

CHEMISTRY OF SNOW FROM HIGH ALTITUDE, MID/LOW LATITUDE GLACIERS

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INTRODUCTION

1.1 Snow chemistry records from high altitude, mid/low latitude (HAMLL) glaciers

Glaciochemical records describing the spatial and temporal variation in the chemical content of snow and ice in HAM/LL glaciers allows us to improve our understanding of the distribution of chemical species in the atmosphere at these latitudes, and their variation over space and time. The resulting data base provides the framework for describing and understanding aspects of atmospheric chemistry and circulation, biogeochemical cycling, climate change, anthropogenic emissions to the atmosphere, glacial hydrology and evidence of volcanic events. Furthermore, records from glaciochemical investigations are especially important when direct observations and measurements of the atmosphere are either spatially and/or temporally lacking.

Glaciochemical records recovered from high altitude/mid-low latitude sites provide a basis for determining *regional* climatic response (i.e., relative temperature, humidity, atmospheric circulation) to past *global* environmental change (as indicated by other paleoenvironmental records). These types of records could provide valuable regional constraints in the development of global climate models

Types of glaciochemical records include: 1) The collection of fresh snow, 2) snow pits in accumulation zones of glaciers that represent a time series of individual snow events or seasonal chemical signatures for a number of years, 3) and longer term records such as ice cores. These glaciochemical records undoubtedly represent the "best" paleoenvironmental records from these locations. Areas where records of these kinds have been or could be developed are shown in Figure 1.

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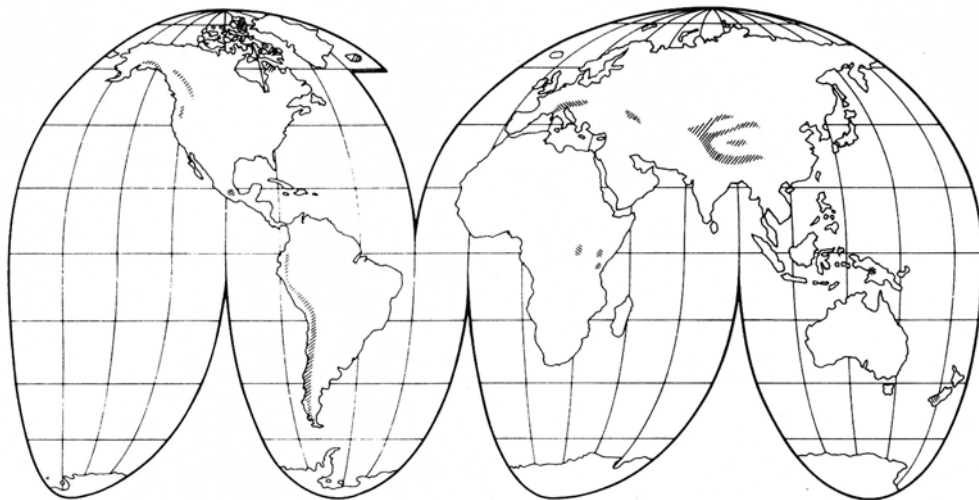


Figure 1. Location map for high altitude/mid-low latitude regions (outlined with hatching).

1.2 Site Selection, Sample Collection, Dating and Analyses

Site Selection

Glaciochemical samples recovered for paleoenvironmental interpretations should be collected from sites where the snow has experienced minimal postdepositional alteration, especially from the effects of wind, avalanches and meltwater percolation. Alpine glaciers in temperate regions are affected by strong vertical temperature and precipitation gradients (Barry 1981; Price 1981). Higher elevations within these glacier basins commonly experience cooler mean annual temperatures and higher rates of net annual snow accumulation, both important factors in preserving the chemical record within the snowpack. Cooler temperatures serve to limit the production of meltwater and thereby reduce the effects of postdepositional alteration due to percolating meltwater (Mayewski, et al. 1981). Collection sites should therefore be chosen at elevations as high as possible and in the dry snow zone. High rates of annual snow accumulation also help to preserve seasonal stratigraphy as meltwater must travel a greater vertical distance in order to significantly disturb the seasonal distribution of chemical species in the snowpack. However, glaciochemical