

### 1. Introduction

For well understanding paleoclimatic and paleoenvironmental changes on the Tibetan Plateau, Zigetang Lake (32°00' -32°09' N, 90°44' - 90°57' E), located in central Tibetan Plateau(Fig.1) and the sensitive belt of southwest monsoon front(Fig.2), has been investigated in detail during past years. Several lake shore terraces show that the lake level has been experienced several high lake level periods, which may indicate the rich precipitation periods because of no glacial melt water supplying to the basin. Therefore, to study the lake level change history could be to well understand the southwest monsoon fluctuation processes.

Tab. 1. Hydrochemical character of waters in Zigetang Lake (unit: mg/l except for pH)

Water	K <sup>+</sup>	Na <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup>	CO <sub>3</sub> <sup>2-</sup>	HCO <sub>3</sub> <sup>-</sup>	Salinity	pH
Lake	756	12390	9	120	1520	8164	3404	14794	41157	10.0
Inflow	3.4	28.4	114.4	48.5	14.7	52.3	5.8	124.3	369.3	8.7

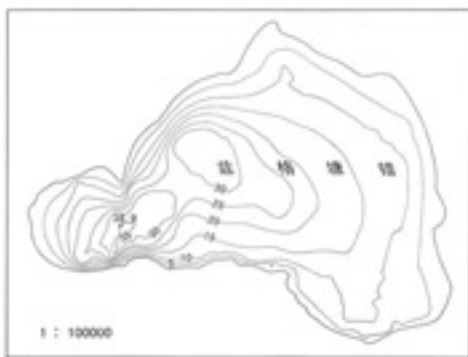


Fig.3. Isobath map of Zigetang Lake detected by echo sounder

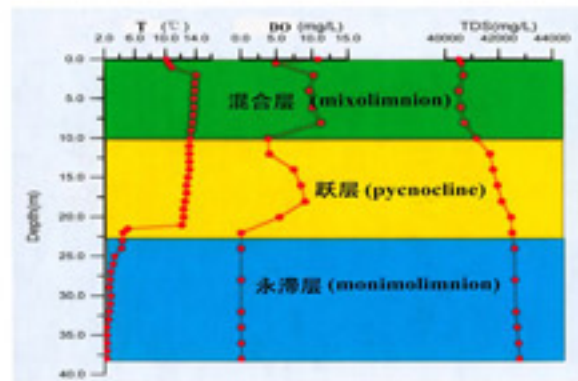


Fig. 5. Temperature, dissolved oxygen and total dissolved salt changes with water depth

### 3. Results of modern processes research

Investigation results revealed that it is a meromictic lake, which might be a highest elevation one in the world. The feature of thermocline and chemocline existed simultaneously(Fig.4) could be stratified this lake water column into three strata: 0-10m, 10-22m and below 22m(Fig.5). The value of delta <sup>18</sup>O is changed with the water depth, which shows the lower layer of water is of high concentration of heavy oxygen(Fig.6). This feature may be as an indicator of much older water in the lower layer of the lake.

The terraces and shoreline bars surrounding the lake could suggest that the lake has been experienced several high lake level periods(Fig.7), which implies more precipitation periods.



Fig.7. Several shoreline bars in the southeast corner (upper) and lake shore terraces in the southwest side (below) of Zigetang Lake

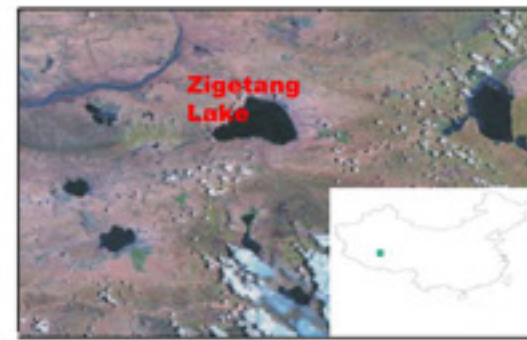


Fig.1 Location of Zigetang Lake

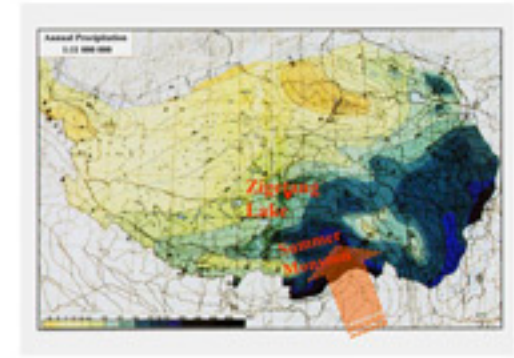


Fig.2. Zigetang Lake is located in the sensitive belt of the southwest monsoon front

### 2. Backgrounds of Zigetang Lake

The Zigetang Lake is a closed alkaline and saline lake with pH value of 10(Tab.1). The elevation of water surface is 4560 m above sea level with an area of 190 km<sup>2</sup> and a maximum depth of 39 m(Fig.3). The hydrological system drains a total watershed of 3430 km<sup>2</sup> with terrains of gentle slope. Meteorological records indicate a mean annual air temperature of -1 to -2 °C in the basin. Precipitation of 300-400 mm/a falls mainly in summer. Water chemical analysis shows that the Zigetang Lake is a typical saline lake dominated by Na<sup>+</sup> and HCO<sub>3</sub><sup>-</sup> ions(Tab.1).

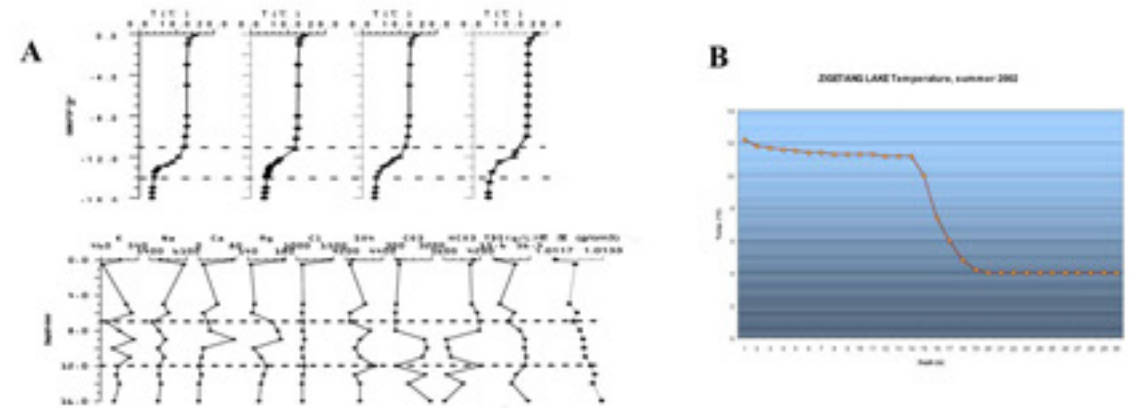


Fig.4. Thermocline and water chemical profile in water column of Zigetang Lake (A: in summer of 1999; B: in summer of 2002)

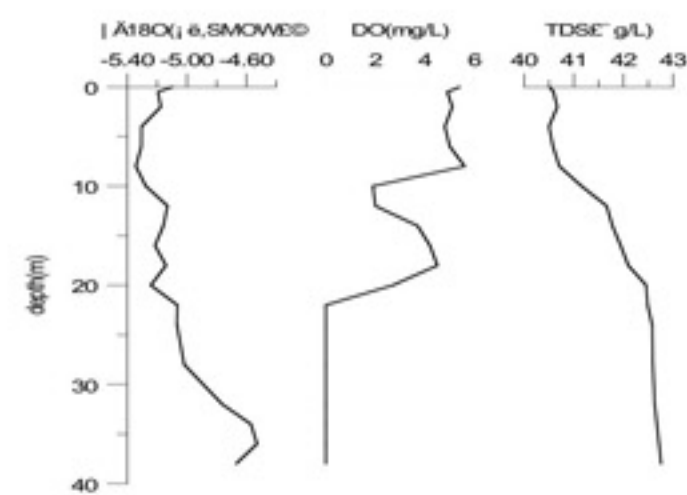


Fig.6. Delta <sup>18</sup>O changing with the water depth

### 4. Discussion and Conclusion

● As the highest meromictic saline lake(4560m a.s.l.) ever discovered in the world, we are sure that Zigetang Lake could provide some new insight into the modern lake processes and historical processes, which is more sensitive to response to climate change and the summer monsoon front shifting.

● It is widely accepted that meromictic lakes are favorite sites for varve formation and preservation. Once the clastic, chemical and organic precipitates reach the deeper monimolimnion, they will be easily preserved. So, studies on preservation of palaeoclimatic information with high resolution and more reliable proxies in varved sediments has gained increasing interest for paleolimnologists. Additionally, the shift of chemocline, as well as the emergence and disappearing of meromixis reflects an abrupt climate change or other fundamental alteration in the catchment, which will be genuinely recorded in the water column and deposits.