Last 20,000 years of climatic change

D. P. Agrawal

Agrawal DP 1992. Last 20,000 years of climatic change. *Palaeobotanist* **40** : 393.

Recent evidence, especially from continental Asia, shows that there are marked latitudinal differences in global climatic changes. From India, we now have new evidence from Kashmir, Rajasthan and the Arabian Sea which shows that in the north (35°-40°N latitude) warming had started *c.* 20,000 yrs BP in Kashmir, Ladakh and Nepal when in higher latitudes it was still the Last Glacial Maximum (LGM). At *c.* 18 Kyr, Butapathri (Kashmir) bogs show emergence of thermophilous plants like *Alnus, Juglans, Carpinus* at the cost of conifers. A palaeosol on the loess profile of Kashmir is datable to *c.* 18 Kyr which again shows climatic amelioration. Organic matter from this palaeosol gives $\delta^{13}C$ values of about -24 0/00 indicating that it was derived from C_3 type of vegetation. Presence of an Upper Palaeolithic culture at this time, in Kashmir, again confirms a period of climatic amelioration.

From Ladakh, Bhattacharya has inferred climatic amelioration from the higher percentage of Juniper during 20-20 Kyr period. Similarly in Nepal, a climatic amelioration is indicated.

In Rajasthan, *c.* 18 Kyr is a period of aridity. Maximum sand building activity is TL dated by Singhvi to *c.* 14 Kyr and just preceeds the strengthening of the monsoon in *c.* 13 Kyr. Upwelling at *c.* 13 Kyr in the Arabian Sea has been reported by Anderson *et al.* (1990) and the French group has shown a similar evidence of monsoon strengthening at *c.* 13 Kyr based on pollen evidence fom African lakes. Unfortunately, we have only one ^{14}C date from Butapathri which shows that at *c.* 10 Kyr the cooler oscillation was on its way out and warming had gradually started. We need more closely spaced ^{14}C dates for such profiles. In the Arabian Sea cores the spike at *c.* 18 Kyr of freshwater (low salinity, low $\delta^{18}O$, high $\delta^{13}C$) has been interpreted variously as due to strengthening of NE monsoon or due to Tibetan ice melt. The role of Tibet in climate forcing is being emphasized by the multiple new data. It will be relevant to know what was happening in the peninsular India during this period.

Key-words—Palaeoecology, Palaeoclimate, Vegetation.

D. P. Agrawal, Physical Research Laboratory, Navrangpura, Ahmedabad 380 009, India.

सारांश

पिछले 20,000 वर्षों में जलवायवी परिवर्तन

डी० पी० अग्रवाल

वर्तमान प्रमाण, मुख्यतः महाद्वीपीय एशिया, से यह व्यक्त होता है कि भूमण्डलीय जलवायवी परिवर्तनों में निश्चित रूप से अक्षांसी परिवर्तन विद्यमान हैं। भारत में इस तरह के और नये प्रमाण काश्मीर, राजस्थान तथा अरब सागर से प्राप्त हुए हैं। अभी हाल में भट्टाचार्य ने भी लद्दाख से इसी प्रकार के जलवायवी परिवर्तनों को इंगित किया है। यही नहीं अपितु नेपाल से भी ठीक इसी प्रकार के परिणाम उपलब्ध हुए हैं। इन परिवर्तनों में मानसून की सर्वत्र महत्वपूर्ण भूमिका रही है। वैसे महत्वपूर्ण अब यह होगा कि इस अवधि में प्रायद्वीपीय भारत में किस प्रकार के परिवर्तन हुए हैं।

Four Decades of Indian Palaeobotany
Editors : B. S. Venkatachala & H. P. Singh
Publisher : Birbal Sahni Institute of Palaeobotany, Lucknow