

PACIFIC REGION TECHNICAL NOTES

81-006

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THE NOCTURNAL LOW LEVEL JETS OVER PRINCE GEORGE

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INTRODUCTION

Numerous investigations have been made into the phenomenon of low level nocturnal jets which are a common feature in many parts of the world where the terrain is smooth. They occur frequently over the Great Plains Region of the United States (Bonner). There is not much evidence of them in mountainous terrain other than a study by A.J. Thorpe and T.H. Guymer (1977) indicated low level nocturnal jets over rough terrain in Britain under certain synoptic conditions.

LITERATURE REVIEW

The jet maximum which is supergeostrophic occurs just above the night time temperature inversion. Large wind shears of about 30 knots/1000 feet exist just below the maximum speed (Thorpe). They form with the onset of nighttime radiational cooling and dissipate as daytime heating destroys the inversion. Byram (1954) noted an intensification of forest fires in the presence of low level jets. Such jets if they exist in B.C. could be of significance during slash burning or for on-going forest fires.

Some of the conditions for the jet to form in rough terrain in the British study are stated briefly below:

- 1) Skies clear enough to allow radiational cooling to create a temperature inversion near the ground.
- 2) If cold air lies to the right of the geostrophic wind the jet will be enhanced, i.e. a cold high to the east and south.
- 3) The magnitude of the jet is related to the ageostrophic wind the previous afternoon. If winds are very light the jet will not be strong. However if winds are too strong a nighttime inversion will be prevented from forming.

The above conditions are usually found in an anticyclone.

METHOD

The morning (1200 GMT)RAOBS from Prince George were inspected for the period from September 1 to October 31, 1980 and indicate the presence of such a jet over the airport on a number of occasions. Reports from pilots out of Prince George suggests they extend about 40 miles east south and west of the airport but the northern extent is not known. At least four instances of such jets were found in the period from September 1 to October 31, 1980. (See Appendix A)

A brief examination of the Vernon RAOBS did not turn up a similar jet.

RESULTS

Below is a summary of the findings.

- 1) The jet is located just above the temperature inversion, at about 1000 feet above the surface of the airport.
- 2) It extends another 2 to 3 thousand feet upward.
- 3) Winds were from a south southwesterly direction.
- 4) Maximum speed found was 30 knots. The speed did not appear to depend on the intensity of the inversion but there appears to be a connection with the winds of the previous afternoon.
- 5) In every case there was a surface high over southeastern B.C. with a ridge extending northward along the divide giving a light southerly geostrophic gradient over the area.

CONCLUSIONS

RAOB soundings indicate the presence of low level nocturnal jets in Prince George area similar to those found in other parts of the world. They are much stronger than geostrophic and occur just above the night temperature inversion. They probably form just after sunset and continue until a few hours after sunrise. The direction was south-southwesterly with a light southerly pressure gradient over the area. The jet may not show up on the first RAOB transmission with only the surface and 850mb winds (5 thousand feet). The largest wind shear found from the radiosonde reports was just over 20 knots/1000 feet but actual wind shears may be much higher.

Fires burning into the night during the summer and fall clear skies and relatively light geostrophic wind gradients could be subjected to these strong winds at exposed hills and ridges.

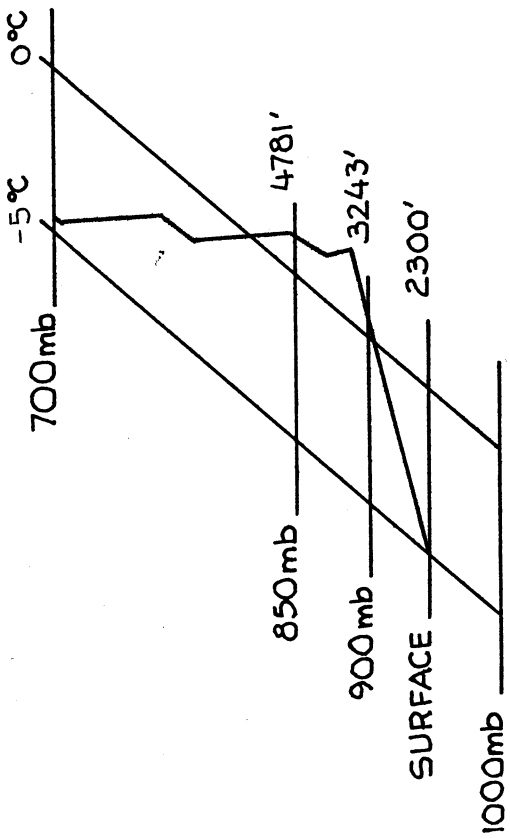
ACKNOWLEDGEMENTS

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REFERENCES

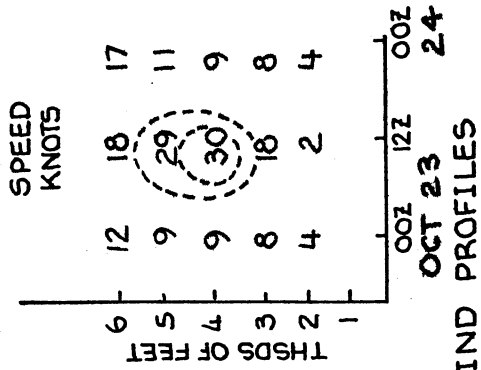
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APPENDIX A



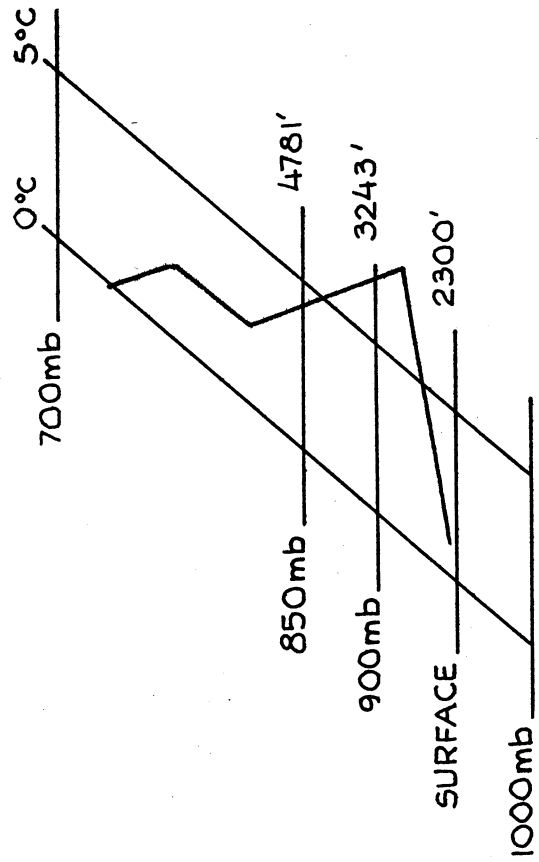
VERTICAL TEMPERATURE PROFILE

OCTOBER 23, 1980



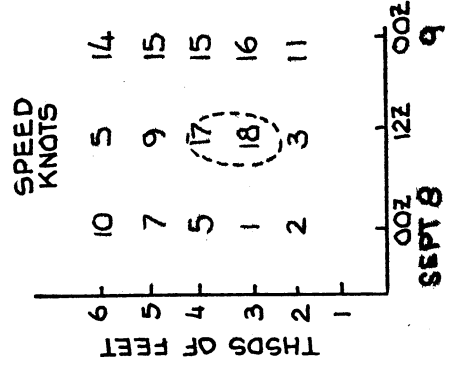
VERTICAL WIND PROFILES

OCT 23



VERTICAL TEMPERATURE PROFILE

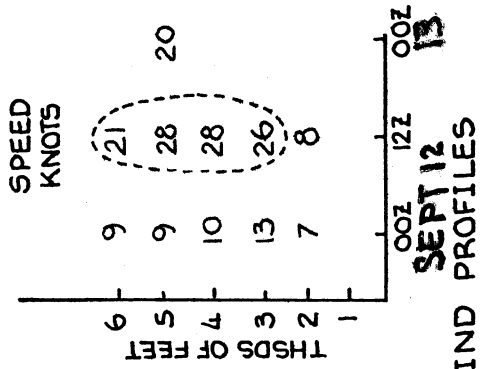
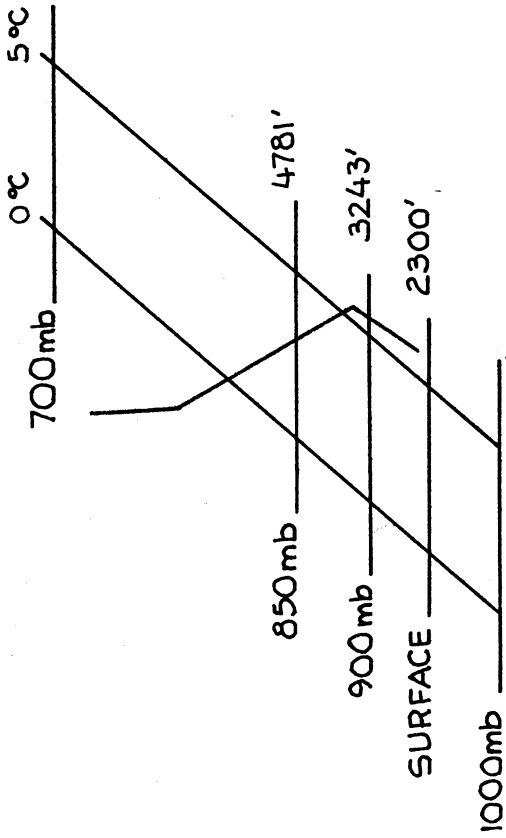
SEPTEMBER 8, 1980



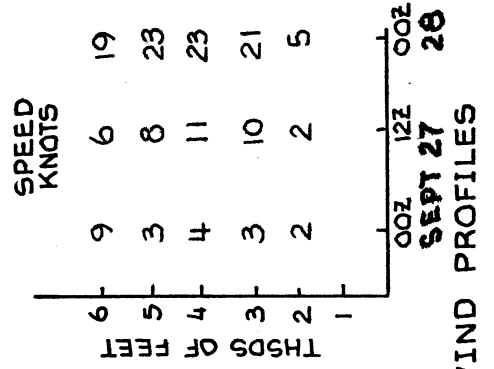
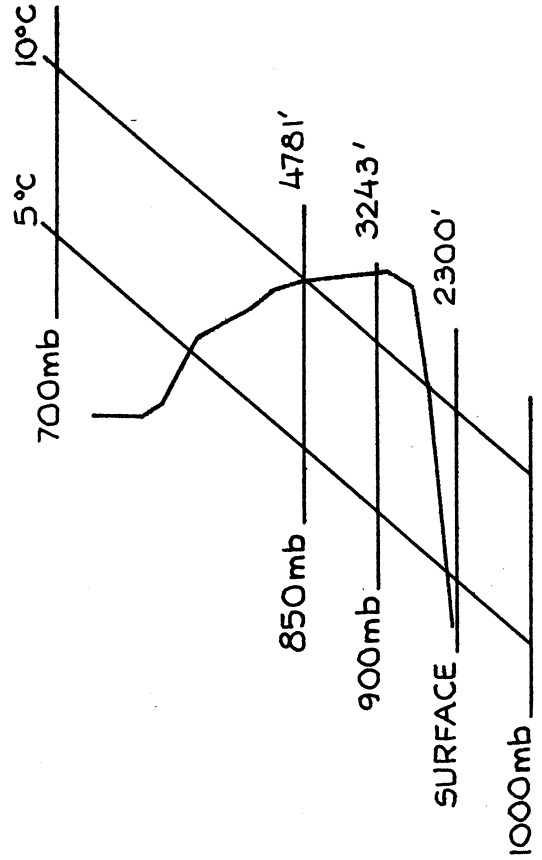
VERTICAL WIND PROFILES

SEPT 8

APPENDIX A



VERTICAL TEMPERATURE PROFILE
SEPTEMBER 13, 1980



VERTICAL TEMPERATURE PROFILE
SEPTEMBER 27, 1980