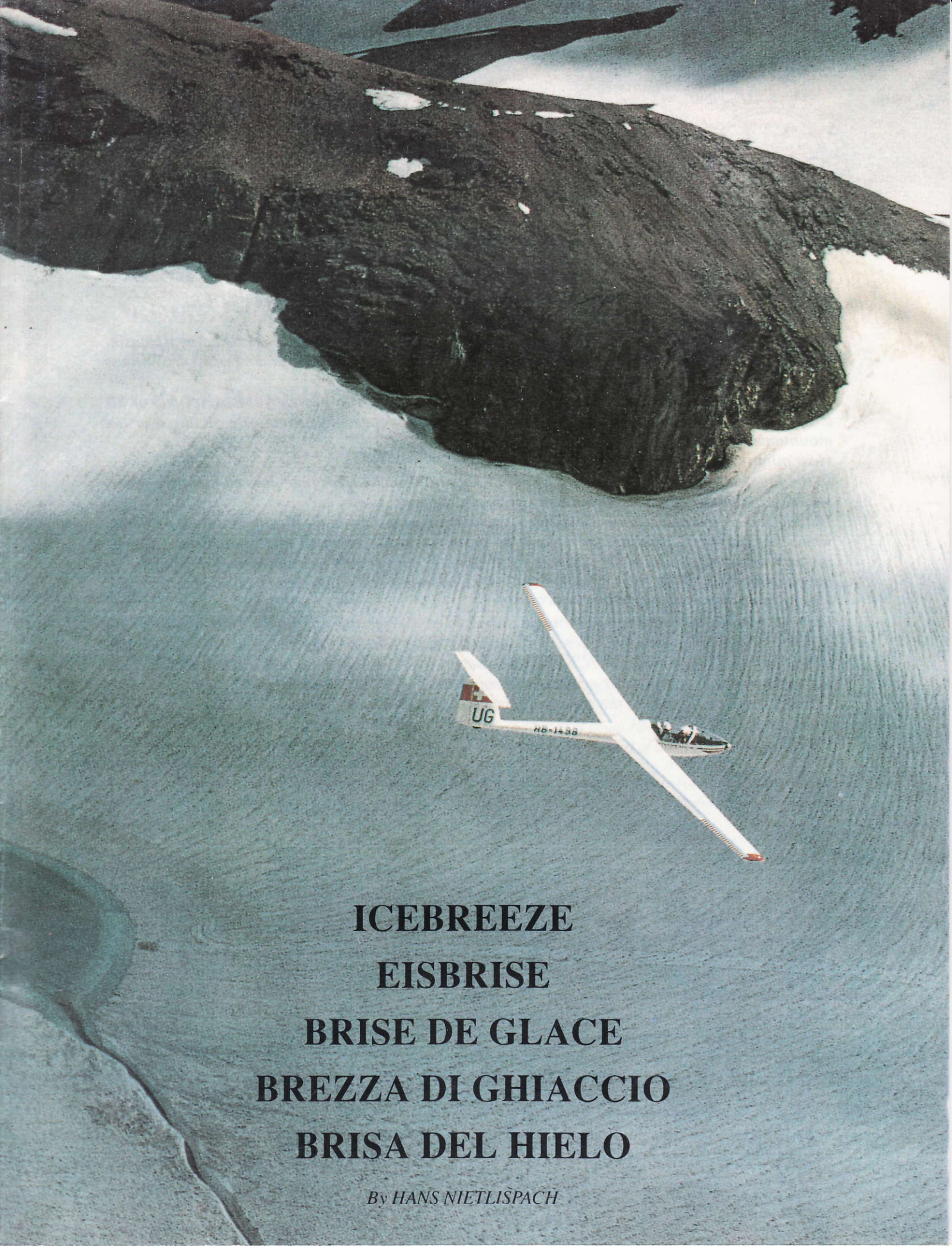


ICEBREEZE
EISBRISE
BRISE DE GLACE
BREZZA DI GHIACCIO
BRISA DEL HIELO

By HANS NIETLISPACH

An Introduction

by Dr. Manfred Reinhardt
(OSTIV President and Director of the Institute for Atmospheric Physics of DLR)

Who does not know Dr. Hans Nietlispach, possibly more famous under his nickname «Hansi», a top glider pilot of Switzerland over tens of years, and a participant in and winner of countless competitions in his country and abroad?
He is also the writer of numerous articles and reports, each giving wonderful descriptions of his adventurous flights, during which all possibilities abd challanges that come with gliding over the mountains were explored.
How mighty, descriptive and humorous his words!
In the following article we experience another Hans Nietlispach. This time he is an attentive observer of geographical features and meteorological processes.
Willing and ready to analyze and classify very many observations made during hundreds of flights which he completed in mountain regions, he offers a much condensed review of them, followed by some significant conclusions regarding such flights. Both should be studied very thoroughly by the community of glider pilots and meteorologists, so that similar flights can be turned into successful ones too.
If Hans now distills in his considerations the «cold airmasses sneaking down from the névé and glaciers day and night» as a main factor for planning flights over high snow and iceblanketed mountain areas, his creation of the name «ICEBREEZE» seems to be very accurate, and a pinpoint substitute for our normal technical term «catabatic downflow».
Glider pilots should use it, the meteorologists and physicists may forgive ... ou use it as well!

Wessling, August 1992

ICEBREEZE, *the cool little sister of the Seabreeze*

EISBRISE, *die kuehle kleine Schwester der Seebrise*

BRISE DE GLACE, *la petite soeur frileuse de la Brise de Mer*

BREZZA DI GHIACCIO, *la piccola sorella fresca della Brezza di Mare*

BRISA DEL HIELO, *la pequena hermana fria de la Brisa del Mar*

This deltoidikositetraeder manuscript is dedicated to OSTIV on the occasion of the Otto Lilienthal Centenary 1891-1991

by Hans Nietlispach
Switzerland

1. Introduction

The new meteorological notion of "Icebreeze" (10) will be explained on the basis of a description of certain microclimatic conditions of the Swiss region of Valais and why therefore the author names the Icebreeze the cool little sister of the Seabreeze.

This publication should lead airmen to a better understanding of valley wind systems connected to effects of Icebreeze for practical reasons, but also should invite scientists to activate collection of adeguate measurements corroborating theoretical reflection including ecological or even glaciological and astronomical aspects. It will finally be shown that this notion may be used as a collective name for similar phenomena all over the world.

2. The Region of Valais

The young Rhone River flowing west in a large main valley from its central alpine glacier origin with all the side valley affluents reaches the eastern end of the lake Geneva and drains the whole area of the Canton of Valais. 51 peaks reaching more than 4000 m are with impressing glaciers the highest mountains of the Alps - for example the Matterhorn south of Zermatt, Mont Blanc in the west and Jungfrau, Moench, Eiger in the north. The Valais, about some 120 km long and 60 km wide, offers a silent paradise to soaring alpinists when cloud base goes up to 5000 m in the southern high alpine part. But for four decades more and more observations (2) have shown that down under this paradise adverse winds are existing - envious of the high flying sailplanes.

3. Soaring in the Valais During Summertime

A. Summary of longtime inflight observations of the best afternoon soaring conditions in the Valais region (2):

A1. A longer period of high pressure above the Alps.

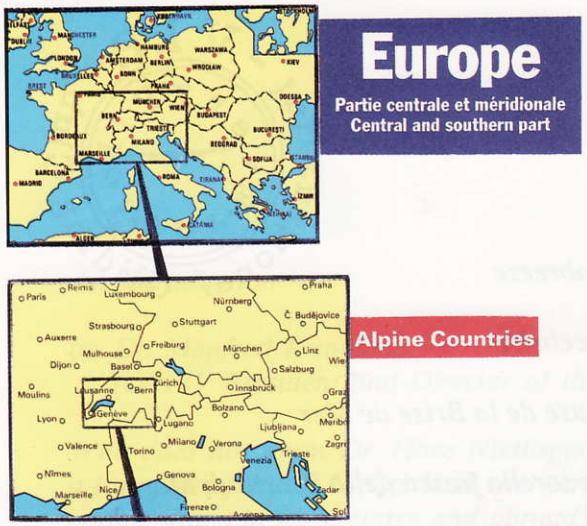
A2. Cloud base about 1000 m higher in the southern part than in the northern part of the region.

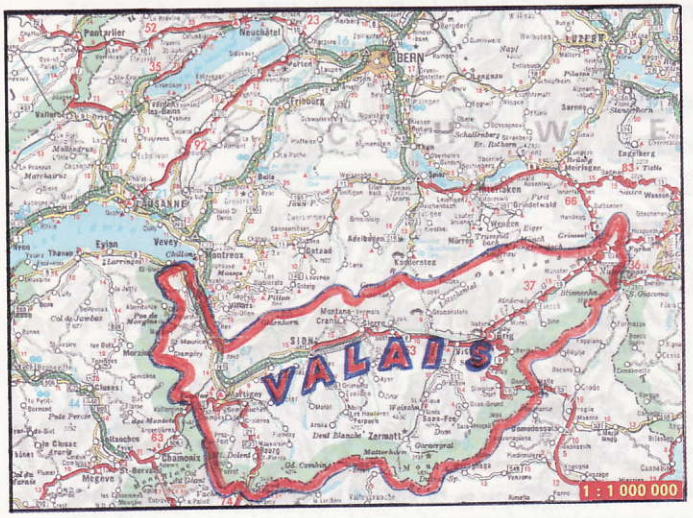
A3. Southern part cloud base reaching 5000 m ASL in the best days, descending abruptly above the southern Italian neighbourhood of the region.

A4. Synoptically in the western and eastern part of the region thermal conditions are only 1/3 as good as in the central part. In general, glaciers and eternal snow (névé) don't generate thermals or interesting dynamic effects, but obviously contain over their surface a layer of cold air like a thick protecting skin.

A5. Thermals begin to work rather late in the morning at a quite slow and boring rate. If you enter the region from high outside too early, you see distinctly a layer of haze in the bottom of the valley. This is an airmass hostile to soaring, filling up half of the huge bathtub under your ship.

A6. The valley wind from the west, obviously backed up by (an inland) seabreeze, originated by the lake Geneva, sets in when thermals in the central part of the region are getting active.



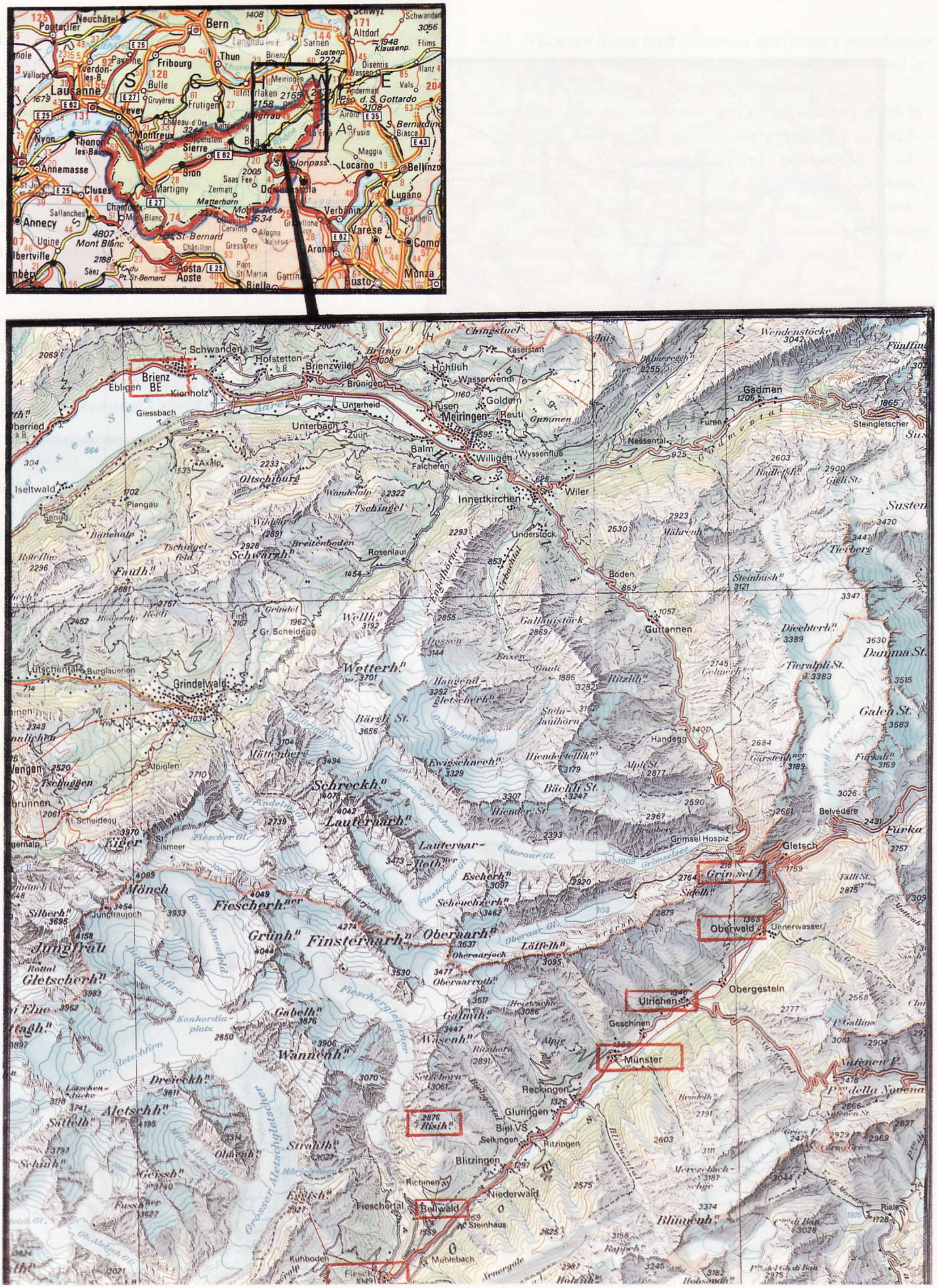


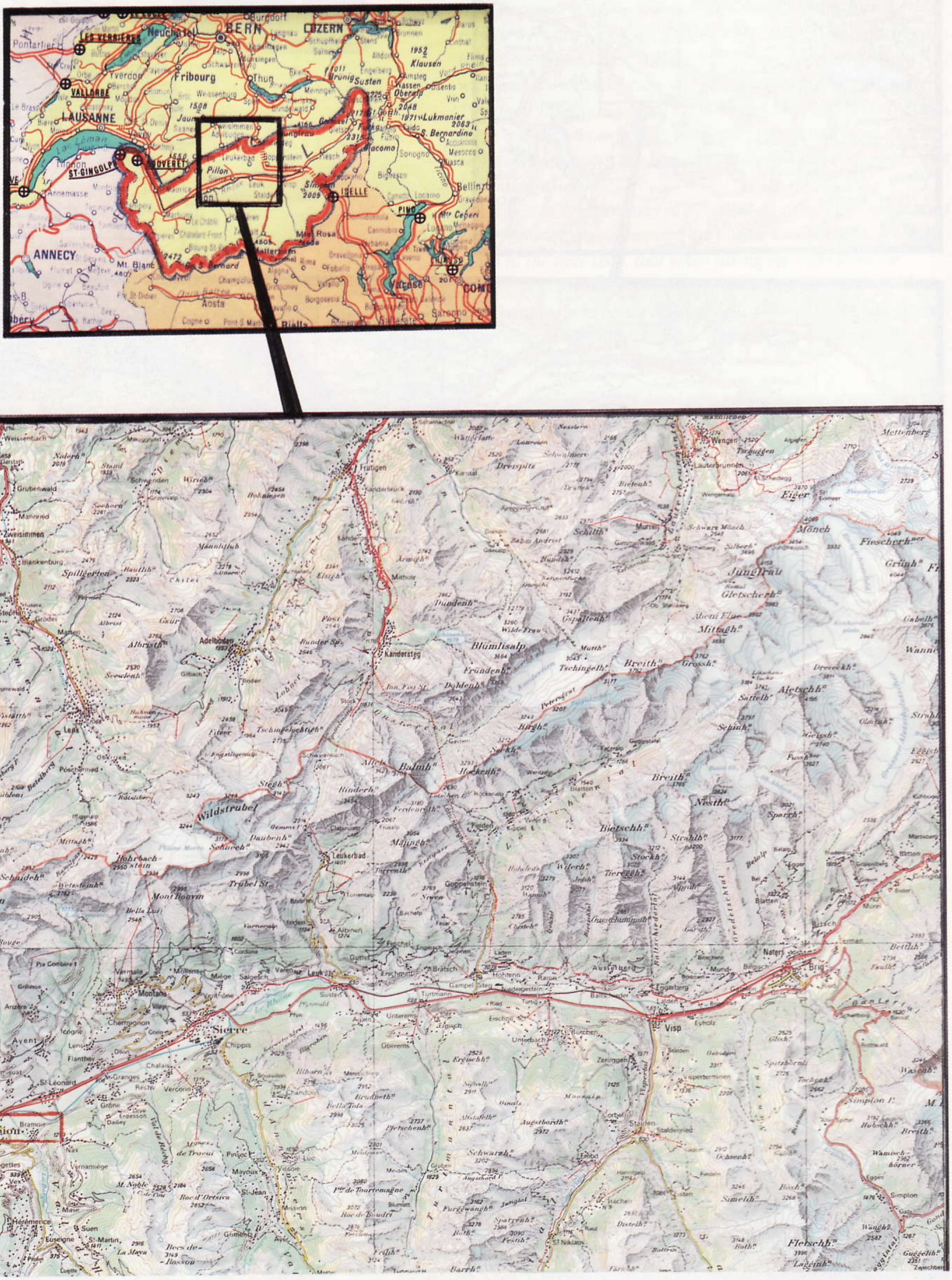
A7. The thermal destructive effect of this Seabreeze/Valley wind is preserved the whole afternoon, but moves slowly from east to west and from altitude to lower levels. The correlated inversion moves in the same sense, remaining higher in the west and lower in the east, thereby forming a probably waved "inclined-inversion-plane". If you drop through this inversion, there is a distinct smell of "Raclette", a very fine local cheese-snack, because your landing at Sion Airport or somewhere else is imminent.
So, you better fly and stay high above all ridges and mountains right from the beginning and during the whole flight. All this leads to the necessity, that when taking off right from the Valais, you have to tow higher in the western part at midday - for example up to about 2500 m ASL or more when you intend to release in the vicinity of Bex Airfield, but releasing at least at 2000 m ASL near Sion Airport.

A8. Even if the valley wind gets rather strong, dynamic possibilities are poor and capricious and will improve only in the middle of the afternoon with increasing insolation of a well known restricted number of northwest exposed slopes south of the Rhone river and may rise your glider from less than 1000 m ASL to the top of such thermodynamic pleasure.

A9. During valley wind regime no thermals can be found above the main valley. This will change at the beginning of the evening when good looking cumuli give reliable lift in the middle of the valley.

Every evening the region of the lake of Brienz and the lake of Thoune, invisible in the background, is filled up with icebreeze/mountain wind airmasses changing during night into local seabreeze for the next morning. Read A. 10


Neuchâtel
Bern
Schwyz
Altdorf
Fribourg
Thun
Sarnen
Brienz
Lausanne
Bulle
Vevey
Interlaken
Meiringen
Disentis
Montreux
Frutigen
Jungfrau
Andermatt
Pso. d. S. Gottardo
Nyon
Thonon-les-Bains
Sierre
Sion
Brig
Airolo
S. Bernardino
Annemasse
Martigny
Zermatt
Simplonpass
Locarno
Bellinzona
Lugano
Cluses
Chamonix
Matterhorn
Monte Rosa
Domodossola
Verbania
Annecy
Mont Blanc
Gr. St-Bernard
Varese
Como
Albertville
Aosta
Aoste
Biella
Busto
Monza
Brienz BE
Ebligen
Kienholz
Giessbach
Schwanden
Hofstetten
Brienzwiler
Brünig P.
Brünigen
Hohfluh
Wasserwendi
Goldern
Reuti
Unterheid
Hasliberg
Husen
Meiringen
Unterbach
Zaun
Balm
Willigen
Wyssenflue
Falcheren
Innertkirchen
Wiler
Iseltwald
Axalp
Oltschiburg
Plangau
Tschingel
Wandelalp
Rosenlaui
Schwarzh.
Faulh.
Gadmen
Furen
Nessental
Steingletscher
Susten
Tierberg
Understock
Boden
Guttannen
Grindelwald
Gr. Scheidegg
Wetterh.
Wellh.
Burglauenen
Lütschental
Dossen
Hangendgletscherh.
Gallauistöck
Ritzlih.
Diechterh.
Tieralpli St.
Damma St.
Galen St.
Handegg
Mettenberg
Schreckh.
Lauteraarh.
Ewigschneeh.
Bächli St.
Furkah.
Belvédère
Furka
Gletsch
Grimsel Hospiz
Grimsel P.
Sidelh.
Eiger
Mönch
Jungfraujoch
Fiescherh.
Finsteraarh.
Oberaarh.
Grünh.
Löffelh.
Oberwald
Unterwasser
Obergesteln
Ulrichen
Geschinen
Münster
Reckingen
Gluringen
Biel VS
Selkingen
Ritzingen
Blitzingen
Jungfrau
Gletscherh.
Konkordiaplatz
Wannenh.
Dreieckh.
Aletschh.
Grosser Aletschgletscher
Risih.
Nufenen P.
Pso. della Novena
Niederwald
Fieschertal
Bellwald
Steinhaus
Blinnenh.
Mühlebach
Kuhboden
Fiesch


BERN
LUZERN
Neuchâtel
LES VERRIERES
Pontarlier
VALLORBE
Yverdon
Fribourg
Thun
LAUSANNE
Lac Léman
ST-GINGOLPH
LE BOUVERET
Annemasse
ANNECY
Mt. Blanc
Aosta
Pillon
Simplon
ISELLE
PINO
Mte Rosa
Gd St. Bernard
Klausen
Susten
Brünig
Oberalp
Lukmanier
S. Bernardino
Locarno
Bellinzona
Weissenbach
Zweisimmen
Frutigen
Wengen
Lauterbrunnen
Eiger
Mönch
Jungfrau
Adelboden
Kandersteg
Blümlisalp
Lenk
Wildstrubel
Leukerbad
Montana
Sierre
Leuk
Sion
Visp
Brig
Naters
Stalden
St. Jean
Simplon
Fletschh.

A10. The upper Rhone Valley (3), (4), (5) Muenster Airfield at 1328 m ASL shows a very interesting diurnal wind direction developement: in the late morning tow pilots have to take off against wind blowing from southwest and gliders release northeast of Fiesch between Bellwald and the Risihorn. But after a short calm around midday or later they are taking off toward a gusty northeasterly wind and gliders release at about 2000 m ASL or more inside thermodynamic lift of a southern slope between Ulrichen and Oberwald.
It was observed that this Muenster Airfield afternoon wind is supported by a valley wind starting from the lake of Brienz with some possible seabreeze effect and flowing up through the Haslital (= upper Aare Valley), crossing the Grimsel Pass and falling down south along the Aargrat.

A11. So, while strong valley wind at Sion Airport blows from southwest, Muenster Airfield wind direction is opposite.

A12. The daily heating by insolation is joined with atmospheric pressure drop in the valleys - the more heating, the more pressure drop. Where the heating is strongest, there you may talk of the "Heatpole" with the greatest pressure drop. The Valais heatpole is situated around Fiesch. This explains the opposite wind direction of lower and upper Rhone Valley. The same explanation applies to the upper Engadin Valley, where the heatpole, distinctly situated east of Samedan Airport, generates the famous "Maloyawind".

A13. When not flying high enough in afternoon's paradise, or when a slightly other general met situation than described in A.1 to A.12, for instance during the 1990 Swiss Gliding Championships at Sion airport, gives the whole bag of tricks with clouds sneaking low under the mountain tops, one will possibly come to know unexpected and apparently illogical strong downwash or even more extended dramatic catabatic wind along sun exposed rocky mountain ridges at the north side of the Rhone. An urgent necessity of outlanding or losing time at 200 m above the lowest valley floor will make your heart beat at high frequency.

This last aspect is of special interest:

You may try to avoid the imminent outlanding in a very weak thermal, just holding the altitude and try hopefully several times to change in another airmass along the slopes just south of the Rhone. If you are lucky, you will be able to continue the flight in normal conditions, yet rather frustrated. But you will also remember the same poor conditions during a World Championship contest 1974 in the South Australian Seabreeze: A triangle's first turning point was located southwhest, the second one southeast of Waikerie. An unexpectedly quick advancing seabreeze from southwest was just avoided by the early starters, but punished severely the usual starting-time gamblers, who had to round the first turnpoint in dead air and went down to 200 m AGL or less on the second leg. With great

loss of time they reached the good conditions around the second turnpoint, sneaking above the outback in very weak thermals going up to 250 m AGL. This was due to the Seabreeze effect.

A14. After so many adventures you will ask yourself, why this behaviour so hostile of the northern side in the best afternoon conditions is not repeated at the same time above the southern side of the Rhone.

A15. You just have to wait for the later evening, when the big reverse of the valley wind in the descending mountain wind takes place also in the south, because the sun heating effect decreases. At this point you will be likewise disappointed of these southern slopes. The colder mountain wind flows down under the warmer airmass in the middle of the main valley and rises up thermals and cumuli good for late use.
Read again A9.

A16. During the whole night and a good part of the next morning mountain winds flow west to meet the lake Geneva until valley wind starts the cycle again.

B. Summary of Preliminary Conclusions

B1. It is obvious that the cold airmasses above névé and glaciers are moving softly downwards the inclinations day and night during the warm seasons. Relatively heavier than the ambient warmer air, they flow down underneath the warmer airmasses with all the well known effects of the Seabreeze such as forming an inversion and other passive features, hostile to soaring. There is one important difference however: streaming down in the mountains everywhere, these airmasses are an active cause of downdraft. This catabatic effect is more marked during the diurnal drop of pressure. See A 12. and A 13.

B2. It is time to give to those cold airmasses, sneaking down from the névé and glaciers day and night, a name. Let us call them:

ICEBREEZE

B3. Icebreeze is expected to flow slowly up high, faster and more turbulent in the lower part of névés or glaciers. Icebreeze descends farther than the end of glaciers until density difference between ambient airmass and Icebreeze ends by adiabatic warm. There is a direct relation between the thickness of the layer of Icebreeze and the temperature difference between ice surface and the ambient airmass with all the obvious variations between cold and warm seasons.

B4. Do you agree to talk even of a little Icebreeze Front when you read again A.13? What about the different other local Icebreeze Effects under the merry, strong and high reaching paradise thermals?

B5. And what do you think, how large is the part of Icebreeze in the Valais mountain winds?

B6. ***Icebreeze Mixes with Sea Breeze.***

If you look on the map of the Valais for the distribution of the icebreeze generators, if you remember the extension of the icebreeze effect down the side valleys and rather far to the west of the main valley and if you imagine the icebreeze influence in the western part of the region, you can easily see that the lake Geneve (inland) Seabreeze but also the possible influence of the lake of Brienz Seabreeze will join several individual Icebreezes in different places and mix up to a rather complicated substructure of the high soaring paradise. You will have little trouble to make an addition of the Valais spots where Icebreeze will mix with Seabreeze/Valley wind, valley wind and/or mountain wind. Play the game.

B7. To learn all about the Seebreeeze/Icebreeze Connection you will expect scientists to accumulate all necessary data to build up theories including ecological aspects. When casting a glance in a modern scientists bag, you will find tools like "Mathematics of Chaos, Mixing, Fractals $x = x^2 + 10$, Double Periods, Mandelbrot Quantity, Affine Transformation" and others. Worried, while waiting for results, you better imagine in the meantime, how the world-famed great Seabreeze takes the cool hand of her little Icebreeze sister, how they embrace and how they put their heads together and whisper how to catch those elegant sailplanes above them.

4. General Use of The Notion of ICEBREEZE

4.1 Some 60 years ago (1) in Germany, people were beginning to talk very "gruendlich" (thoroughly) about "Luftstroemungen in Bereich von Gletschern" (airflow in glacier areas) and "Gletscherwind" (glacier wind).

4.2 In 1985 the "First Himalayan Soaring Expedition" (6), (7), (8), (9) explored, among other things, the thermally driven mountain valley wind circulation in the world's largest and deepest valley in the Nepalese Himalayas, named the Kali Gandaki Valley, which connects the Tibetian high plain directly with the Indian plain over a length of 70 km, a 35 Km width, a depth of 6000 m and passes between Dhaulagiri (I) (8167 m) and Annapurna (I) (8091 m).

4.3 With a motorglider Valentin Taifun 17E, the successful expedition registered most interesting data, among them Dr. Manfred Reinhardt used the terms "Gletscherabwind" (glacier downdraft) and "Kali Gandaki Wind" for the Annapurna and Dhaulagiri glacier descending airmasses and stated their vectors. Dr.Reinhardt, president of OSTIV and head of the Institute for Atmospheric Physics of DLR (Deutsche Forschungsanstalt fuer Luft - und Raumfahrt e.V.), was delighted to get from the author the proposal for a new notion of "Icebreeze", circumscribing the Himalayan observations, and will endeavour to introduce this name (10).
The meritorious secretary of OSTIV, Frau Loeb, is anyhow

Chile's ***Cerro Aucanquilcha,*** *6176 m.*
wears a cool Icebreeze veil.

already convinced that snowman YETI is exclusively breathing icebreeze.

4.4 The Himalayan Kali Gandaki Valley wind system appears to be less complicated than the Valais system described earlier, because there, no (local inland) seabreeze effect can be mixed with valley/ mountain wind and Icebreeze.

4.5 The Swiss lakes, embedded in the northern foothills of the Alps, the western part of lake Geneva and of Mont Blanc in France, but also the site of the lakes in northern Italy let presume Seabreeze/Icebreeze connection. Where else in the world? Could' nt Antarctica be a gigantic icebreeze generator?

4.6 The notion "Icebreeze" could be the collective name for névé, glacier and snow originated descending winds, flowing everywhere on earth or elsewhere in the solar system, e.g. on planet Mars with its mountainous polar icecaps.

4.7 So, you may use this new notion, though Icebreeze is really only the little sister of the Seabreeze. But everywhere glaciers and névés ask great caution, be it in the Alps, the Himalaya, the Rocky Mountains, New Zealand, the Andes, Antarctica or elsewhere. See the cover of the magazine, where a monstuous giant rocky black hand rests on ice as a warning, but is ready to catch careless sailplanes.

Did you hear of Cerro Aconcagua near Santiago de Chile, with its 6960 m the highest mountain of the Andes and of both Americas where the cold is the hell and the wind is its devil? Did you know of this mysterious thirteen year old girl sacrified to the sun by the Incas looking down with frozen eyes in the deep Andes valleys for five hundred years from her heaven-high Aconcagua grave? If you do not feel sure to understand all about the cold breath of glaciers, if you hope this Inca Girl to tell you more about Icebreeze, then take to heart that her ice-cold mouth is closed for eternity.

5. Summary

The new notion of "Icebreeze" is explained extensively with the wind system of the Central Alpine region of Valais. The use of a few unconventional terms is a consequence and sometimes systematic austerity is slightly kept in background in favour of a more agreeable presentation. It is shown how Seebreeze and Icebreeze mix. For better understanding of complex wind systems and their interdisciplinary aspects, scientific data collection by field measurements is proposed. Verbal and physical relationship to the well known" Seabreeze" should make it easy to introduce this term in Atmospheric Physics.

* * * * *

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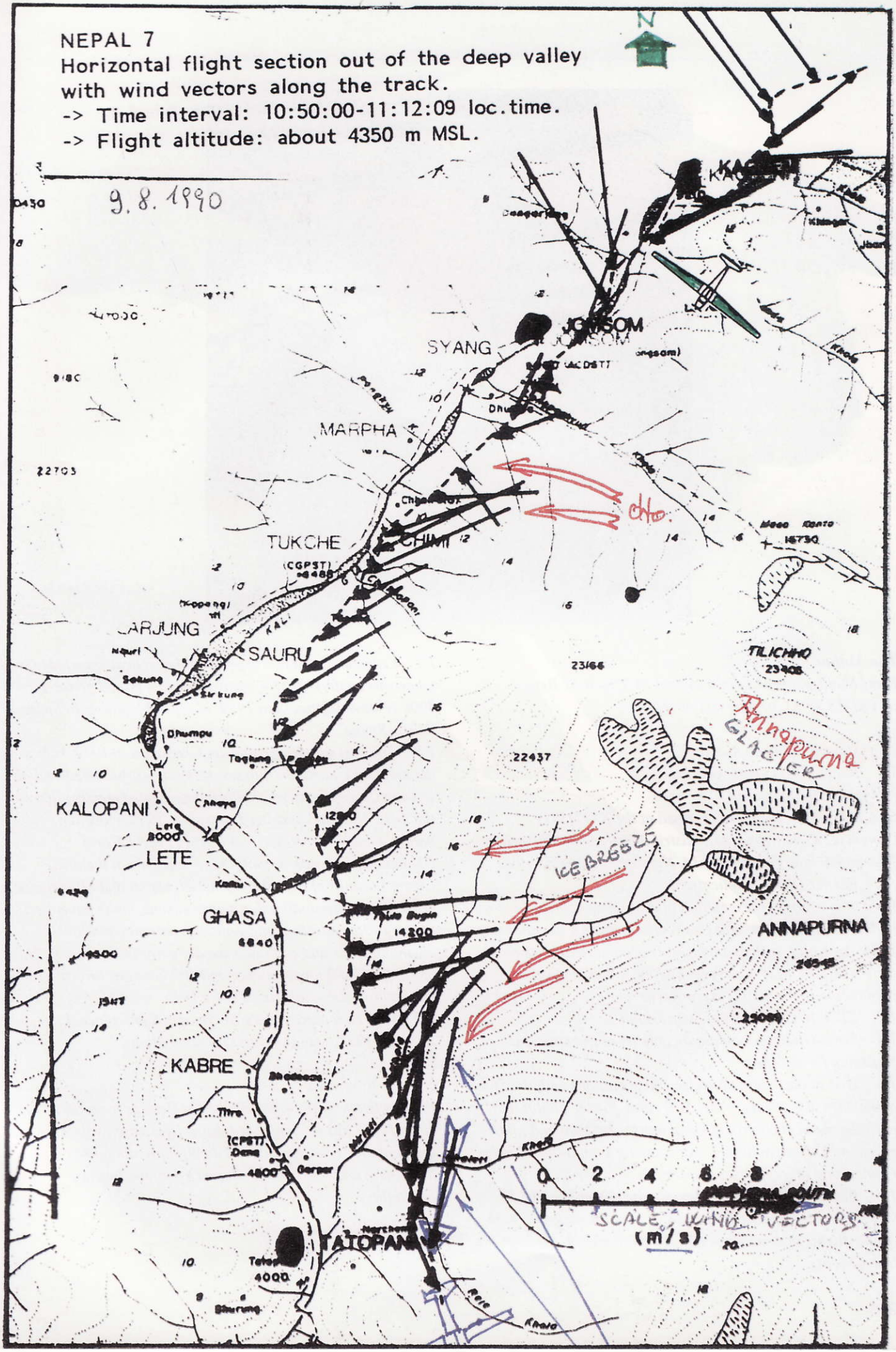
Photographs
Cover: Hans Maerki, Meggen. Photo para A.5: By courtesy of Walliser Verkehrsverband. Cerro Aucanquilcha: Loren McIntyre by courtesy of National Geographic Magazine. Lake of Brienz: By courtesy of Railways of the Jungfrau Region.

Cartography
Dr. Manfred Reinhardt, DLR, "Nepal 7". Map graphics Hans Nietlispach.


NEPAL 7
Horizontal flight section out of the deep valley
with wind vectors along the track.
-> Time interval: 10:50:00-11:12:09 loc.time.
-> Flight altitude: about 4350 m MSL.
9.8.1990
N
JOMSOM
SYANG
MARPHA
TUKCHE
CHIMI
KAGBENI
TILICHHO
23166
22437
Annapurna GLACIER
ICE BRGE
ANNAPURNA
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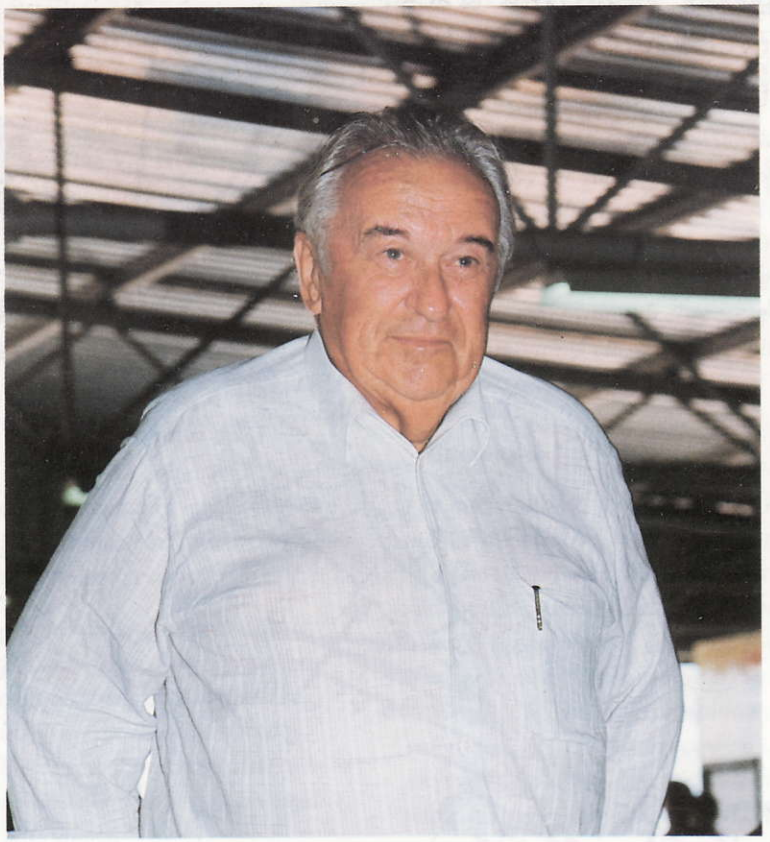
GHASA
KABRE
TATOPANI
SCALE, WIND VECTORS
(m/s)



The Author
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1. Contributions to Soaring
1.1 Recent OSTIV publications
A. Manuscript Icebreeze
B. A Y-Aerotow, a paper presented at the XXI OSTIV Congress, Wiener Neustadt, Austria, 1989, and published in "Technical Soaring" Volume14, Number 1, January, 1990.
1.2 Earlier OSTIV publication:
First international presentation of Phototime camera prototype and its possibilities at Wakerie World Soaring Championships 1974, Australia, with an immediatly organised discussion at the Wakeries OSTIV Congress and the following Ostiv publication in the Swiss "Aero-Revue".
1.3 CIVV/IGC delegate of Switzerland.
1.4 Swiss Gliding Commission activity as member and chairman for decades.
1.5 Was at the origin of decisive negociations with the Swiss authorities, e.g. for the glider IFR rules, for the abolition of the periodic medical control of parachutists, balloon and glider pilots, now effective for ten years, saving so millions of Swiss Francs, and other important items.
1.6 Besides normal instructor activity during the last 45 years, executed practical training of long distance and high Alpine flights in double command with numerous pilots in the last 40 years.
1.7 Communicated corresponding theoretical knowledge in numerous conferences for many clubs and issued privately 5000 relative textbooks in 1959. Many publications in Swiss "Aero-Revue".
1.8 The first time Swiss soaring Champion in 1949, H.N. won the national Champion title seventeen times, became Belgium soaring Champion twice, holds uninterrupted membership of the Swiss National Soaring Team since 1949, made ten national soaring records, took part in twelve World Championships, was/is qualified to take part at the orld Championships of Benalla, Wiener-Neustadt and Minden, but refused the participation for many reasons, made many first places in several other international, national and local championships and continues the activities in this sector. Has more than 5600 hours gliding and 500 hours as aircraft (tow) pilot and is active instructor since 1945.
1.9 Was honoured at the FAI General Conference, Los Angeles, 1983, with the Otto Lilienthal Medal.

2. Short Biography
Born at Olten in 1924, established at Bern as a dental surgeon since 1951, still working hard, Hans lives happily with his wife and longtime crew Josette and the fifth private glider "Discus", and is prepared to search for new soaring highlights.