# NORTHERN HEMISPHERE SNOW COVER CONDITIONS DURING THE WINTER OF 1982

720-82

By

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## INTRODUCTION

Snow cover area, on a continental basis, was impractical to measure until the advent of satellite data. However, beginning with the ESSA-3 satellite in 1966, and continuing to the present NOAA and GOES satellites, snow cover has been routinely mapped by the National Oceanic and Atmospheric Administration (NOAA) (Matson and Wiesnet, 1981). The utility of NOAA and GOES satellite data for mapping snow in drainage basins greater than about 1000 $km^2$ has been demonstrated by Schneider, et. al. (1976). In 1972, with the launch of Landsat by the National Aeronautics and Space Administration (NASA) and continuing to the present, high resolution multispectral imagery has been acquired which is particularly suitable for mapping snow in small mountainous watersheds not drastically affected by cloud cover. Table 1 presents some of the characteristics of the NOAA and NASA satellites currently used for mapping snow.

## THE WINTER OF 1982

During the winter of 1982, although the mean snow cover extent in Eurasia was near normal, the snow cover in North America was the third greatest since 1966. Figures 1, 2 and 3 show the monthly mean snow cover for the Northern Hemisphere for December 1981, January 1982 and February 1982, respectively.

## DECEMBER 1981

In December of 1981 (Figure 1) in North America the mean snow cover extent was 0.7 million $km^2$ above the 16 year mean of 15.8 million $km^2$ and more than 2 million $km^2$ greater than in December of 1980. This was the fourth largest December snow cover on record. In Eurasia the mean snow cover was 0.6 million $km^2$ above the normal of 25.9 million $km^2$ but over 3.5 million $km^2$ greater than the previous December.

## JANUARY 1982

The mean January 1982 snow cover extent (Figure 2) in North America of 18.2 million $km^2$ was tied for the second greatest on record and only 0.1 million sq. km. off the record set in January of 1979. The average snow cover for January is 17.2 million $km^2$. The snow cover in January of 1982 was more than 1 standard deviation above normal and almost 2.5 million $km^2$ greater than January of 1981. During a one week period in the middle of January 75% of the U.S. was covered by at least 2.5 cm of snow. The satellite image of January 14 revealed that in the contiguous U.S. every state except Florida had some snow on the ground. Over 100 low temperature records, including an all time low of $-31^{\circ}C$ for Chicago, were set in January of 1982. In Eurasia the snow cover was near the January mean of 28.9 million $km^2$ but more than 4 million $km^2$ greater than the previous January. In the winter grain areas of the western Ukraine the snow cover was patchy but no potential winterkill conditions were reported (U.S.D.C./U.S.D.A., 1982a).

## FEBRUARY 1982

During February of 1982 (Figure 3) in North America the mean snow cover was 0.7 million $km^2$ above the normal of 16.9 million $km^2$ but still more than 2 million $km^2$ greater than in February of 1981. This was the fourth largest February snow cover during the 16 year record. Temperatures for the most part were slightly above normal across most of the U.S. with the result that snowmelt occurred in the central Great Plains, Ohio Valley and the Middle Atlantic states. In Eurasia the February snow extent was 2 million $km^2$ below the normal of 29.6 million $km^2$ and nearly the same as in February of 1981. Although much of the western U.S.S.R. was quite dry in January and February, towards the end of February snowfall increased moisture supplies over the agricultural areas. This additional moisture is very beneficial when crops break dormancy and spring growth beings (U.S.D.C./U.S.D.A., 1982b).

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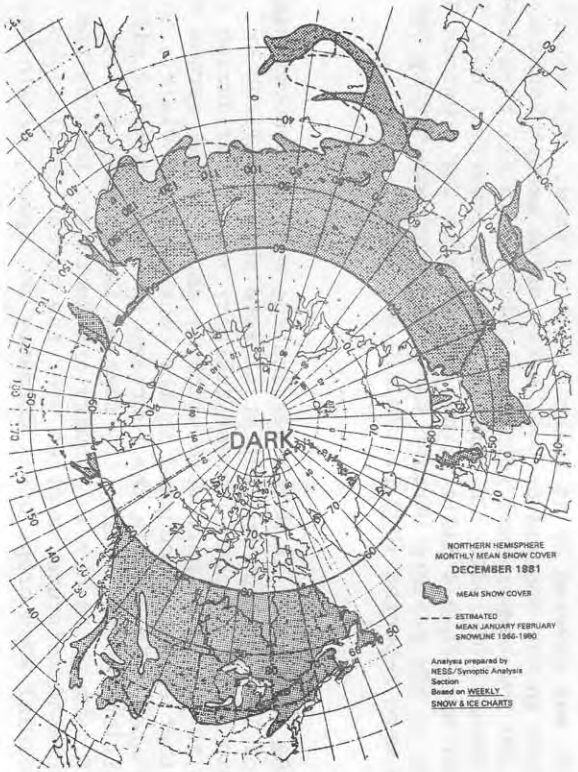


Figure 1

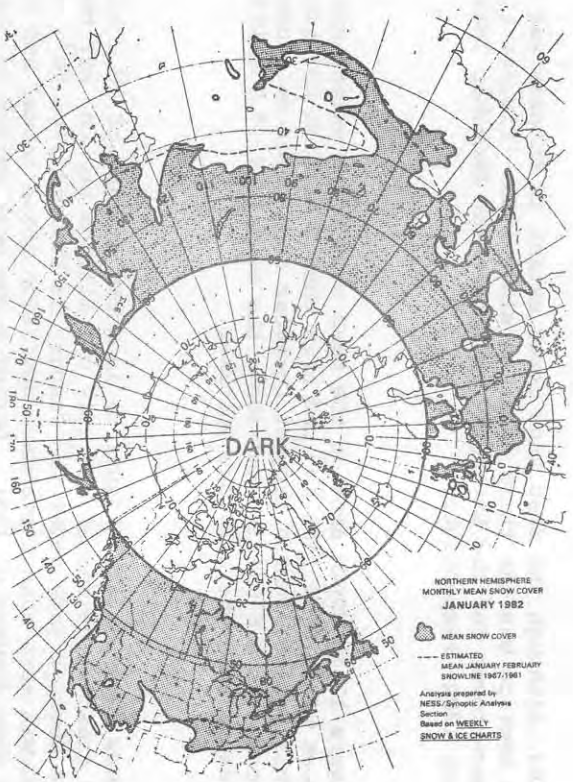


Figure 2

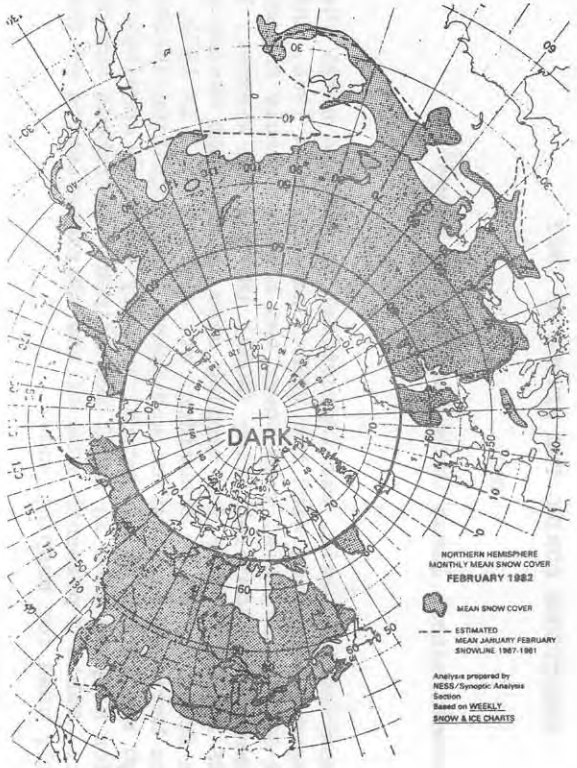


Figure 3

## SNOW COVER TRENDS

Figures 4, 5, and 6 are plots showing the average winter snow cover (December - February) for North America, Eurasia and the Northern Hemisphere, respectively. From Figure 4 it can be seen that the average winter snow cover for North America generally increased from 1967 to 1979. During the winters of 1980 and 1981 the average winter snow cover dropped off significantly from that of the previous year. For Eurasia (Figure 5) the winter snow cover shows an interesting cyclic pattern (Matson and Wiesnet, 1980). Snow cover maximums peaked in 1968, 1972 and 1978, and snow cover minimums were reached in 1970, 1975 and 1981. However, the data set is too short to confirm the apparent repeatability (Matson and Wiesnet, 1980). The average winter snow cover in both North America and Eurasia for both 1980 and 1981 decreased from that of the previous year, the first time this has been observed in the fifteen year period of record. During the winter of 1982, the average snow cover in both North America and Eurasia increased over that of the winter of 1981. Thus, for the last three winters (1980-82) the average winter snow cover on both continents has fluctuated similarly. Because Eurasia is a larger continent than North America, Eurasian seasonal snow cover variations dominate the North American variations with the result that the plot of the Northern Hemispheric average winter snow cover (Figure 6) is very similar to that for Eurasia (Figure 5).

## CONCLUSION

What implications or effects snow cover has on global or regional climate cannot be assessed at present due to the relatively short data base. Satellite snow cover data of the Northern Hemisphere from 1966-1981 has now been digitized by NOAA (Dewey and Heim, 1981), and recently snow cover data for the U.S. from 1948-1981 have been digitized by Walsh, et. al. (1982) using data from surface stations. Because there are many types of climatological products which can be derived from these snow cover archives, a greater knowledge of the role snow cover plays in understanding climatic variability should result.

## REFERENCES


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**NORTH AMERICAN AVERAGE WINTER SNOW COVER (DEC.-FEB.)**

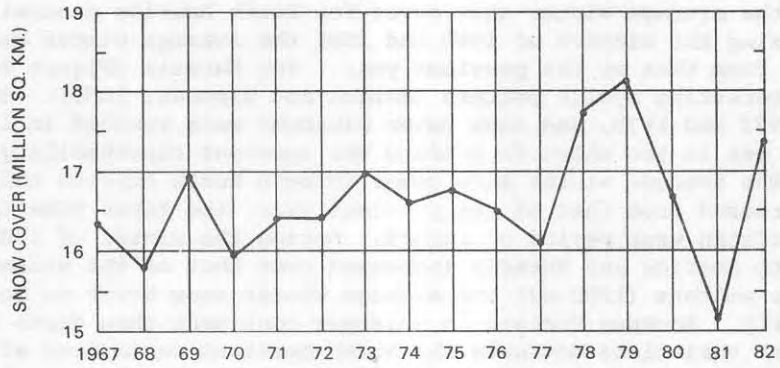


Figure 4

**EURASIAN AVERAGE WINTER SNOW COVER (DEC.-FEB.)**

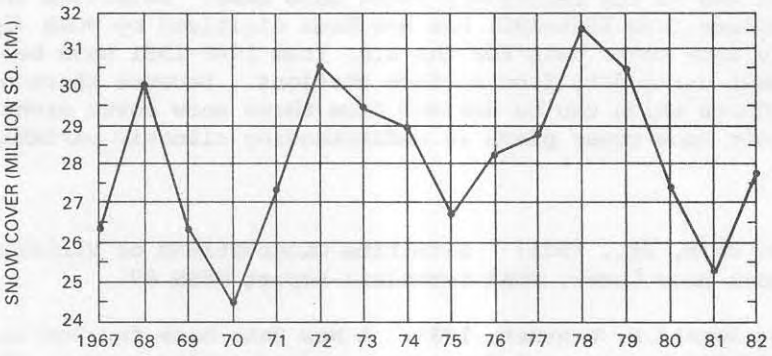


Figure 5

**NORTHERN HEMISPHERIC AVERAGE WINTER SNOW COVER (DEC.-FEB.)**

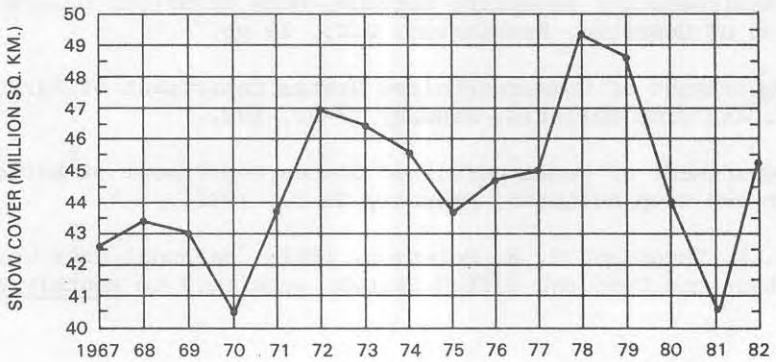


Figure 6