Table 5. Standard deviation and coefficient of variation of each sample analysed*

First	Second	Third	Fourth	Fifth	Mean	S D	C V
102	108	106	109	111	107	3 43	3 23
215	203	212	208	201	207	6 20	2 99
508	513	515	514	505	511	4 30	0 84
1009	1042	1033	1030	1021	1027	12 54	1 22
2029	2051	2008	2015	2032	2027	16 65	0 82

* Concentration in ppm.

The silver present in solution should be in excess of arsenic to complete the precipitation of silver arsenide. When arsine is bubbled through silver nitrate solution only a part of silver nitrate is utilized for the reaction between arsine and silver nitrate as the contact time is short. For example, 200 μg of arsenic required about 8620 μg of silver for precipitation but the silver in the solution should be approximately 30,000 μg to complete the precipitation. It is clear from Table 4 that the values obtained by the present method are in good agreement with the certified values of international standards. From Table 5 it can be seen that coefficient of variance is higher in the sample containing low arsenic. But samples containing more than 200 ppm of arsenic show low coefficient of variance, confirming the method to be precise and accurate for samples containing higher arsenic.

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Prehistoric flood deposits on the Choral River, Central Narmada Basin, India

Vishwas S. Kale, Sheila Mishra*, V. R. Baker, S. N. Rajaguru*, Yehouda Enzel** and Lisa Ely****

Department of Geography, University of Poona, Pune 411 007, India
*Department of Archaeology, Deccan College, Pune 411 006, India
**Department of Geosciences, University of Arizona, Tucson, USA

We report here a 5000-year record of large floods on the Choral River in central Narmada Basin. Geomorphic, stratigraphic and hydraulic studies provide evidence of floods with peak discharges greater than 4500 $m^3 s^{-1}$ in the last 5000 years. The flood record from the Choral River is the longest yet discovered from any river basin in India.

RECENT advances in palaeoflood techniques have made it possible to reconstruct chronologies of large floods in bedrock channels using slack-water deposits and other palaeostage indicators[1]. Slack-water deposits consist of silt or sand that generally settle rapidly in backwater locations during large floods[1]. These flood sediments selectively preserve records of large floods spanning 10^2 to $>10^3$ years[2]. Such deposits have been investigated in the central Narmada basin and its tributary, the Choral River.

The site containing prehistoric flood records is located near Barjar (22°21'49"N and 76°02'54"E) on the Choral River (Figure 1 *a*). The river in this reach has developed a small canyon in Vindhyan Quartzites. At several locations, sequences of fine-grained sandy flood deposits have been preserved on the channel margins. Excavation of these deposits and stratigraphical studies revealed at least seven flood units separated by scree deposits, slope wash and charcoal (Figure 1 *b*). Sand and debris from floods were observed in narrow crevices along both the canyon walls, up to 5.9 m above the top of slack-water deposits. A radiocarbon date on charcoal collected from the lowest flood unit of the section is 5170 ± 135 yr BP (δ^{13} C(%) = –27.1; A6859), implying that the overlying flood units were emplaced in the last 5000 years. The occurrence of scree and slope wash

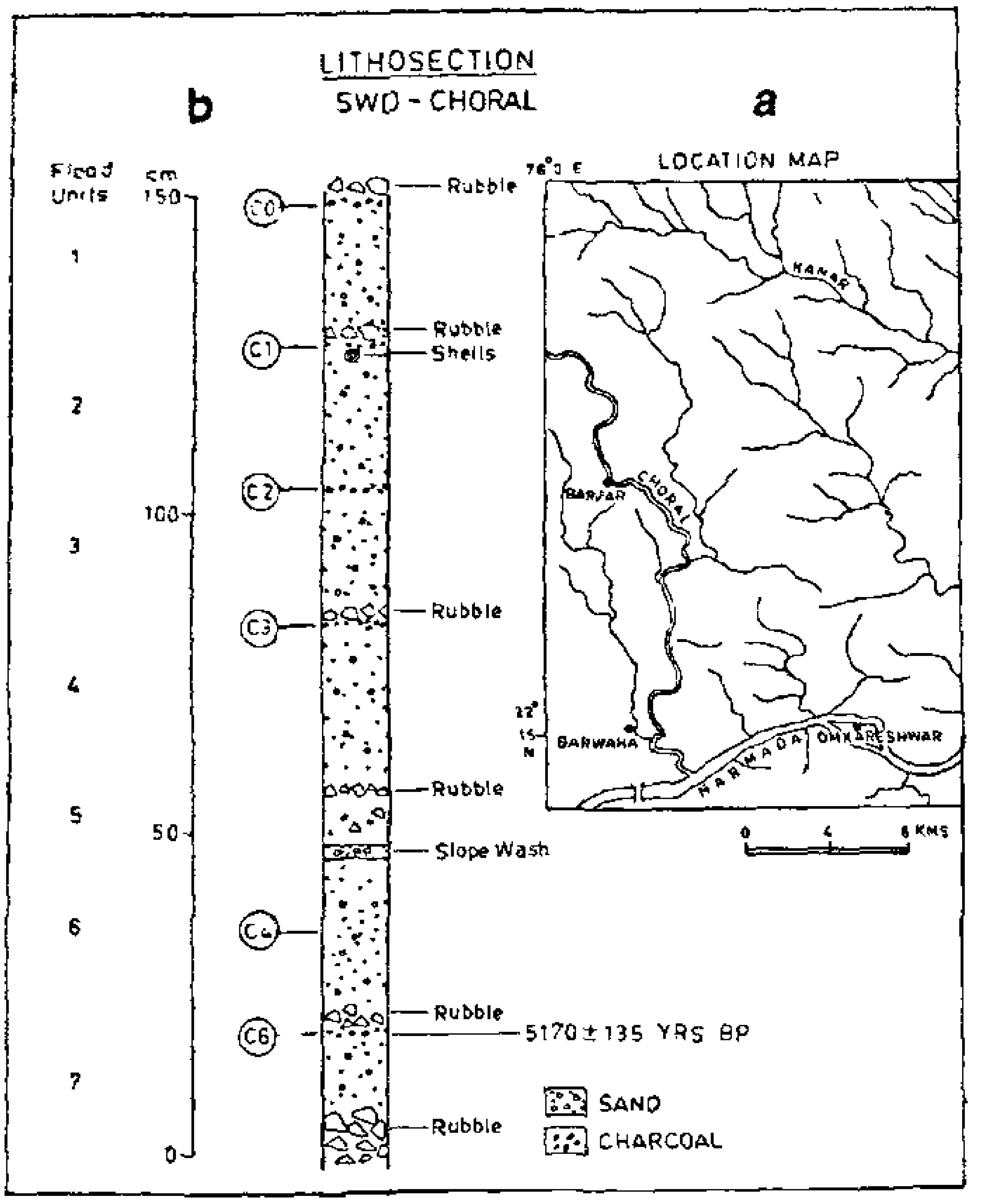

Figure 1. *a*, Location of the study area *b*, Lithosection of the slack-water deposits observed at Barjar

between the flood sediments suggests long breaks between successive floods that were capable of transporting substantial sediments.

In the absence of streamflow records for the Choral River, the step-backwater computer modelling technique was used to estimate the discharge associated with the flood deposits[3]. The modelling, based on surveyed cross-sections, indicates that the highest flood deposits were emplaced by flows that were at least 4500 $m^3 s^{-1}$. In comparison, the discharges associated with the low-lying slack-water deposits were no more than 200 $m^3 s^{-1}$.

Geomorphic investigations reveal the presence of a large boulder berm about 100 m downstream of the canyon. Intermediate axis measurements obtained for the boulders show values between 23 and 42 cm. In comparison, the cobble sizes in the canyon seldom exceed 22 cm. Calculations were made to estimate the unit stream power for the modelled reach. The measure of power per unit area of bed in watts/m² ($W m^{-2}$) is expressed by the formula[4]

$$\omega = \gamma QS / w$$

where ω is power per unit area of bed ($W m^{-2}$), Q is the discharge ($m^3 s^{-1}$), S is the slope, w is the channel width (m) and γ is the specific weight of fluid (9800 $N m^{-3}$ for clear water). Using these values the equation yields power per unit area of 100 to 1350 $W m^{-2}$. Comparison of these values with the force necessary to transport the boulders using a stream-competence approach[5] shows that the flows in the canyon had the capability of transporting largest boulders observed on the berm. These estimates further emphasize the earlier inference that large floods have been experienced by the Choral River in the last 5000 years.

The flood record from the Choral River is the longest yet discovered in the Narmada River Basin. Flood deposits on the main Narmada River cover at least the last 1500 years[6], but forthcoming radiocarbon dates from flood deposits will probably increase the length of the Narmada flood record. In any case it is apparent that the palaeoflood records from the tributaries are important in establishing a long regional record of floods within the basin of one of the most flood-prone rivers in India.

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Almandine and spessartine garnets from the giant plagioclase basalts of Deccan Traps, Western Ghats, India

B. V. Oleinikov*, A. V. Okrugin*, P. Krishnamurthy§, R. Murari† and K. Gopalan†**

*Institute of Geology, Russian Academy of Sciences, Yakut Institute Yakutsk 677 891, Russia
**Atomic Minerals Division, Begumpet, Hyderabad 500 016, India
†National Geophysical Research Institute, Uppal Road, Hyderabad 500 007, India

Electron microprobe analysis of small (0.3 mm × 0.1 mm) and rare crystals of almandine and spessartine garnets with subordinate amounts of other end

§For correspondence