ASSESSMENT OF SEDIMENT DEPOSIT IN LAKE TUNI

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1. INTRODUCTION

This study was made due to Lake Tuni provides important water resources to two major cities of Bolivia (La Paz and El Alto); furthermore, global climate change will accelerate glacier retreat and it may result in accelerate sediment deposit reducing the capacity of the lake, having as a main objective to assess the sediment deposit in Lake Tuni analyzing the change of the morphology around river mouth.

There are a variety of investigate strategies for understanding and evaluating this phenomena, regarding morphology change in a lakes; for instance, in Lake Biwa (Tsuchiya et al. (1984)), in Lake Kasumigaura (Uda et al. (1998)), in Lake Hawea (Kirk et al. (2000)), in Lake Inawashiro (Fujita & Tanaka (2002)) giving new insights into understanding basic process of sand movement and erosion in lakes.

2. STUDY AREA AND DATA COLLECTION

In Lake Tuni were found two sand terraces placed around the mouth of two rivers, Tuni River and a nameless river, both sand terraces are the target area depicted in Fig. 1.

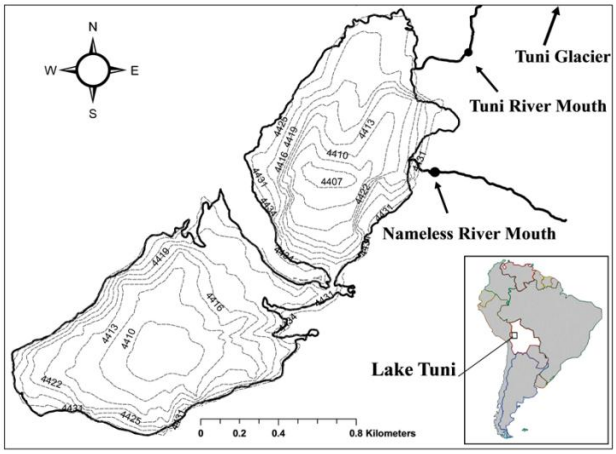

Fig. 1 Location of Tuni River mouth and a nameless river mouth in Lake Tuni

Tuni River originates in Tuni Glacier, it flows for 5.46 Km before draining into Lake Tuni, and it has a contributing catchment area of 9.98 Km2. On the other hand, a nameless river flows for 0.94 Km before draining into Lake Tuni, and it has a contributing catchment area of 0.65 Km2.

The information collected was: data of wind direction and velocity (from June 2011 to May 2012), bathymetric measurements performed in 2000 and water level data of the lake (from 2000 to 2012) were provided by EPSAS (Social public enterprise of water and sanitation in La Paz). Despite the lack of topographical data, Geo-Eye satellite images were used for the periods: November 2005, August 2009, May 2011 and September 2012.

3. METHODOLOGY ANALYSIS AND RESULTS

Fujita & Tanaka (2002), showed through analysis of topographical maps and aerial photographs for different periods around the mouth of Nagase River a multiple sandspit development (morphology changes), concluding that the wind impact is the main erosive factor. Following this methodology analysis it was performed the appraisal in Lake Tuni.

Water elevation in Lake Tuni through a year is depicted in Fig. 2, where is clearly appreciated the water level variations due to the season. In Bolivia the raining season extends from January to March, while dry season extends from June to August

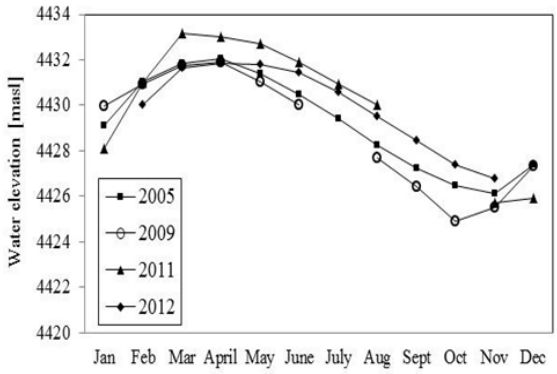

Fig. 2 Temporal variation of water elevation on Lake Tuni from (2005,2009, 2011 and 2012)

Keywords: sediment deposit, river mouth, wind impact
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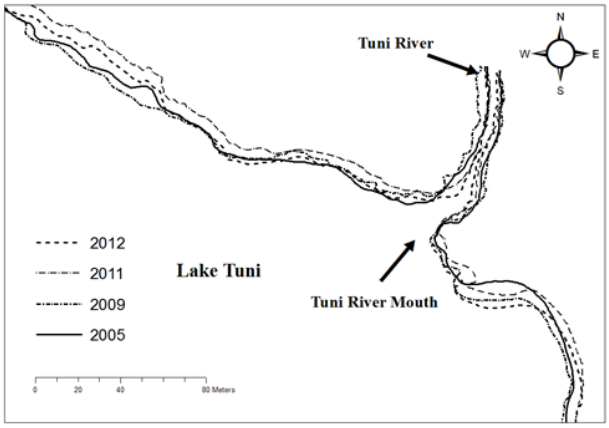

Fig. 3 Morphology change process around Tuni River mouth

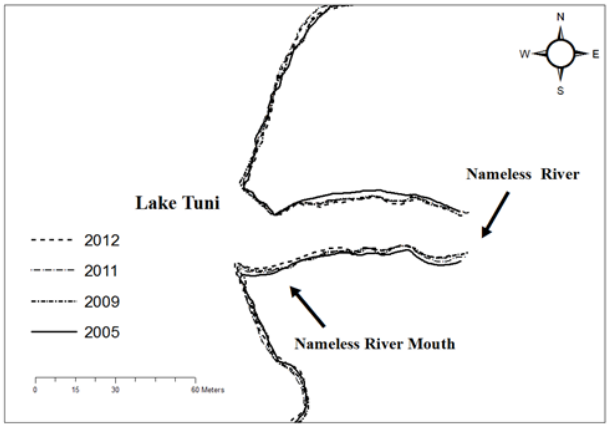

Fig. 4 Morphology change process around a nameless river mouth

It was made a comparison between morphology changes around Tuni River mouth and a nameless river mouth through overlapping satellite images respectively for each case as it can be seen in Fig. 3-4.

Around Tuni River mouth (Fig. 3), differences on the morphologies between May 2011 and September 2012 with November 2005 and August 2009 are appreciated, but it is because the images were not taken in the same season nor with the same water level. Therefore it can be assumed that in Tuni River there is not remarkable erosive process.

In Figure 4 it was analyzed around the nameless river mouth.

In this case the influence of water level does not play an important role because it is clearly represented in the graph that there is no remarkable morphology change. Also for this case can be assumed that the erosive process is not significant.

Examining the correspondence of wind direction, wind velocity and sand movement it was found that, due to wind direction prevails in north-north-east direction (Fig. 5), the fetch length cannot have a remarkable erosive action around the mouth of both rivers; furthermore, 0.9%of the data analyzed for north-north-east direction is bigger than 10 m/s and 2.3% of the velocity analyzed for the whole data is bigger than 10 m/s, concluding that the rate of velocity is low.

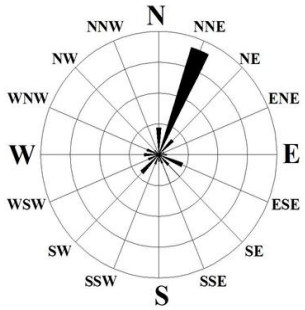

Fig. 5 Measurement of wind direction

4. CONCLUSIONS

Despite the lack of meteorological data and based on satellite overlap graphs it can be said that neither Tuni River mouth nor the nameless river mouth develop significant morphology changes.

Fujita & Tanaka (2002) found the wind impact as a remarkable erosive factor on morphology change process, but in Lake Tuni, it has a low impact, consequence of a low wind velocity; in addition, the relationship between wind direction and fetch length does not contribute to the erosive phenomena.

In spite of the analysis made in Lake Tuni have not counted with older periods as it was made in Lake Inawashiro, this assessment bring and important perspective of the grade of erosive phenomena which is acting around the mouth of both rivers.

ACKOWNLEGEMENTS

The authors would like to express our greatest gratitude to JST/JICA, SARTREPS (Science and Technology Research Partnership for Sustainable Development) for supporting financially this study. It would not have been possible without its help.

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