CHAPTER VII

CONCLUSION

CONCLUSION

In India glaciers are a valuable source of fresh water which sustain perennial Himalayan rivers even during peak summer months and provide water for drinking, irrigation and hydel power generation and are of high socio-economic importance. Since 1850, the Himalayan glaciers are in a state of recession and the rate of recession is accelerated in recent times.

As glacier is a dynamic and sensitive body of ice, frequent measurement on the shifting of snout or percentage of retreat has to be monitored. The conventional method of geomorphic mapping is very time consuming and economically not viable for the rugged terrain and inclement weather conditions of Baspa valley.

Techniques of remote sensing are widely accepted on account of synoptic view, its repetivity, increase in spatial resolution and decrease in cost. The remote sensing and GIS techniques used here suggest that, there is not any single technique of visual interpretation or image processing available to map glacial features precisely. Visual techniques make use of the excellent ability of the human mind to qualitatively evaluate spatial pattern in an image and proved to be very good for mapping the landforms. However, visual interpretation techniques have certain disadvantages, that they may require extensive training and labour intensive. In addition, spectral characteristics are not always fully evaluated in visual interpretation efforts. This is partly because of the limited ability of the eye to discern tonal values on an image and the difficulty for an interpreter to simultaneously analyze numerous spectral images. In applications where spectral patterns are highly informative, It is preferable to analyze digital, rather than pictorial, image data.

The band no.4 i.e. SWIR band shows DN value of 28 for snow cover and DN value of 255 for cloud cover allowing the separation in this band. The boundary between snow and glacier ice can easily be identified on the image which is nothing but the snow line. In SWIR band the energy will be absorbed by exposed ice while it will be reflected by soil and rocks, thereby, making the difference between exposed ice and debris covered ice more discernable. There are certain features which are demarcated more significantly on the basis of spatial resolution than the spectral resolution e.g. morainic ridges. The histogram equalization which is applied to LISS III + PAN data, reflect increase in the visibility of morainic ridges and deglaciated valley for Shaune garang glacier.

A visual interpretation technique helps in differentiating the various types of moraine while the image processing techniques can be used as a complementary methods.

For the mapping of cirques, horns and aretes SRTM DEM overlapped by Satellite data is proved to be very effective. The digitization of all these maps under the GIS environment helps in generating reliable glacier inventory. GIS overlay analysis is also useful to generate a correlation between the parameters like lithology, slope, size of accumulation and ablation zone, ratio of Mcab/Exab, and orientation of glacier. From the above parameters the glaciers of Baspa valley are classified into seven zones of retreat as shown in the (Fig. 6.2)

The glacial geomorphic studies which are carried out for 35 glaciers of Baspa valley suggest, that the south facing glaciers are retreating faster (33.92%) than the north facing glaciers (22.20%). Since 2001, the average snowline in the Baspa valley has gone up by 33 m (Fig 7.1). In the past the extension of glaciers were at much lower altitude i.e atleast 950 m below the present day extent of the glacier (Fig.7.2). From this limit the present day south facing glacier shows 4670 m lengthwise retreat while that of north facing show 3880 m of retreat. (Fig.7.3)

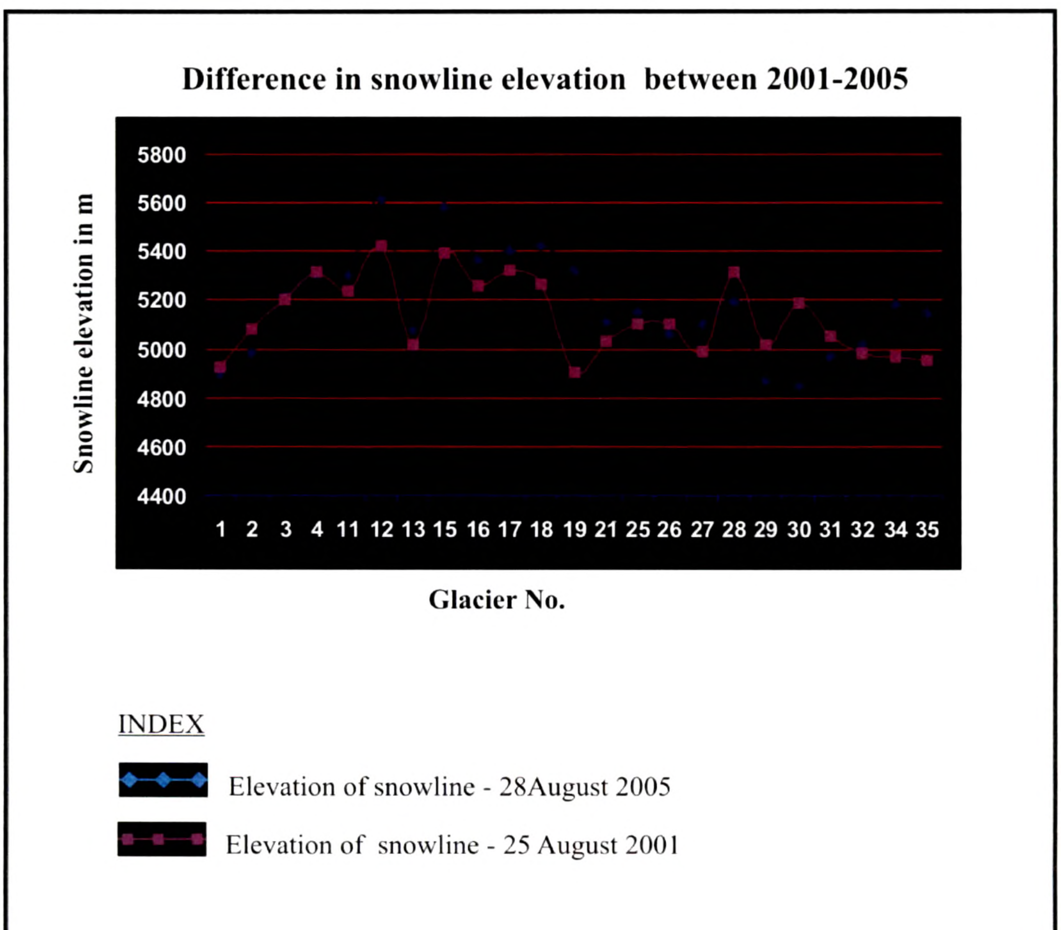

Fig.7.1 Snowline variation

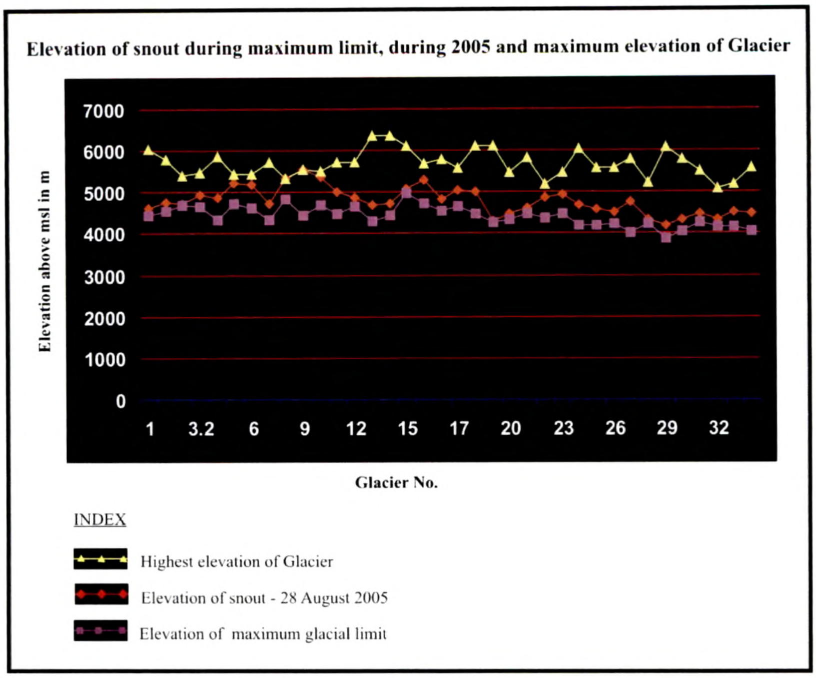

Fig.7.2 Past and present glacial limit in Baspa valley

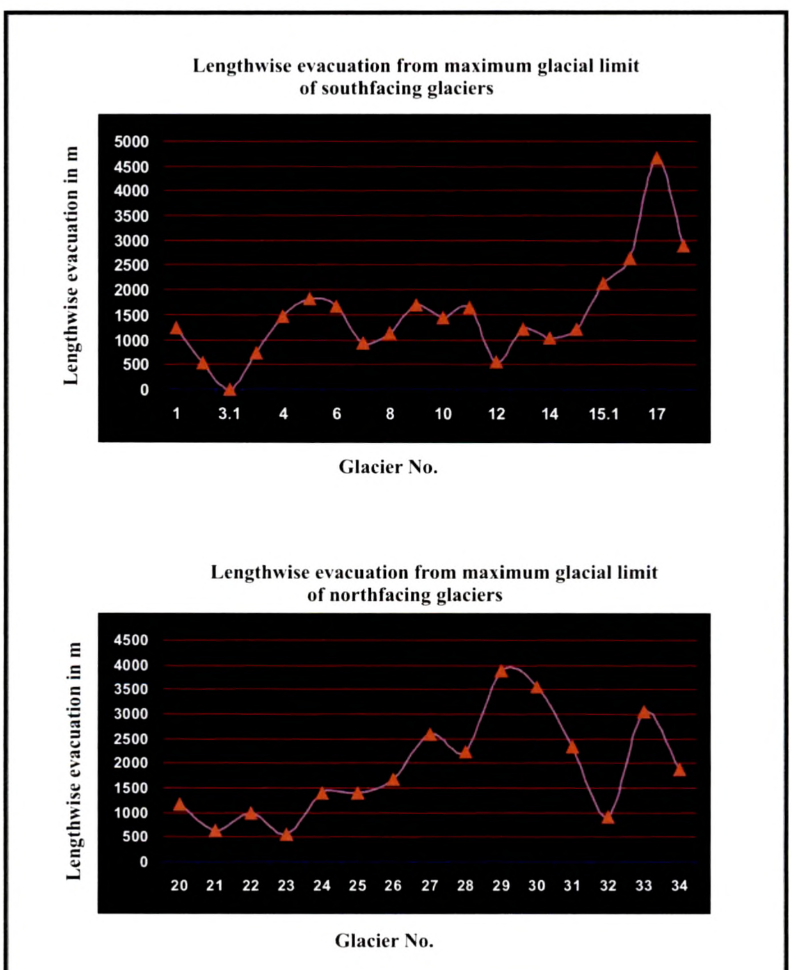

Fig.7.3. Lengthwise evacuation of glacier from maximum limit

The retreat is supported by the presence of many empty cirques, hanging valleys, horns and aretes of different shape and size. The enhanced retreating trend reveals that many glaciers in Baspa valley show their individual limbs exposed, which were initially flowing as a single glacier. Present day, Baspa valley reflects increase in the number of glaciers and decrease in the size of glaciers on account of process of *fragmentation.*

Terminal and lateral moraines are found to be an important glacial geomorphic indicators and present in almost all the glaciers. The number of sets can be correlated with the stages of deglaciation however dating is required to confirm this fact. The stage 1 lateral and terminal moraines are covered with vegetation and at places by debris or rock-fall. The lateral and terminal moraine of stage 2 and stage 3 do not breach the lateral and terminal moraines of stage 1, indicating the gradual lengthwise and widthwise recession of glacier in Baspa valley. Maximum three stages of deglaciation have been delineated by application of Remote Sensing and GIS for Baspa valley.