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Mountain Regions, Wintertourism and Possible Climate Change: Example Austria

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Problem description

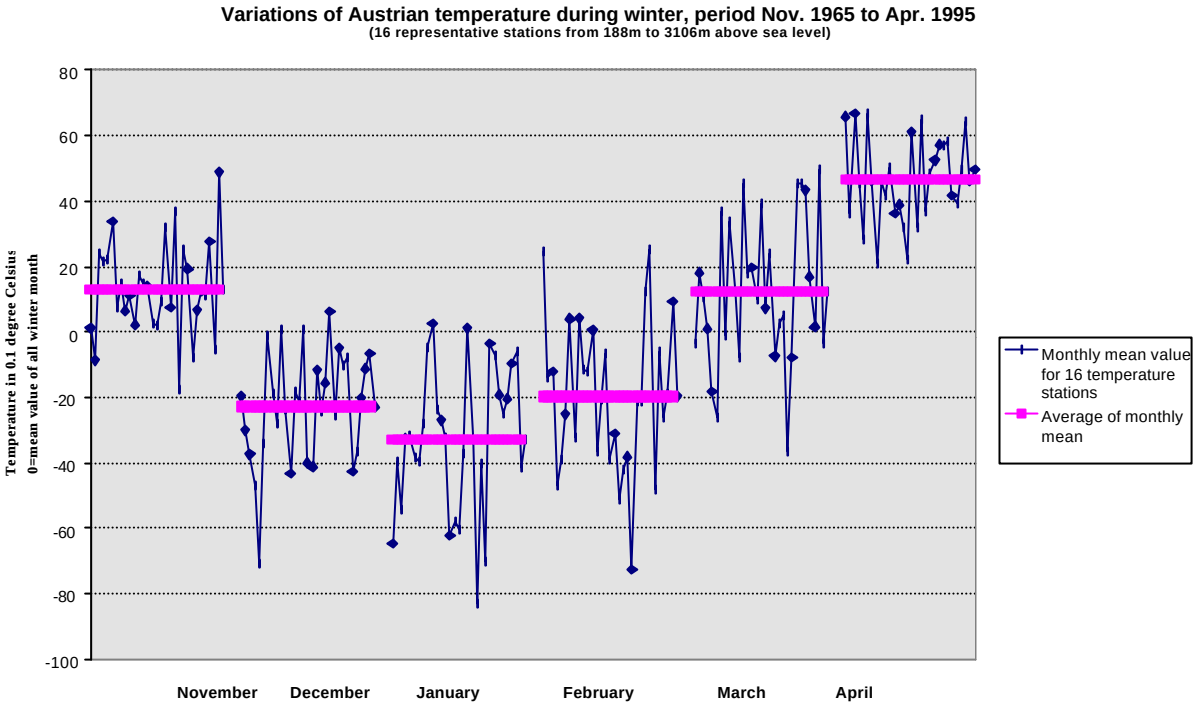
The industry of Austria is climate dependent. A shift in climate may represent a major threat to the tourist industry. Variability of climate conditions, mainly snow cover, is an important factor for winter tourism, which alone accounts for 4 % of the GNP of Austria. The climate of the recent 30 year period (1965 - 1995) has been examined from the tourist point of view.
Some areas whose industry depend on winter sport activities and situated in areas of lower altitudes, may not be able to sustain the present level of economy and may be compelled to look for alternatives. Current crises in the economy of tourism is a fact and economic experts anticipate a further decrease in the economy of this sector. Climatic fluctuations may increase the need for funds to be invested in snow making equipment at a time when the economic potential is shrinking. The 80,000 companies who are dependent on tourist business have their financial credibility set on the bases of revenues from tourism.

The most prevalent problems for the winter tourism are caused by climate. Alone a slight increase in air temperature may cause serious problems to the winter tourist industry. However, other factors than climate variability may cause problems to this industry.
Environmental dilemmas are in this context in the first place and are expected to appear in the regions were the economy of decreased tourism is concentrated. Funds to provide landscape management and erosion protection measures will under these conditions be limited. This may even multiply the degradation due to events of extreme weather condition (can occur long before ecological impacts of possible climate change become apparent).

Regional and local variance may occur within Austria. A conceivable scenario is that some small areas at the fringe of Alpine region might be the first to suffer significant losses and the next in line might be the region of the lower Alps. Areas that are much dependent on tourism may suffer the most as no real alternative to income from winter tourism is present.

Climate parameters

a) temperature

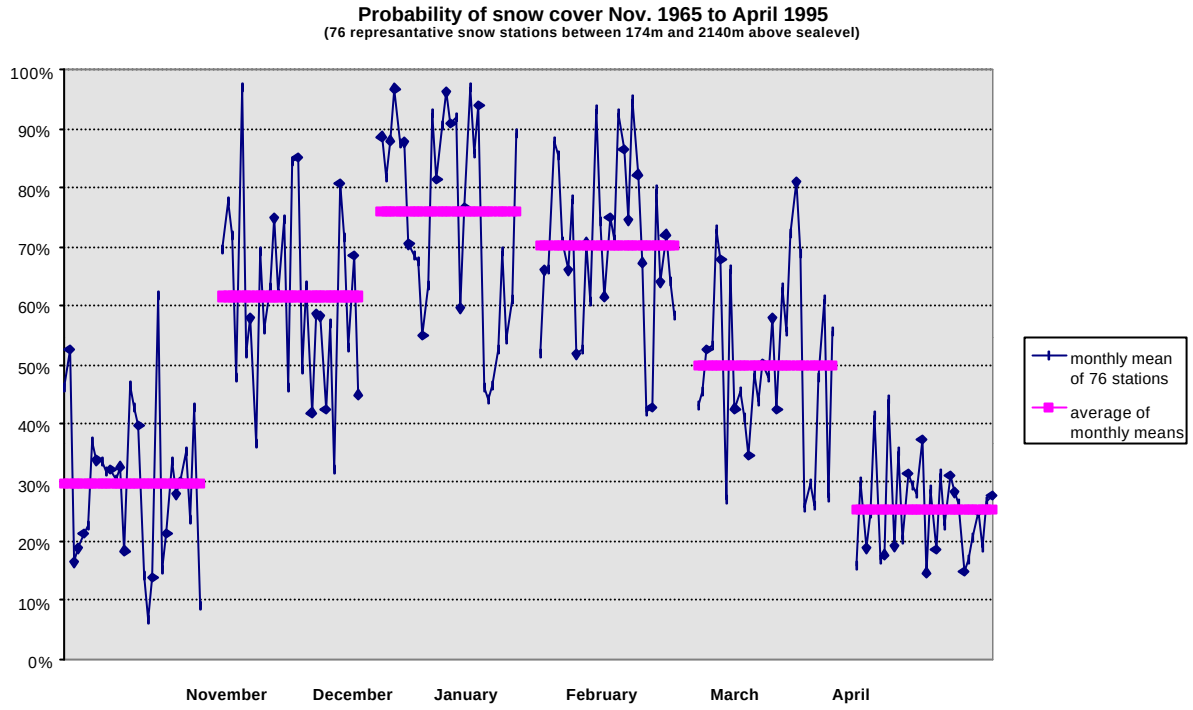


The approach of our study was to arrange the recent 30 winter seasons according to their suitability for winter tourism into the categories ”good” (colder than average) and ”bad” (warmer than average). The data on temperature was derived from the recordings at 16 stations located between the altitudes of 188 and 3106 meters above sea level. The average of winter temperature is somewhat higher for the recent period of 30 years than for the recent 150 year period. Thus will the ratio of ”good” and ”bad” seasons differ somewhat according to what time period we make use of. The observed trend of warming during the last 30 years will produce fewer ”bad” seasons than the average of the 150 year period. This relative classification has to be taken into account when the material is being evaluated.

Table 1: Ratio between cooler and warmer month relative to the average of 1965-1995.

Month	1965 to 1995		0.5 ° C cooler		2° C warmer		3° C warmer	
	good	*bad*	*good*	*bad*	*good*	*bad*	*good*	*bad*
November	**15**	**15**	**18**	**12**	**3**	**27**	**1**	**29**
December	**15**	**15**	**19**	**11**	**4**	**26**	**0**	**30**
January	**17**	**13**	**19**	**11**	**7**	**23**	**2**	**28**
February	**14**	**16**	**17**	**13**	**7**	**23**	**3**	**27**
March	**14**	**16**	**16**	**14**	**8**	**22**	**5**	**25**
April	**15**	**15**	**19**	**11**	**1**	**29**	**0**	**30**

b) snow



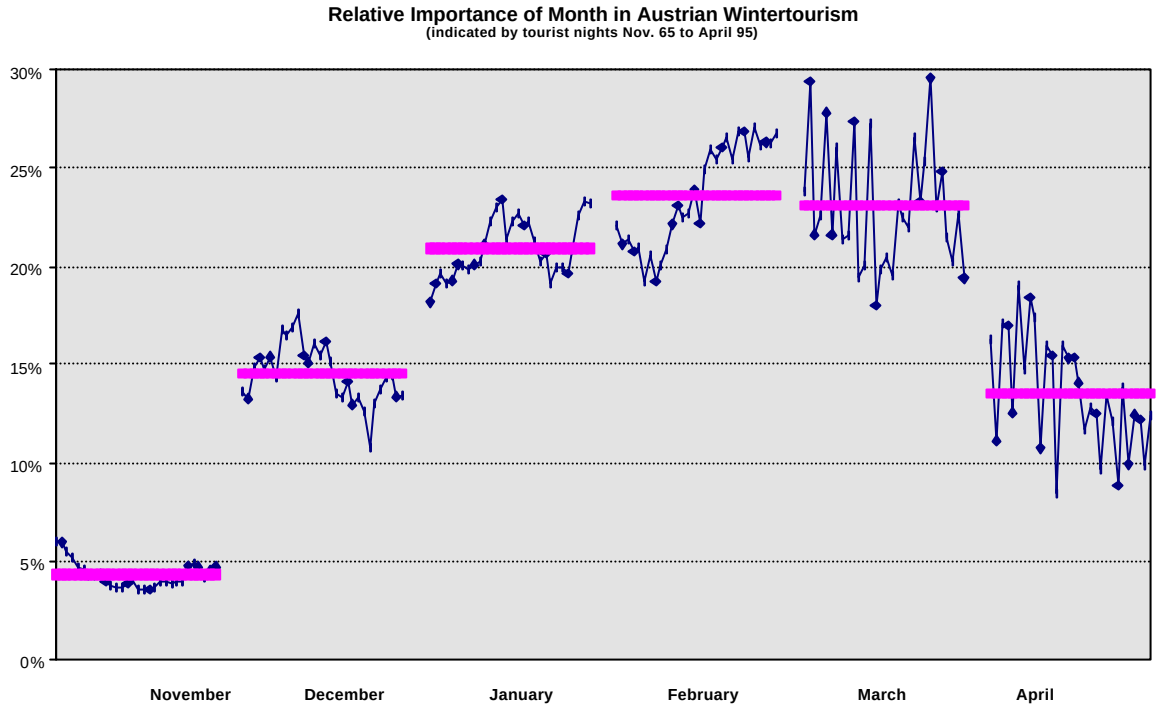
Even more important than the temperature variability are the fluctuations in snow conditions. Snow is dependent on the climate parameters temperature and precipitation. While temperature is related to altitude is the situation more complex for the factor precipitation. Large variations may occur within tourist regions. For the whole of Austria does the month of January bring the best snow conditions. In this month is the maximum average probability of snow cover 77% (based on 76 recording sites situated between 174m and 2140m o.s.l.). The closer we come into the warmer season the more favoured are the resorts situated at higher altitudes. They may maintain a snow cover suitable for skiing (30 cm) into the month of April. One favourable characteristic of the snow cover at these winter resorts is the time lag between the effects of raising air temperature during the day and the maintenance of an appropriate snow cover.
In the perspective of climate are the resorts located in the lower altitudes to be characterised as very vulnerable to variability during the month of December (Christmas season). The probability of having a suitable snow cover for winter skiing is relatively low.

Tourism parameters

c) development of winter tourism in Austria.

During the period from 1965/66 to 1994/95 has the volume of winter tourism in Austria more than tripled. In particular where the first two decades accompanied by rapid growth. Tourism is Austria's major "export" item. The foreign trade deficit has during this period to a great extent been balanced by the income of winter tourism as foreigners constitute two thirds of the guests in the resorts of Austria. On an average do one guest generate an income well over US$ 100 per day. The current winter tourism provides an annual net income of more than five billion US$. The western Alpine part of Austria contributes the most to the volume of tourism. Large regional and local differences are present. A potential warming of the winter climate is presumed to widen the gap and thus impose an even greater concentration of tourist activities to the favoured locations and the less favoured resorts may experience notable difficulties.

d) relative share of different month in winter tourism



The demand for services at the winter tourism resorts fluctuates during the winter season months. February is currently the most important month for winter tourism as season holidays has become frequent in several of the European countries. The secondary peaks are related to the Christmas and Easter seasons. In the sixties was March the most important month to the tourist revenue. December is important because of the notable peak during the Christmas season. When the Easter season falls into the month of April are the tourist activities high even in this month. The advantages of January, the month with the best snow conditions, are nut fully utilised. To some extent may the losses caused by climate fluctuations be compensated by an increased traffic in January. However, the concentration of the tourist business to fewer months may cause logistic problems concerning the capacity for accommodation and for the employment.

Summary:
Certain is that climate conditions constitute an important factor to the success of the winter tourist industry. An increase in the average monthly temperature are likely to reduce the frequency of ”good” seasons. A concentration of winter tourism to the midwinter months of January and February may become necessary. The present less intensively utilised month of January may provide a potential for expansion.

Certain is that the tourist resorts at lower location are likely to be disfavoured relative to those of higher location.

Uncertain is the effect of warming on specific locations. Due to temperature inversions may locations at an altitude of 900m have better snow conditions than resorts at 1300m. Other factors for local variations of snow cover are wind exposure and topography. We did not within the framework of our study follow those tracks.

In the republic of Austria is 56 % of the population settled below 400m. In the lower regions are winter based tourism activities of minor importance. The economic potential of the lowlands are, consequently, not likely be too much influenced by changes in snow conditions. The lands between 400m and 800m carries 38% of the population of Austria and has a great interest in winter tourism. The region is likely to experience an adversely affect caused by warming of the winter climate. This may cause a loss of industry and thus may in turn hurt the economy of the country (losses up till 1% of GNP by 2°C raise of average winter temperature) and thus causing great adversities to the economic balance of the region. Only 6% of the Austrian population live over 800m. At this altitude are the snow conditions are relatively safe. The tourist industry of higher regions may even experience a comparative advantage from the effects of a warming scenario.

For the examination of the future problems for the tourist industry one ought to take into account how the demand is influenced by the economic development in the home countries of the potential winter tourists [Germany (1), Austria (2) and Netherlands (3)], by the relative strength of the Austrian currency; and by the competition from tourist locations outside Austria.

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