2 m.y. These latent periods are too long for strictly ecological explanations such as incumbent advantage, and are more likely to reflect the arrival of optimal climatic conditions in the area being sampled.

It has not yet been determined if shifts in floral composition correspond to periods of accelerated climatic change, but it is clear that climate continued to change during some periods of relative stability in composition. The punctuated pattern of change in community composition can be explained by individualistic behavior of plant species, but demonstrates that groups of species with similar habitat and climatic preferences co-occurred over geologically long periods of time. The backswamp vegetation type probably shows the least change in overall species composition and dominant taxa, as well as the lowest diversity. The constancy of backswamp vegetation may reflect the relatively small number of species that could colonize this edaphically stressed habitat.