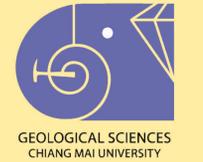


# Comparison of Sedimentation Rate of Ping River at Mae Taeng and Mae Rim Districts, Chiang Mai Province Using Single Aliquot Regeneration Optically Stimulated Luminescence Technique



Author : Ms. Pannisara Wongmak, 640510444. Advisor : Assistant Professor Dr. Rattanaporn Fongngern.  
Department of Geological Sciences, Faculty of Science, Chiang Mai University

## ABSTRACT

The Ping River exhibits a meandering pattern, with significant movement observed in Mae Taeng District, decreasing in Mae Rim District, and ceasing upon entering Mueang District. It is hypothesized that the river's movement correlates with sedimentation rates. To investigate this, point bars five sediment samples from Mae Taeng and eight from Mae Rim were collected for age determination using Optically Stimulated Luminescence (OSL) dating with the Single Aliquot Regeneration (SAR) technique. This study aims to evaluate the effectiveness of OSL dating in age determination and to compare sedimentation rates between the two areas. For extracted quartz grains, grains smaller than 425–150  $\mu\text{m}$  were extracted under red light after removing magnetic minerals. Then samples were treated with 12% hydrogen peroxide ( $\text{H}_2\text{O}_2$ ), 37% hydrochloric acid (HCl), and 48% hydrofluoric acid (HF) to measure the equivalent dose (DE). The dose rate (DR) was measured for those smaller than 250  $\mu\text{m}$ . The obtained OSL ages were then correlated with sediment layer thickness to compare sedimentation rates between the two areas.

## INTRODUCTION

- The Ping River originates from Doi Tui in Chiang Dao District, Chiang Mai Province, located between the Thanon Thongchai Mountain Range and the Phipan Nam Western Mountain Range. It flows southward (Kuneng Nawong, 2002). The river exhibits a meandering shape.
- According to a study by Satethawut Srisuanjick (2022), it was found that significant movement observed in Mae Taeng District, decreasing in Mae Rim District, and ceasing upon entering Mueang District.
- The researcher hypothesized that the river's movement is related to changes in sediment deposition rates.

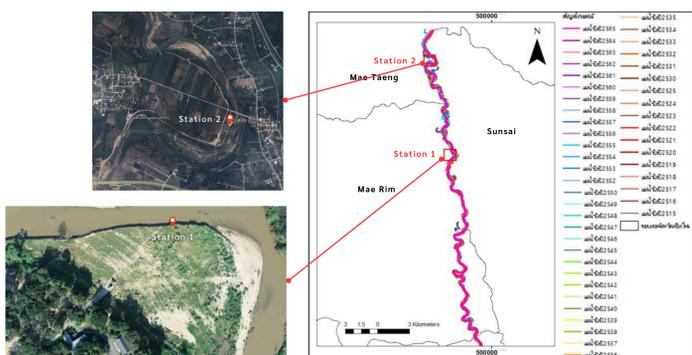


Fig 1. A map showing the upper Ping River watershed area of Chiang Mai Province, which has moved significantly over the past 50 years (Satethawut Srisuanjick, 2022) with satellite imagery and aerial photography.

## OBJECTIVES

- To study the determination of sediment age using Optically Stimulated Luminescence (OSL) dating with the Single-Aliquot Regeneration (SAR) technique.
- To compare the sedimentation rate of the Ping River in the areas of Mae Tang and Mae Rim districts, Chiang Mai Province.

## METHODOLOGY

### Sample collection

- Recording sample locations and stratigraphic column.
- Collecting sample with tubes and heavy-duty bags.



Fig 2. (A) Digging the point bar perpendicular to the ground surface (B) Collecting samples using tubes

### Dose rate (DR)

- Using sample heavy-duty bag to dry at  $\sim 80^\circ\text{C}$
- Grinding to a grain size of  $< 250 \mu\text{m}$
- Drying sample at  $\sim 80^\circ\text{C}$  and
- Ashing at  $\sim 450^\circ\text{C}$ , overnight
- Mixing 500g of wax with 200 g-250 g of sample
- Casting sample mix into aluminum mold
- Measuring the Dose rate.

### Equivalent dose (DE)

- Using sample in middle part of tube to dry at  $\sim 40^\circ\text{C}$
- Grinding to a grain size of  $< 425-150 \mu\text{m}$
- Using a magnet, 12%  $\text{H}_2\text{O}_2$ , 36% HCl, 48% HF, respectively
- Drying sample at  $\sim 40^\circ\text{C}$
- Measuring the Equivalent dose.



Fig 3. (A) Mixing wax with sample (B) The sample has been removed from the aluminum mold

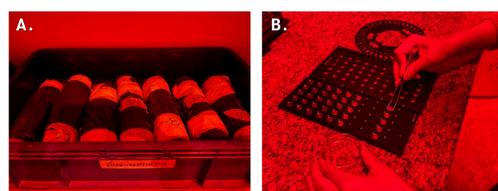


Fig 4. (A) The samples stored in the tubes (B) The preparation of aliquots for sample placement

### OSL age dating

### Sedimentation rates

## RESULTS

### Stratigraphic column

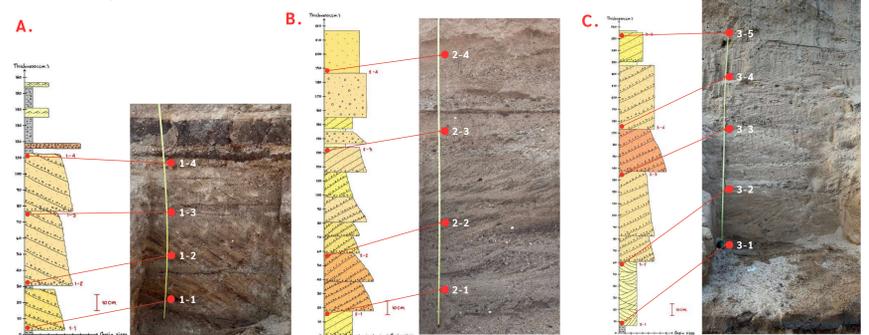


Fig 5. Sample locations and stratigraphic column of (A,B) station 1 Mae Rim and (C) station 2 Mae Taeng

### Dose rate (DR)



Fig 6. Dose rate from DoseRateCalculator program.

### Equivalent dose (DE)

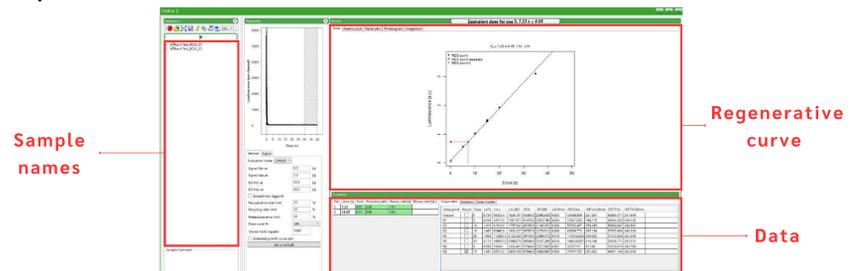


Fig 7. Equivalent dose from LexEva2 program.

### Sedimentation rates

## CONCLUSIONS

- The age determination using Optically Stimulated Luminescence (OSL) dating with the Single-Aliquot Regeneration (SAR) technique can be calculated by dividing the Equivalent Dose (ED) in units of Greys (Gy) by the Dose Rate (DR) in units of Gy/ka.
- The Equivalent Dose (DE) can be obtained from the sample that has not been exposed to light using pure quartz grains of  $< 425-150 \mu\text{m}$  in size. The quartz grains are then stimulated with blue light to release the radiation accumulated after the latest sedimentation event.
- The Dose Rate (DR) can be obtained by Gamma Spectrometer using grain size of  $< 250 \mu\text{m}$ . The accumulated radioactive material in the sediment is then analyzed, and the radiation release rate is measured per thousand years.
- The obtained OSL ages were then correlated with sediment layer thickness to determine the sedimentation rates.

## REFERENCE

- Kuneng Nawong. (2002). Conservation Network of the Ping River: Final Research Report. Office of the National Science, Research and Innovation Policy Council, 1.
- Satethawut Srisuanjick. (2022). Pattern and Possible Control of Lateral Migration of the Southern Ping River in Chiang Mai Province, Undergraduate Thesis, Faculty of Science, Chiang Mai University, (2022), 20-23.

## ACKNOWLEDGE

I would like to thanks to 50th Anniversary Geology Fund, Chiang Mai University, Asst.Prof.Dr. Rattanaporn Fongngern, Mr. Sathit Kanthata, Mrs. Mayuree Promphutha, Mr. Pattawee Gakham, Ms. Pithchanuch Mali, Ms. Matika Kasikrit, Ms. Puntila Kuntawong, Mr. Kongphob Intaraphuk and Mr. Kittiphan Chansi.