



# PACIFIC REGION TECHNICAL NOTES

79-009

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Update on Stability Indices for Coastal B.C. Stations

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## INTRODUCTION:

IN MAY 1978 A COMPUTER ANALYSIS WAS MADE OF STABILITY INDICIES AND DYNAMIC PARAMETERS SUCH AS 500MB 700MB 850MB WINDS, AND 500 MB HTS TO DETERMINE THEIR REALTIONSHIP TO CONVECTION USING SUMMER 1977 DATA. THE RESULTS WERE SUMMARIZED AND PUBLISHED IN PACIFIC REGION TECHNICAL NOTES 78-012. ANOTHER SET OF DATA WAS OBTAINED FOR 1978 AND A SIMILAR ANALYSIS WAS PERFORMED THIS PAST WINTER TO CONFIRM AND IMPROVE RESULTS OF THE PREVIOUS ANALYSIS. AN ADDITIONAL STABILIV INDEX, THE BOYDEN INDEX, AND 1000-500MB THICKNESS WAS ADDED TO THE DATA.

## METHOD

THE ANALYSIS WAS SIMILAR TO THAT CARRIED OUT IN 1978 WITH THE EXCEPTION OF THE BOYDEN INDEX. THE DATA CONSISTED OF 120 OBSERVATION DAYS FROM MAY 10 TO SEPTEMBER 6 1978. THE BOYDEN INDEX IS DEFINED BELOW.

$$\text{BOYDEN INDEX} = \text{H1000} - \text{H700} - \text{T700} - 200$$

WHERE H1000 = 1000MB HT(DECAMETERS)  
H700 = 700MB HT( " )  
T700 = 700MB TEMP (CELCIUS)

## RESULTS

1. FOR YPR THE RESULTS WERE SIMILAR TO THOSE OBTAINED IN 1978 WITH REGARDS TO THE TOTALS INDEX (TI850). HOWEVER A NEW INDEX, THE BOYDEN INDEX APPEARED TO BE A BETTER INDICATOR OF CONVECTION THAN THE TOTALS INDEX; WITH 500 MB HTS A GOOD SECONDARY DISCRIMINATOR. RESULTS ARE SUMMARIZED IN FIG 1.
2. FOR YXT THE RESULTS WERE SIMILAR TO RESULTS ON 1977 DATA FOR THE TOTALS INDEX (TI850). AGAIN THE BOYDEN INDEX APPEARED TO BE A BETTER INDICATOR OF CONVECTIVE ACTIVITY, WITH THE 500MB HTS AS A SECONDARY DISCRIMINATOR. IN THE 1977 DATA, THE 700MB

WIND DIRECTION COULD BE USED AS A SECONDARY DISCRIMINATOR BUT 500MB HTS APPEARED TO HAVE A SLIGHT EDGE IN THIS ANALYSIS.  
RESULTS ARE SUMMARIZED IN FIG 2.

3. AT YZT RESULTS WERE ALMOST IDENTICAL TO THOSE OF THE PREVIOUS YEAR WITH THE TOTALS INDEX THE BEST PRIMARY INDICATOR OF CONVECTION. AS WAS THE CASE IN THE 1977 DATA THE SLY INDEX CAME A CLOSE SECOND. FOR THE INDETERMINATE AREAS THE SECONDARY DISCRIMINATORS AGAIN WERE 700 MB WIND DIRECTIONS AND 500 MB HTS. THE BOYDEN INDEX DID NOT APPEAR TO BE CORRELATED TO CONVECTIVE ACTIVITY.  
RESULTS ARE SUMMARIZED IN FIG 3.
4. AT UIL RESULTS WERE ALSO SIMILAR TO THE PREVIOUS YEAR. THE TOTALS INDEX (TI850) WAS A PRIMARY INDICATOR WITH THE 700 MB WIND DIRECTIONS AND 500MB HTS AS GOOD SECONDARY DISCRIMINATORS. AS WAS THE CASE FOR YZT THE BOYDEN INDEX DID NOT APPEAR TO CORRELATE HIGHLY WITH CONVECTIVE ACTIVITY.  
RESULTS ARE SUMMARIZED IN FIG 4.

CONCLUSION:

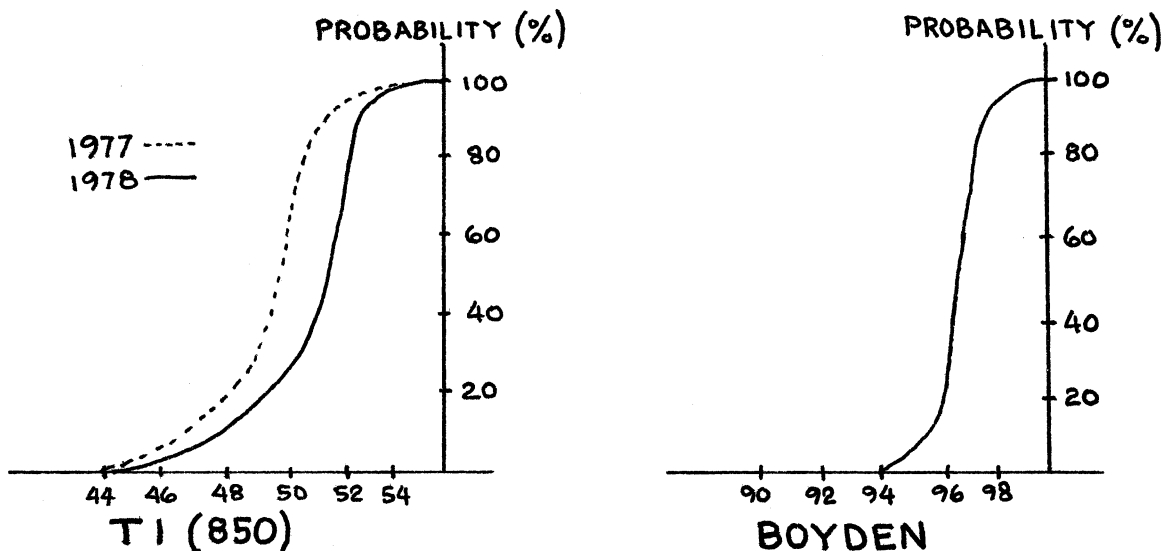
RESULTS WERE SIMILAR TO THE RESULTS FOR THE 1977 DATA AT UIL AND YZT. AT YXT AND YPR THE BOYDEN INDEX APPEARED TO BE SLIGHTLY SUPERIOR TO THE TOTALS INDEX.

THICKNESS DID NOT APPEAR TO BE CORRELATED TO CONVECTIVE ACTIVITY AT ANY OF THE COASTAL STATIONS.

AS WAS THE CASE IN THE ANALYSIS OF 1978 DATA FOR BC INTERIOR STATIONS, SLIGHTLY HIGHER INDEX VALUES APPEARED TO BE NECESSARY FOR CONVECTIVE ACTIVITY. AGAIN NO GOOD REASON COULD FOUND TO ACCOUNT FOR THIS. DIFFERENT VERIFICATION PROCEDURES OR SMALL SAMPLE SIZE MIGHT BE ATTRIBUTABLE TO THIS RESULT.

Figure 1

Probability of Afternoon Convective Cloud\* at  
YPR Vs. TI(850) and Boyden Index Computed  
at Annette



For Boyden Index:

- Indeterminate Range 95 - 97
- 500mb hts > 570 no tstms

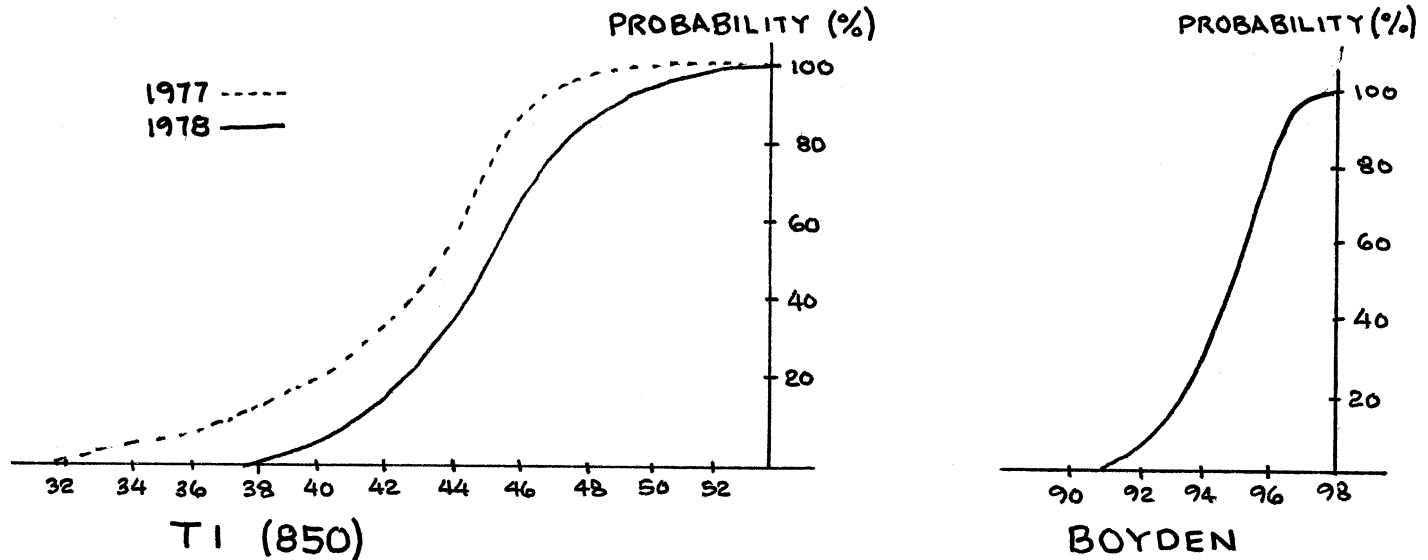
For Totals Index:

- Indeterminate Range 45 - 49
- 1. 700mb wind direction
  - 320-160 no convective cloud
  - 160-220 use TI=48 as cutoff
  - 220-260 use TI=45 as cutoff
  - 260-320 use TI=50 as cutoff
- 2. 500mb hts > 570 no convective cloud

\* Probability derived from frequency of occurrence convective cloud = occurrence of CB or substantial TCU or ACC

Figure 2

Probability of Afternoon Convective Cloud\* at YXT  
vs. TI(850) and Boyden Index computed at Annette



For Boyden Index:

- indeterminate range 94 - 95
- 500 mb hts. > 571 no convection

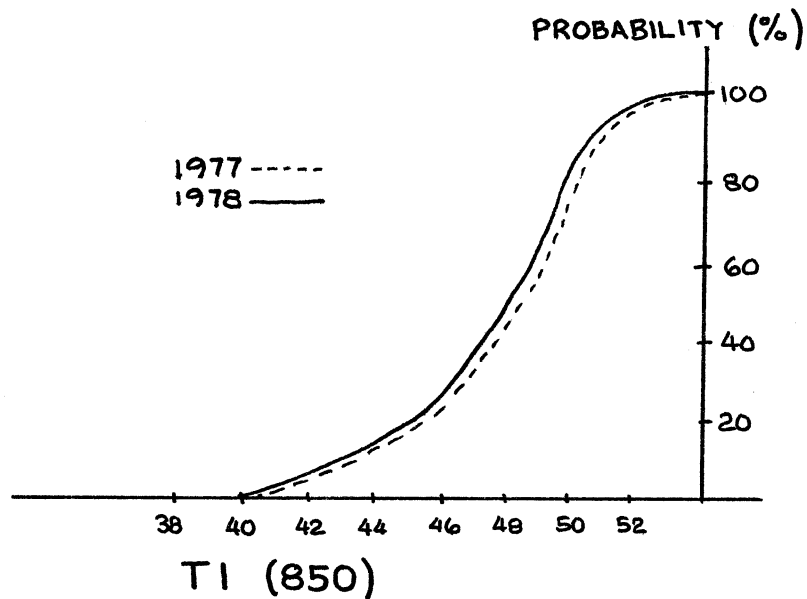
For Totals Index:

- indeterminate range 40 - 49
- 1. 700mb wind direction
  - 340-100 no convective cloud
  - 100-180 use TI=45 as cutoff
  - 180-250 use TI=40 as cutoff
  - 250-300 use TI=49 as cutoff
  - 300-340 use TI=43 as cutoff
- 2. 500mb hts > 579 no convective cloud

\*Probability derived from frequency of occurrence convective cloud = occurrence of CB or substantial TCU or ACC.

Figure 3

Probability of Afternoon Convective Cloud\*  
vs. TI(850) at YZT



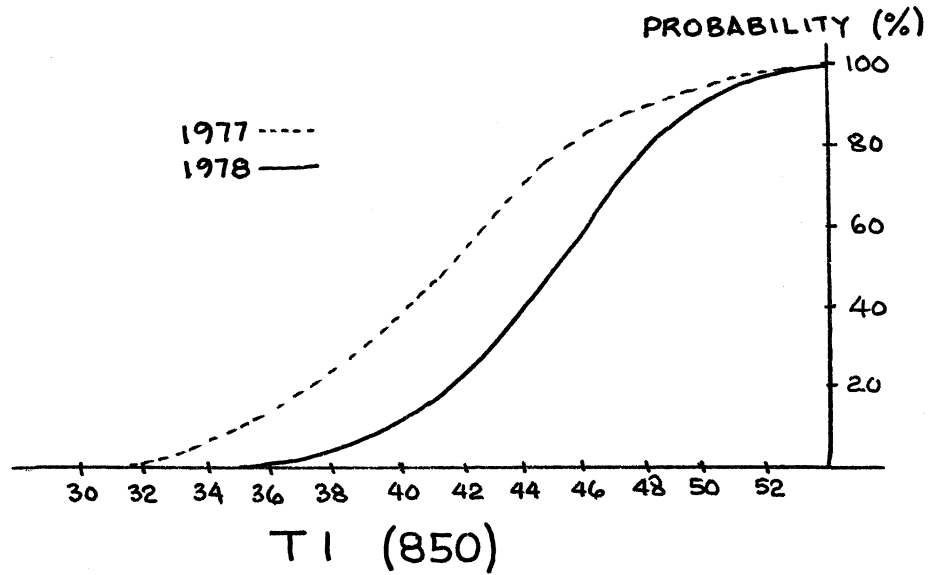
for indeterminate range TI(850); 42 - 50 use:

1. 700mb wind direction  
350-120 no convective cloud  
120-200 use TI = 49 as cutoff  
200-350 use TI = 45 as cutoff
2. 500mb hts < 560 convective cloud  
500mb hts > 574 no convective cloud

\*Probability derived from frequency of occurrence convective cloud = occurrence of CB or substantial TCU or ACC.

Figure 4

Probability of Afternoon Convective Cloud\* at YVR,  
YVI, YYJ and UIL vs. TI(850) at UIL



-for indeterminate range 38 - 48 use:

1. 500mb hts  $>$  574 no convective cloud
2. 700mb wind direction  
290-210 convective cloud unlikely  
210-290 indeterminate

\*Probability derived from frequency of occurrence convective cloud= occurrence of CB or substantial TCU or ACC