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The Relationship of 500 mb Heights and Fire
Weather Indices along the South Coast of
B.C. During the Summer of 1979

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INTRODUCTION

This paper is part of an ongoing study relating the 500 millibar flow to the various fire weather parameters. Values of the Drought Code and the fire weather index over southwestern B.C. during the summer of 1979 are studied and related to the recorded 500 mb heights.

INDICES AND METEOROLOGICAL DATA

All the individual components of the Fire Weather Index are dependent on meteorological factors. Some, such as the ISI and FWI, react very rapidly to the occurrence of precipitation or an increase in wind. This can lead to rather erratic-appearing variations in values from day to day.

The most stable index is the DC which changes relatively slowly, and should therefore be a reasonably suitable indicator of the more broadscale meteorological patterns. The DC rises linearly in the absence of precipitation. Rain amounts above a threshold value (2.9 mm/24 hr. for the DC) are required before the DC is reduced. The amount of reduction depends on the precipitation quantity as well as the initial value of the DC.

For the graphical displays, the upper air data from Quillayute, and the fire weather indices for Abbotsford were used. The valley location of Abbotsford is not representative of forest locations but the relative values of the indices were judged to be indicative of the state of the coastal fuels south of 50 N. The availability of consistent and reliable weather reports from the AES site insures the validity of the index calculations.

ANALYSIS OF THE DATA

Figure 1 displays the 500 mb heights (June - Sept. 1979) with the upper tracing. The dashed line represents the 5 year mean values of the DC. Percent of normal DC during 1979 is indicated by the lower solid line.

It can be seen that the mean DC rises throughout June and July reaching a peak in mid-August. It then drops during the latter part of August (some might relate this to the time of the PNE), and remains fairly steady through September before succumbing to the major fall rains.

The early June DC of 250% of normal is indicative of a dry spring. It lowers fairly rapidly later in the month. This can be seen to coincide with lower 500 mb heights. Rising heights in late June are reflected in an increase in the percent of normal DC. The downward height spike of early July is once more phased with lowered DC.

For the remainder of the summer heights remain fairly high, and the DC varies between 130 and 150% of normal. It might be noted that on two occasions where the height drops below 5570 metres (Aug. 5, Aug. 19), the DC is seen to have minor setbacks. Major troughing of early September, for the first time, leads to DC values of less than normal.

Figure 2 is appended to indicate the variations of the calculated DC, BUI, and FWI. It can be seen that the fluctuations in the FWI are quite closely aligned with height falls and rises. For a more detailed look at the relationship, 500 mb heights were plotted against the FWI. The 1979 results for Abbotsford are seen in Figure 3. Considerable scatter is evident. This is due to the rapid changes in FWI with wind speed as well as with precipitation occurrence. However, the broad concentration of points seems sufficient to indicate a useful relationship.

SUMMARY

The passage of an upper trough is signified by a temporary lowering of the 500 mb heights. Significant troughs are accompanied by precipitation. One would therefore expect some lowering of the fire weather indices with lowered 500 mb heights. This is in fact the case, and is demonstrated quite effectively by the figures accompanying this report. Further study would perhaps lead to a predictive capability using certain empirically derived relationships.

The fact that the DC remained at above normal values for most of the period would indicate that the summer of 1979 was one with precipitation amounts of less than normal.

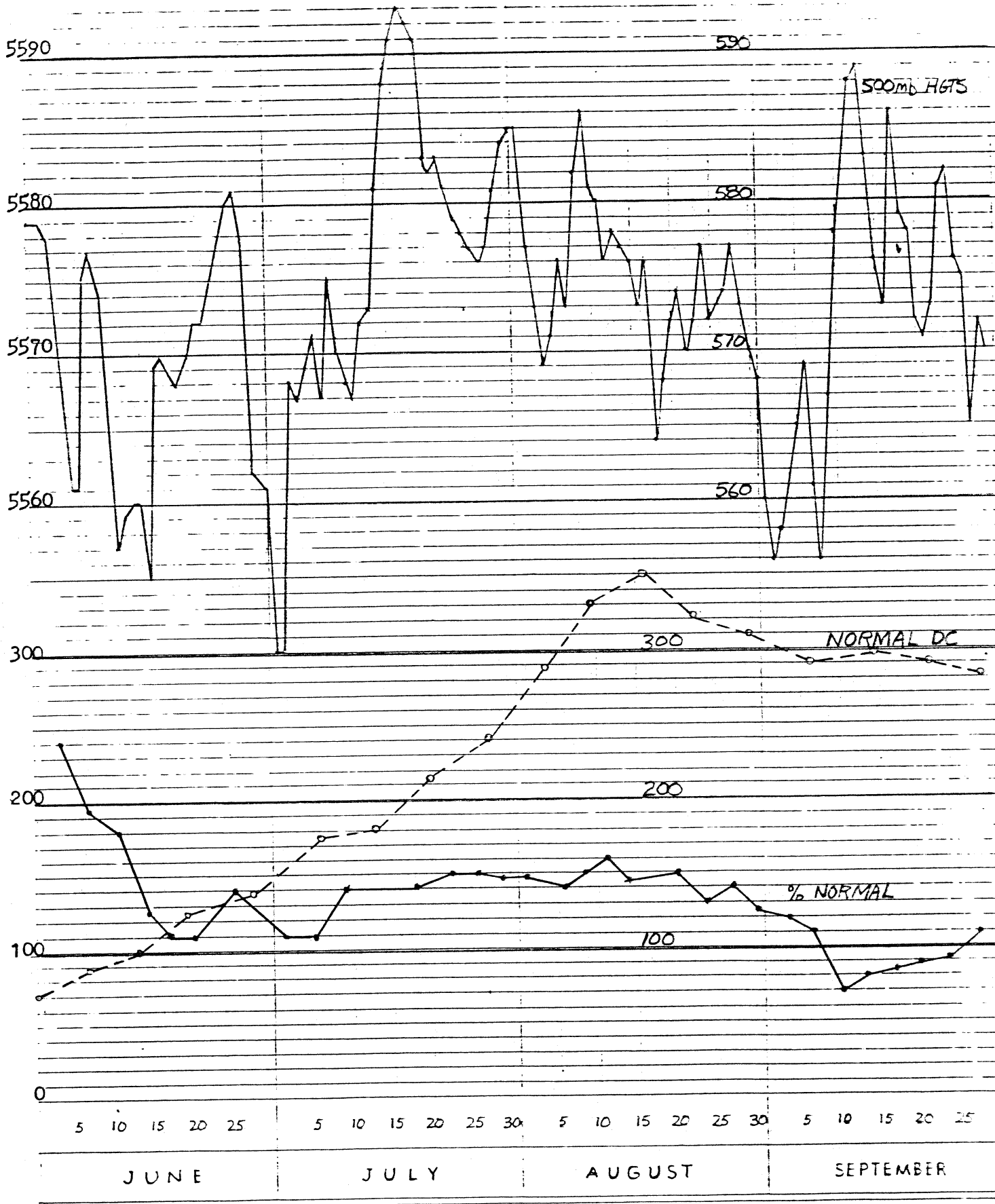


Figure 1. Upper graph: 500mb Heights at UIL
 Lower graph: 5 year mean DC values at YXX —○—
 Percent of normal DC for 1979 —●—

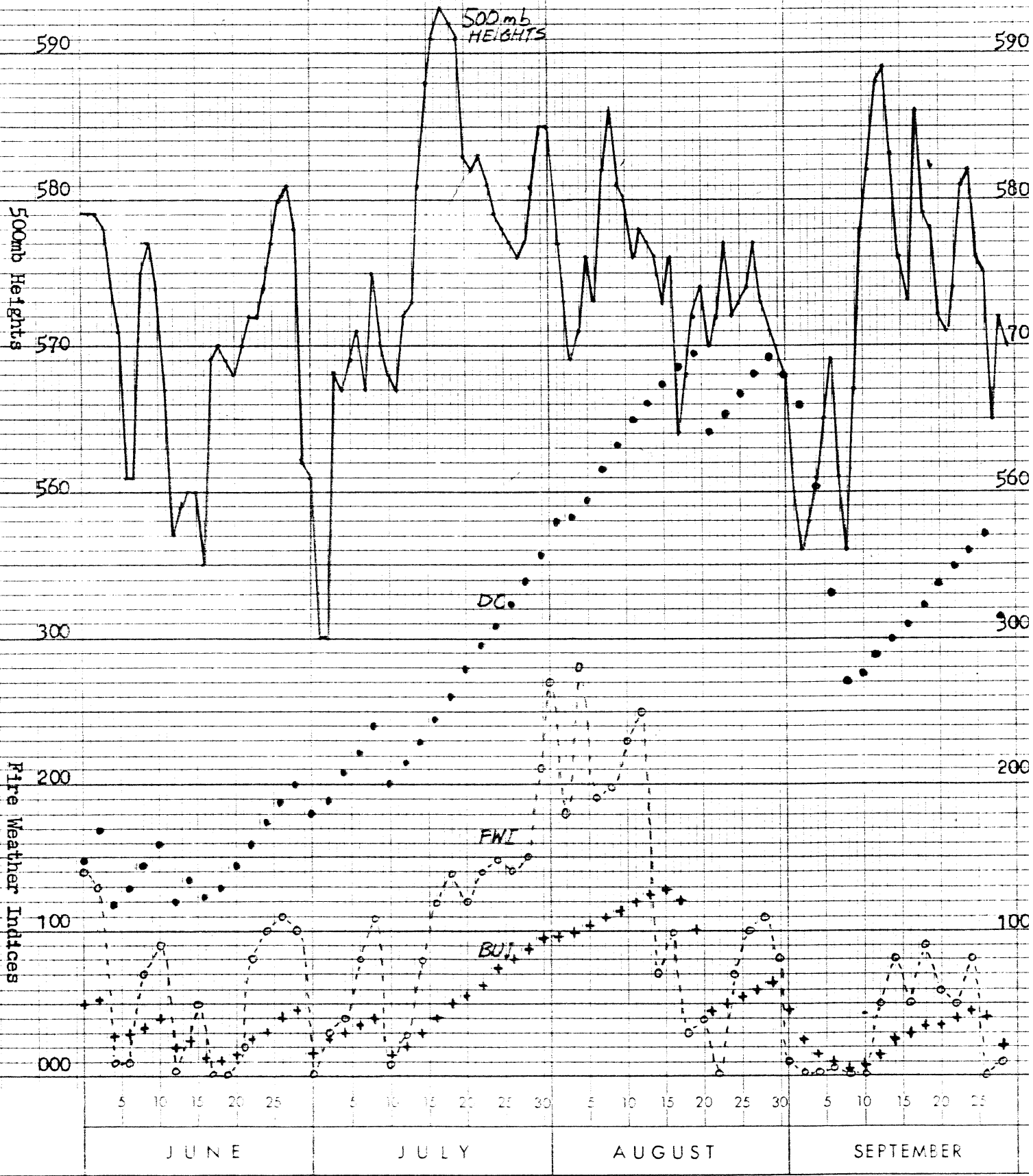


Figure 2. 500mb Heights at UIL (in decametres) ———
 DC at YXX ●●●●●
 BU at YXX + + + +
 FWI at YXX -o---o---o--- (expanded by 10 times)

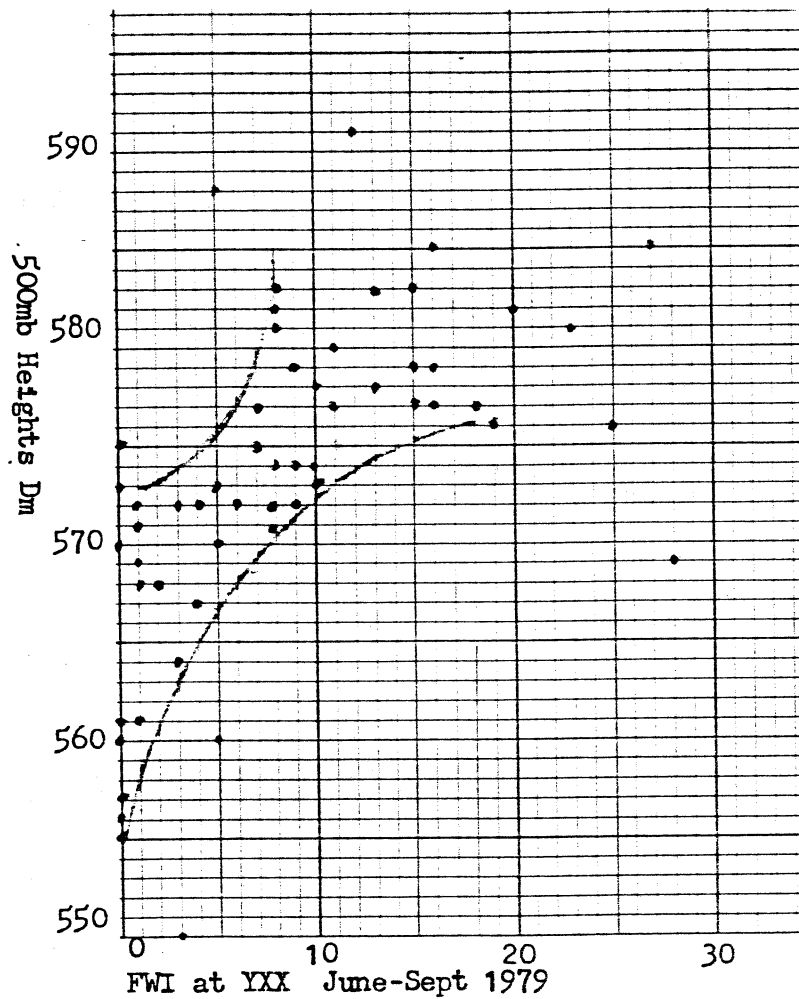


Figure 3. Scatter diagram of 500mb heights versus FWI

LIST OF ABBREVIATIONS

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- AES Atmospheric Environment Service
- BUI Build-up Index (Formerly ADMC)
- DC Drought Code
- FWI Fire Weather Index
- ISI Initial Spread Index
- PNE Pacific National Exhibition
- UIL Quillayute Upper Air Station
- YXX Abbotsford Observing Site