PRACTICAL MOUNTAIN WEATHER

A GUIDE FOR HIKERS, CLIMBERS AND SKIERS

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Front Cover- Northwest ridge of Pequeno Alpamayo (~5400 m), Cordillera Real, Bolivia. Staff Photo.

Back Cover- (*top left*) Makalu (8481 m), Nepal. Sandy Graham
(*Right*) Ama Dablam (6800 m), Nepal. Sandy Graham
(*Bottom*) Cotopaxi (5898 m), Ecuador. Staff Photo

UNITS AND CONVERSIONS

	Metric units	English unit equivalent
distance		
km	Kilometers (1000 meters)	0.621 miles
m	Meter (100 cm)	3.38 ft or 39.27 inches
cm	Centimeters (10 mm)	0.3927 inches
mm	Millimeters	0.03927 inches
area		
km^2	Square kilometers	0.39 square miles
pressure		
mb	Millibars	1013 mb=29.92 inches mercury (sea-level pressure)
temperature		Conversions
^{o} C	Degrees Celsius	To convert to Fahrenheit: ((^{o} C) x 9/5) +32^o
^{o} K	Degrees Kelvin	^{o} C + 273^o
^{o} F	Degrees Fahrenheit	To convert to Celsius: ((^{o} C)-32^o) x 5/9
time		
s	Second	
hr	Hour	
weight		
gm	Gram	
kg	Kilograms (1000 grams)	To convert to lbs: (kg) x 2.2

misc

m/s	meters per second
km hr^{-1}	kilometers per hour
500 mb	500 mb pressure level
mph	miles per hour

Introduction

This book is written for climbers, hikers, backpackers, backcountry skiers, and snowboarders; a group that we refer to as mountain travelers. By reading this book, not only will you gain an understanding of the complexities of mountain weather, but you will also appreciate the difficulties in forecasting it as well. The goal of the book is not to turn each and every reader into a weather forecaster *per se*; nevertheless, the more you understand about weather, the more likely you are to make well-informed decisions once you are in the mountains.

The mountain environment is no respecter of persons, thus the more the traveler knows about the environment they are passing though, the more likely they are to survive the journey. Extreme weather does directly kill a number of mountain travelers each year, primarily through lightning strikes and extreme cold (hypothermia). However, it is the indirect causes: whiteouts, severe winds, and heavy snowfall, to name a few, that frequently incapacitate mountain travelers. Applying what you have learned from this book will not, of course, eliminate the risks, but it will certainly stack the odds of survival in your favor.

Weather forecasting and analysis, and the study of mountain weather in particular, is not an exact science. Forecasting is part science and part experiential knowledge, with some randomness thrown in. Unlike a carpenter who builds a house exactly as the blue prints specify, the weather forecaster does not have a 'perfect' set of guidelines to base their forecast on. In other words, similar weather patterns do not necessarily produce the exact same weather. However, with a basic understanding of weather processes and with the aid of forecasting tools, a considerable amount of the mystery is removed.

Whether you realize it or not, everyone who travels in the mountains is a weather forecaster to some degree. Many technically proficient climbers, skiers, snowboarders and hikers have ventured into the mountains, only to meet disaster face-to-face because they either ignored a weather forecast or failed to recognize the signs of adverse weather. The person who ignores the weather, is still a forecaster, albeit a pretty dumb one. By choosing to ignore the weather, they are 'forecasting' that the weather is going to be survivable. This book is written to equip you with the necessary skills to make your own "on the mountain ' forecast as well as help you evaluate forecast that you receive from meteorological services.

If you have looked at the table of contents page, you probably noticed that this book can be divided roughly into two sections: the theory of mountain weather followed by a guide to weather and climate in various mountainous regions of the world. Some readers at the start may be 'put off ' by the more academic material, however, note that this chapters are loaded with hints on how to apply what you are learning. Note that this book is essentially a reference book and a guide book rolled into one. The power of knowing how processes work, in this case-how the atmosphere works-is that you do not have to know all the answers ahead of time. With a fundamental understanding you will be able to figure out why the weather is doing what it is doing.

We make no excuse for using the metric system as the primary units, with english units in parentheses. Metric is superior in every way shape and form! If you are not familiar with the metric system give it a try. In the body of the text we have underlined words, phrases or sentences that need emphasis-so take note. Words that are *italicized* are included in the glossary, located at the end of the book. In addition, from time-to-time we have inserted little side discussions called 'Excursions', which deviate somewhat from the main topic. They range from being very practical to a bit more off the wall!

Before proceeding however, take the following quiz to test your current knowledge of mountain weather. By the time you have finished reading this book you will be able to 'breeze' through these questions without hesitation.

Mountain Weather Quiz

1. Rising elevation on a stationary altimeter indicates: a) rising pressure b) decreasing pressure
   c) no change in pressure?
2. True/False: Air within a low pressure weather system generally moves toward the center of the low and upward ?
3. True/False: As a general rule of thumb:-wind speeds decrease with increasing height in the lower atmosphere?

4. What is the windiest season in the Presidential Range of New Hampshire: a) summer
b) autumn c) winter d) spring?
5. Cloud-to-ground lightning has the highest frequency of occurrence between the hours of:
a) 10 am-2 pm b) 3pm-7pm c) 10pm-1am d) 1am-4am
6. True/False: Wave clouds and a mountain cloud cap indicate high winds near the summit of a mountain?
7. True/False: Due to mixing of air in the atmosphere, a climber at 5000 m (16,400 ft) in the Alaska Range experiences roughly the same air temperature as a climber at the same elevation in the Himalayas?
8 Large thunderstorms typically develop over what time period: a) 14 hours b) 9 hours
c) 6 hours d) 1-2 hours?
9. During the summer, air temperatures _____ as a major low pressure storm approaches:
a) stay about the same b) cool down c) warm up ?
10. True/False: Most ‘ground blizzards’ occur <u>after</u> new snow has fallen?
11. On a night with no clouds and little wind, pick the location that will have the coldest morning temperature: a) top of a ridge b) half way up a ridge c) floor of a valley ?
12. True/False: Precipitation (rain or snow) always increases with increasing elevation?
13. True/False: The primary climbing seasons in Ecuador are May-September and January?
14. True/False: Climate statistics are not useful in expedition planning since the weather on any given day can be dramatically different then the long-term normals?
15. True/False: Water in the atmosphere <u>always</u> freezes when the air temperature is at or below 0^o C (32^o F)?
16. A large cumulus cloud generates the following types of ‘wind’: a) updraft b) downdraft
c) horizontal d) all of the above ?
17. True/False: Wind chill temperatures increase with decreasing wind speeds?

Answers can be found in Appendix 1.