Global Geological Record of Lake Basins

VOLUME 1

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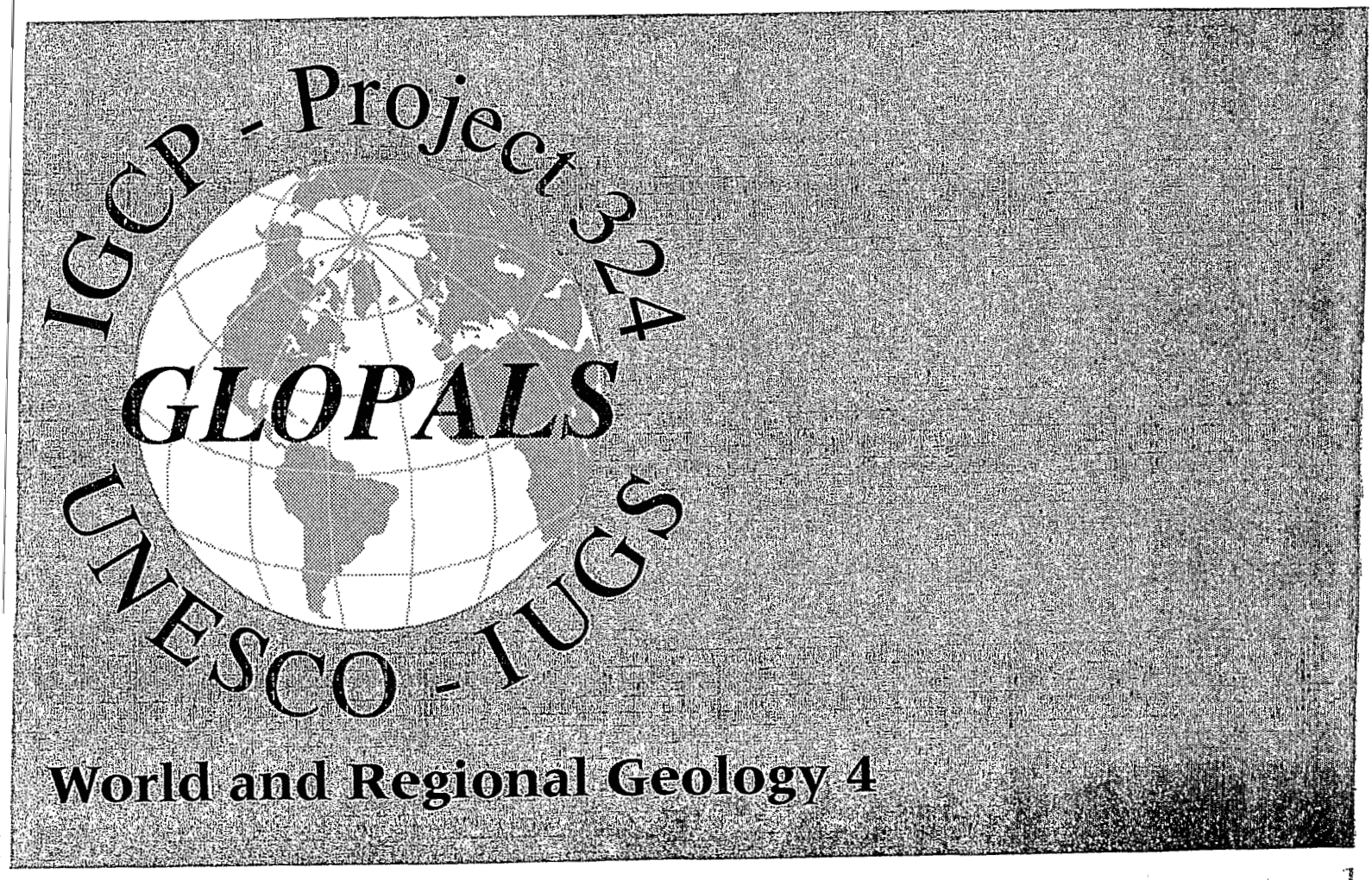

World and Regional Geology 4

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Lake Titicaca, Bolivia–Peru

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Main physical characteristics

South latitude: 15° 13′ 19″ to 16° 35′ 37″
West longitude: 68° 33′ 36″ to 70° 02′ 13″
Altitude above sea level: 3809 m
Total area: 8562 km²
Total water volume: 903 km³
Mean dissolved salt concentration: 0.9–1.2 g/l with a sodium chloride facies (Carmouze *et al.*, 1981).

The origin of Lake Titicaca (Fig. 1) is still not well established and subject to discussion. Lavenu (1981) speaks of the filling of a tectonic depression produced by a distension phase during the Late Tertiary. Later on, during the Pleistocene, various lacustrine transgressions occured (paleolakes Mataro, Cabana, Ballivian, Minchin and Tauca: Ahlfeld (1972); Lavenu *et al.* (1984); Servant & Fontes (1978)).

Detailed climatological, geological, hydrophysical and hydrochemical parameters can be found in: Monheim (1956); Fontes *et al.* (1979); Boulangé & Aquize Jaen (1981); Carmouze & Aquize Jaen (1981); Carmouze *et al.* (1983); Kirkish & Taylor (1984); Powell *et al.* (1984); Kunzell & Kessler (1986); Richerson *et al.* (1986); Iltis (1987); Liberman (1987); Quintanilla *et al.* (1987); Wirrmann (1992).

Present limnological conditions

Bathymetry and local bottom relief control the distribution of the lacustrine macrophytes (Collot *et al.*, 1983) and the ostracode fauna (Mourguiart, 1987). The superficial sediments are mainly autochthonous and biogenic. Their distribution is also controlled by bathymetry (Fig. 2, adapted after Boulangé *et al.*, 1981). The total thickness of the lacustrine deposits is unknown. Lago Grande is classified as a monomictic warm lake and Lago Huiñaimarca (also known as Lago Titicaca Menor or Lago Pequeño) is classified as a polymictic warm lake, except for the Chua depression which is similar to the Lago Grande (Lazzaro, 1981).

More detailed limnological data can be found in: Haas (1955); Richerson *et al.* (1977); Guerlesquin (1981); Iltis (1984, 1988); Loubens *et al.* (1984); Vincent *et al.* (1986); Liberman & Miranda (1987); Loubens & Osorio (1988); Repelin *et al.* (1988); Richerson & Carney (1988).

Late Quaternary evolution

Core TD1 (Fig. 3), the longest one obtained, was taken with a 6 m-Mackereth corer in 19 m of water in the western central part of Lago Huiñaimarca.

The 20,000 years of record (^{14}C chronology established on bulk sediment or organic matter according to the samples) have been

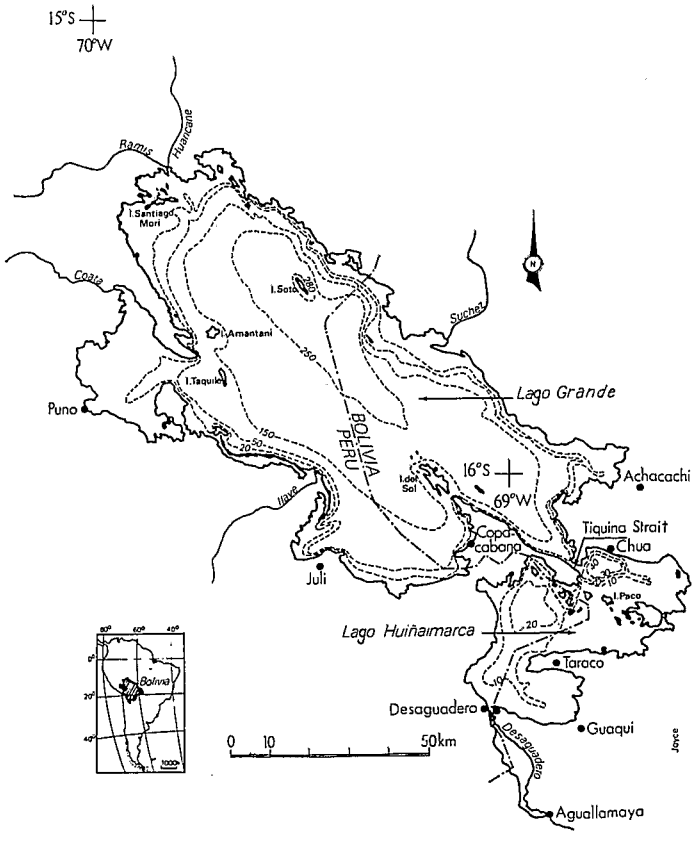
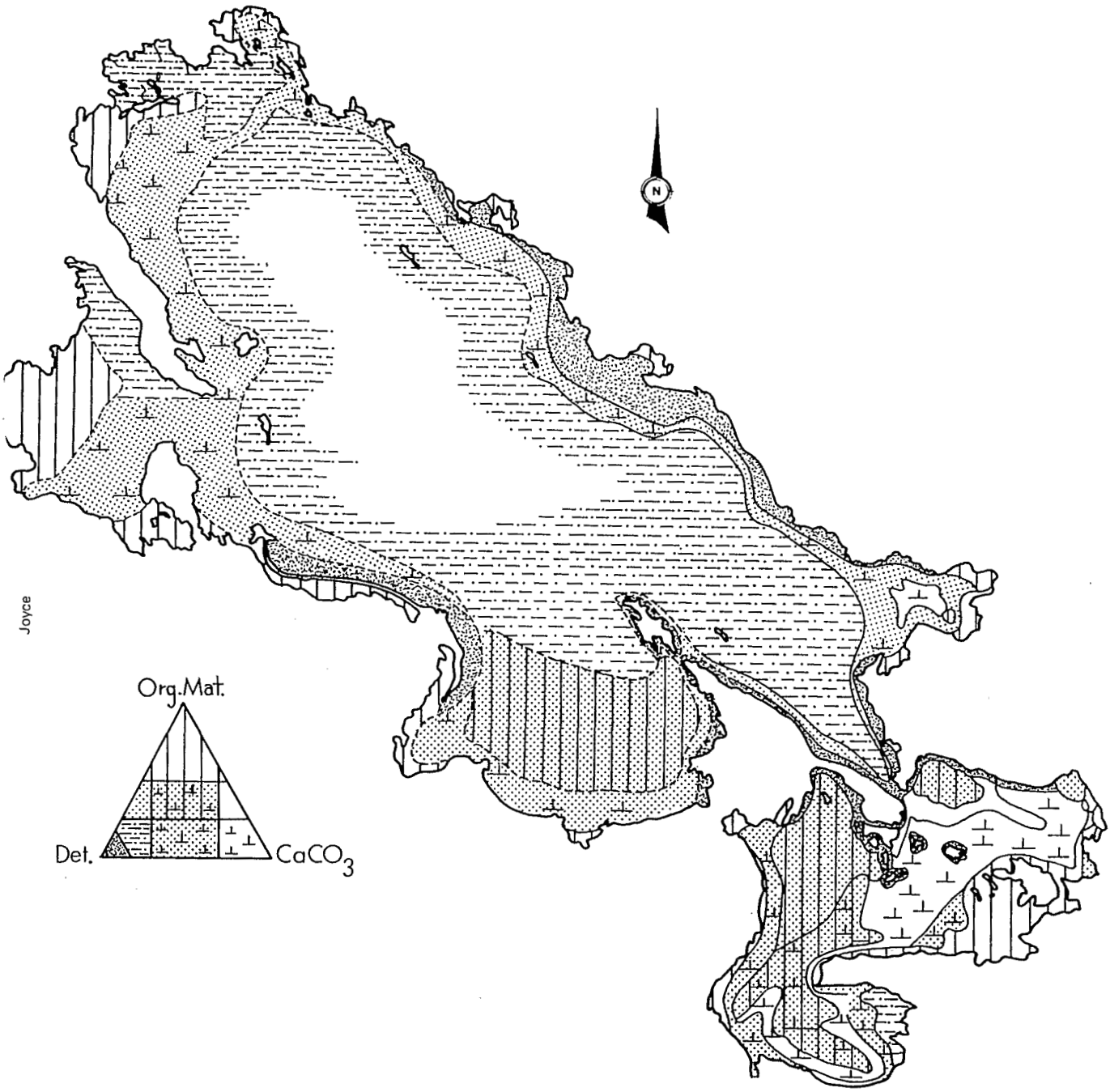
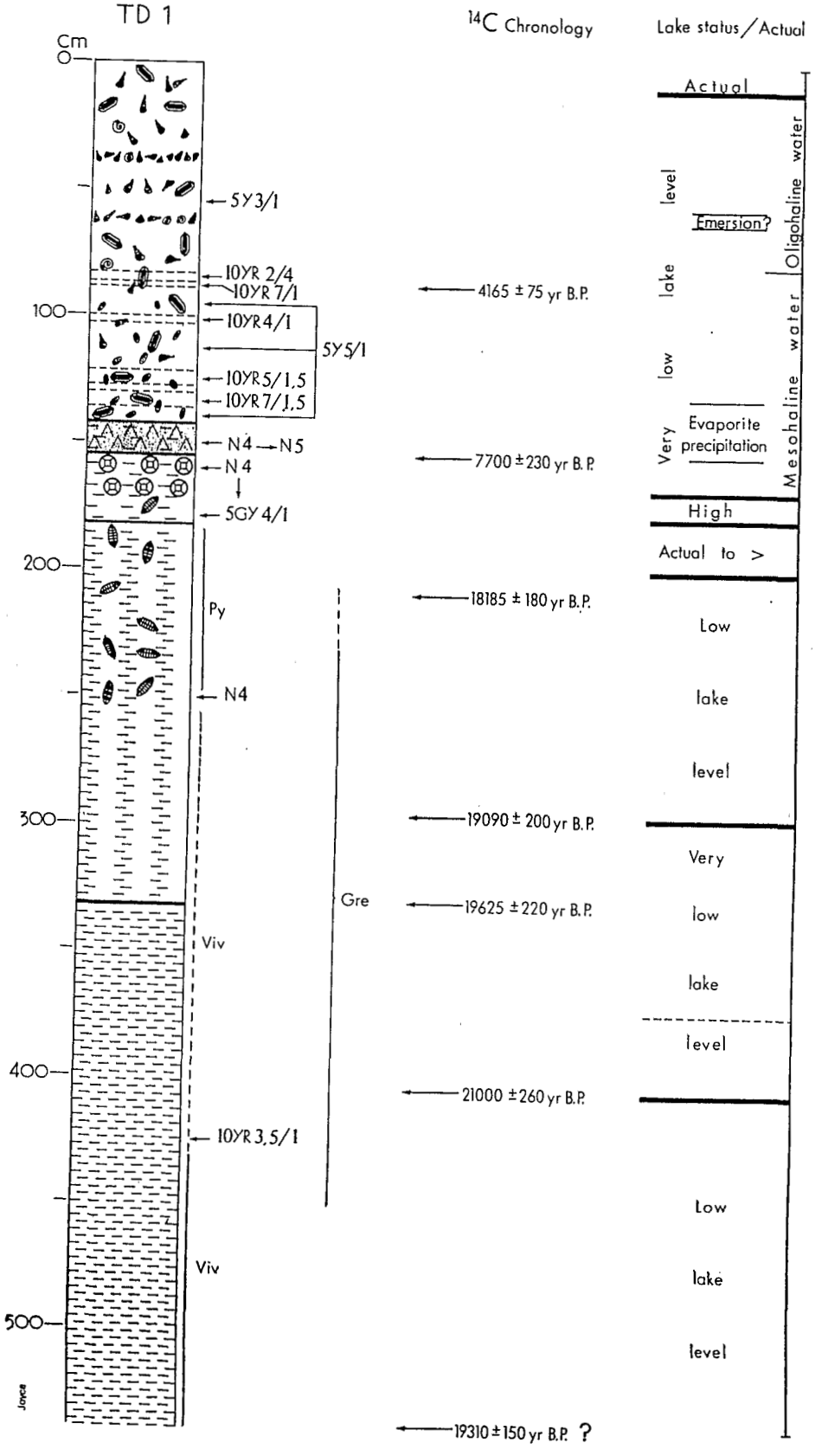


Fig. 1. Locality map.



g. 2. Distribution of superficial sediment. (Adapted from Boulangé *et al.*, 1981.)



ig. 3. Stratigraphic column of Core TD1.

analyzed by sedimentology (Wirrmann, 1987; Wirrman & de Oliveira Almeida, 1987) micropaleontology (Mourguiart, 1987) and palynology (Ybert, 1988). The curve of lake level fluctuations is deduced from these data.

The Late Quaternary evolution of Lake Titicaca is presented in de Oliveira Almeida (1986) and in Wirrmann *et al.* (1988; 1992). The Late Quaternary paleoclimatic variations are reported in Lavenu *et al.* (1984); Servant & Fontes (1984) and Servant *et al.* (1989). Preliminary results concerning the human settlement around the lake basin and during the Tiwanaku stage are available in Bouysse-Cassagne (1987, 1988) and Kolata (1989). Pollution in Lake Titicaca, particularly in the shallow embayment near Puno, is discussed in a recent book by Northcote *et al.* (1989).

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