ALBION™
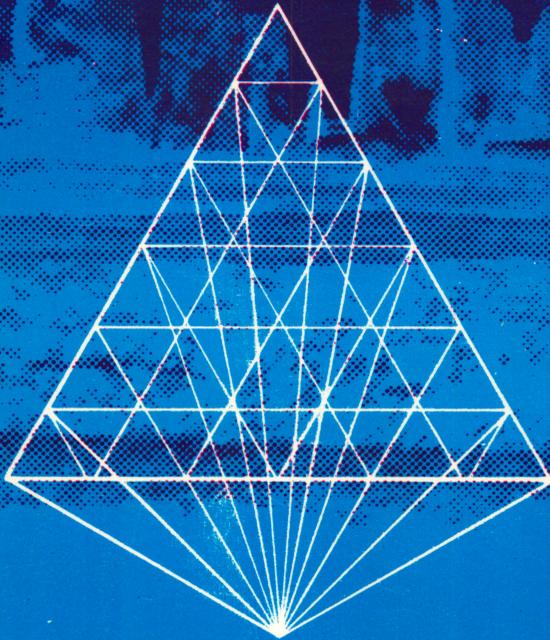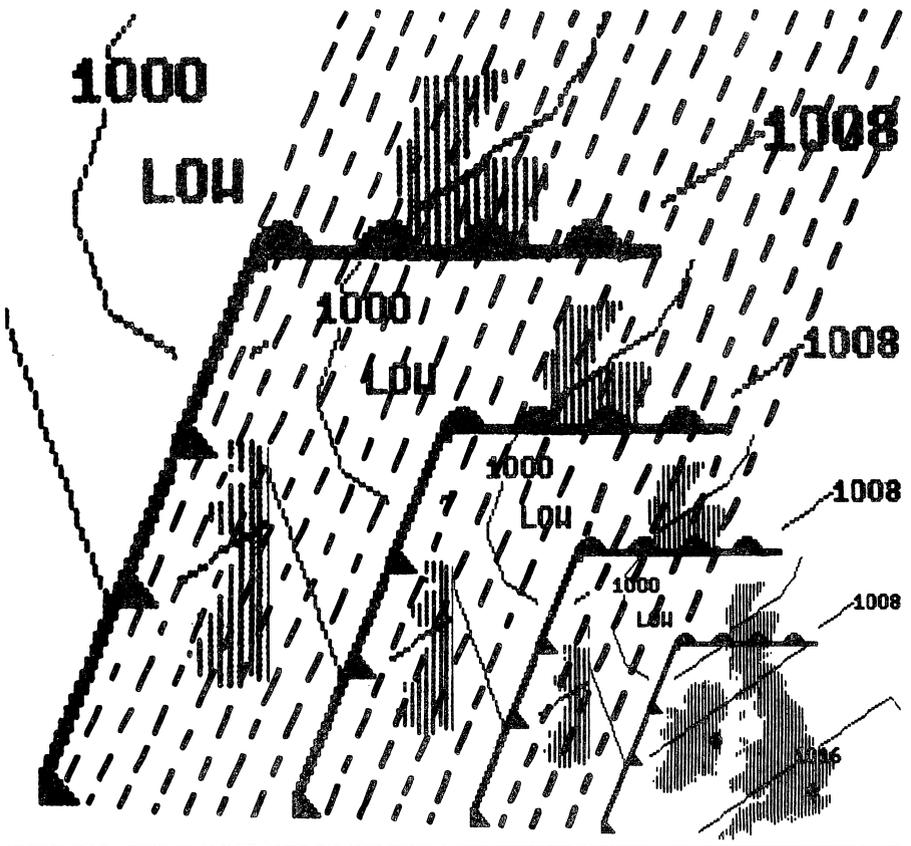
WEATHER FORECASTING

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Weather
Forecasting

Weather Forecasting

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and
A. Bartholomew

Contents

Acknowledgements

1 Introduction

Program description

The program has been designed to be used by secondary school students after they have been introduced to weather forecasting concepts. This may be in the first or second year if the school runs its own weather station but it is also applicable to O- and A-Level studies.

Once the students are aware of the standard symbols as used by the Meteorological Office to record the weather, the synoptic chart as a form of depicting weather situations and the basic weather features associated with air masses and frontal systems, they will then be able to forecast the weather from the animated synoptic situations as displayed in the **Student Mode** of the program.

The **Teacher Mode** will display a series of synoptic situations that can be used for reference or as an electronic blackboard.

The program simulates 'normal' weather conditions in such a way as to allow the forecaster:
1. to study the past weather situation;
2. to assess the future direction and speed of movement of the pressure systems and their associated fronts;
3. to predict the resulting general weather.

It does not deal with freak weather conditions (that many consider are 'normal' in the United Kingdom!), the intensifying and weakening of the systems or complications of upper atmosphere meteorology. It also shows all the weather systems moving from east to west. It should be made clear to students that this is to simplify the learning of weather forecasting.

Finally, the whole program has been designed so that little or no reference to the manual is required and that students worksheets are not really necessary.

Use in the classroom

Most standard classroom textbooks cover the subject of recording weather, air masses, pressure systems and associated fronts and elementary synoptic weather forecasting (1) but the teacher might also make reference to Daily Weather Charts (2), newspaper forecasts (where weather maps are used) as well as the television weather forecasts. In fact, it is strongly recommended that the students are directed to watch the weather forecasts on the television channels that use the same type of synoptic chart as this program. The students will not only become accustomed to the symbols used, but will also begin to appreciate the great variety of synoptic situations.

Once the students are familiar with the main concepts, it is suggested that the program can be introduced to the whole class using the **Teacher Mode** followed by small groups of students attempting to forecast the weather using the **Student Mode**.

References

1) Perry, A. H. & Perry, V. C., *Weather Maps*, Oliver & Boyd, 1973.
   H.M.S.O., *Weather Map – an introduction to weather forecasting*, H.M.S.O., 1961.
   Rice, W. Farleigh, *The Fabric of Geography*, Longman, 1983.
   Chandler, T. J., *The Air Around Us*, Aldus Books, 1967.
2) Daily Weather Summary, The London Weather Centre, 284 High Holborn, London WC1.

2 Operation: Teacher Mode

The **Teacher Mode** displays a series of synoptic situations that can be used for reference or by the teacher as an electronic blackboard.

After the program has been loaded, the Introductory Menu should be on the screen:

All errors should be taken care of by the program. If there are any problems, turn off the computer, wait a moment and then start again.

```
INTRODUCTORY MENU.

   Do you require..

        1. Teacher mode,

        2. Student mode or

        3. Exit program?




Press display number you require..
```

```
INTRODUCTORY MENU.

   Do you require..

        1. Teacher mode,

        2. Student mode or

        3. Exit program?




Press display number you require..
                    1. Teacher mode.
```

press ☐1☐

You will always be given a chance to change your selection by pressing ☐ ESC ☐.

```
press RETURN to confirm or
press ESC to change..
```

then ☐ RETURN ☐

```
TEACHER MODE - Menu 1.

   Displays available:
        1. Warm front.
        2. Cold front.
        3. Occluded front.
        4. Frontal system.
        5. Isobars (high pressure).
        6. Isobars (low pressure).
        7. Example weather system.
        8. Full weather examples.
        9. Exit to main menu.

   Press display number you require..
```

To view all the symbols used by the program

press 1

then RETURN

Each time you press the SPACE BAR you will move onto the next symbol until eventually you will be back with the **Teacher Mode – Menu 1.**
  In order to display the full weather examples
press 8

then RETURN

and you can now select any of the six synoptic situations, with the animation starting at four different times.
press 3

TEACHER MODE - Menu 1.

Displays available:
  1. Warm front.
  2. Cold front.
  3. Occluded front.
  4. Frontal system.
  5. Isobars (high pressure).
  6. Isobars (low pressure).
  7. Example weather system.
  8. Full weather examples.
  9. Exit to main menu.

Press display number you require..

  1. Warm front.

press RETURN to confirm or
press ESC to change.._

Warm front.

press ESC for menu
press SPACE to cont..

TEACHER MODE - Menu 2.

Full weather examples:
  1. Anticyclone-Summer
  2. Anticyclone-Winter
  3. Unoccluded depression-Summer
  4. Unoccluded depression-Winter
  5. Occluded depression-Summer
  6. Occluded depression-Winter
  7. Menu 1

Press example number you require..
..and starting time:1. 6 a.m.
                    2. 12 noon
                    3. 6 p.m.
                    4. 12 midnight_

then [2]   **TEACHER MODE - Menu 2.**

Full weather examples:

1. Anticyclone-Summer
2. Anticyclone-Winter
3. Unoccluded depression-Summer
4. Unoccluded depression-Winter
5. Occluded depression-Summer
6. Occluded depression-Winter
7. Menu 1

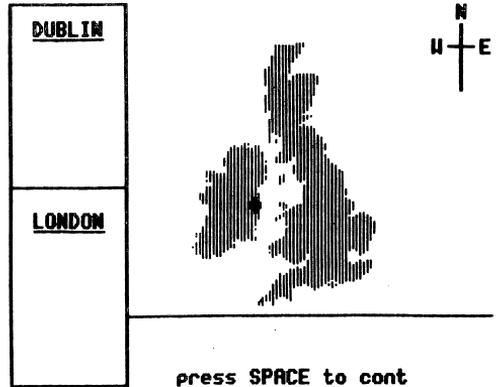Press example number you require..
..and starting time..

Unoccluded depression
Summer starting 12 noon

and [RETURN]   press RETURN to confirm or
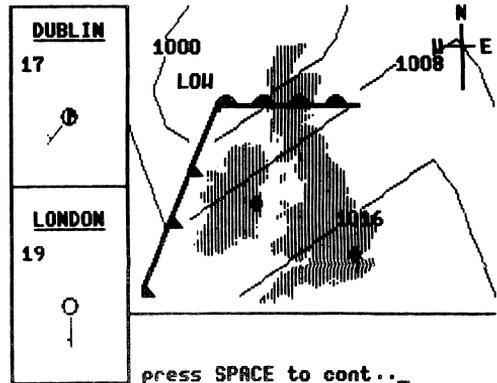press ESC to change..

This display locates the two weather stations and identifies the part of the screen where the relevant weather figures will appear.

Summer Unoccluded depression:12 noon

press SPACE to cont

Press the [SPACE BAR] when instructed and eventually the weather situation chosen will appear.

Summer Unoccluded depression:12 noon

The weather symbols that appear in the left hand boxes on the screen relate to the current positions of the weather system.

press SPACE to cont.._

The synoptic situation can be advanced by pressing the ⌐ SPACE BAR ⌐ and halted by pressing any key on the board.

As the system advances, so the weather figures alter with the time of day and the moving fronts.

If the keyboard is not touched then the animation will stop six hours after it began as indicated by the time in the title.

The system can be restarted by pressing the ⌐ SPACE BAR ⌐ and will stop automatically at two more intervals of six hours, unless it is stopped by a touch of the keyboard. At any stage whilst the weather system is moving if the ⌐ ESC ⌐ key is pressed you will be returned to the **Teacher Mode – Menu 2**.

After 18 hours of movement you will be returned to the **Teacher Mode – Menu 2** where a new selection can be made.

However, assuming that **Teacher Mode – Menu 2** is on display:

Summer Unoccluded depression :6 p.m.

press SPACE to cont..._
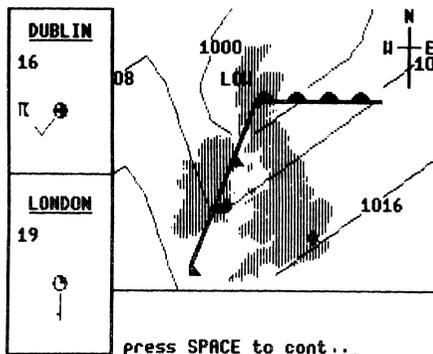
press 7

```
TEACHER MODE - Menu 2.

Full weather examples:

1. Anticyclone-Summer
2. Anticyclone-Winter
3. Unoccluded depression-Summer
4. Unoccluded depression-Winter
5. Occluded depression-Summer
6. Occluded depression-Winter
7. Menu 1

Press example number you require..

        7. Menu 1
```

and ⌐ RETURN ⌐

```
press RETURN to confirm or
press ESC to change.._
```

Note-Two straightforward weather situations are: Anticyclone-Summer, starting at 6 a.m. and Occluded depression-Summer, starting at midnight.

You can still select any of the choices on this menu.

press 9

then RETURN

TEACHER MODE - Menu 1.

Displays available:

1. Warm front.
2. Cold front.
3. Occluded front.
4. Frontal system.
5. Isobars (high pressure).
6. Isobars (low pressure).
7. Example weather system.
8. Full weather examples.
9. Exit to main menu.

Press display number you require..

INTRODUCTORY MENU.

Do you require..

1. Teacher mode,

2. Student mode or

3. Exit program?

Press display number you require..

3 Operation: Student Mode

With the Introductory Menu on the screen

<div align="center">

press 2

then RETURN

</div>

This menu is designed to remind the students of all the weather recording symbols used as well as the key strokes that go with the symbols. Further prompts are given as the students are asked questions.

Student Mode - Key.

```
  Wind: speed, Beaufort Scale:
          ⌐ - 5, ⌐ - 4, ○ - 0 etc.
          direction: ○ - S, ○ - SW etc
  Cloud cover:
          ① - 1/8th, ◔ - 2/8ths etc

  Current weather:
          ≡ - fog(f)
          ⁏ - drizzle(d)
          ⁞ - rain(r)
          ▽ - rain showers(rs)
          △ - hail(h)
          ⚠ - hail showers(hs)
          ✳ - snow(s)
          ✳ - snow showers(ss)
          �𝈆 - thunder(t)
  no symbol - clear(c)

  Temperature: Centigrade - 18 etc.
```

Press the SPACE BAR as instructed. It will be found that most students will do this as a matter of course.

  Eventually the student will be presented with one of 24 possible weather situations.

  They must study the time of year, time of day, the synoptic situation and the weather figures that are given.

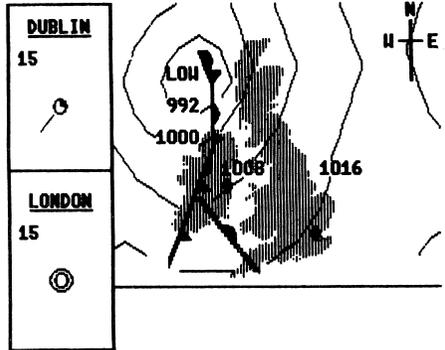press SPACE to cont, ESC for main menu._

<u>Summer</u> :12 midnight

press SPACE to cont..
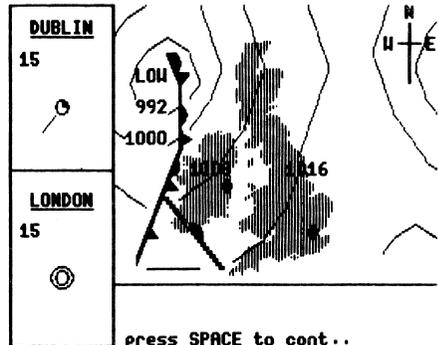
press ⎡ SPACE BAR ⎤

The weather system will advance with the time but the weather figures will remain the same.

Summer :3 a.m.

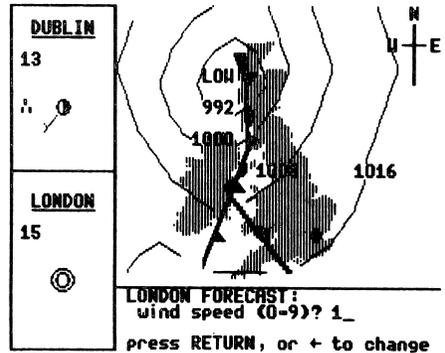| DUBLIN |
|--------|
| 15 |

LONDON
15

When 6 hours have elapsed, the system will automatically stop and present the students with a prompt in order that they can predict the weather figures for the time given in the title. An indication is given as to the key strokes that are required.

Summer :6 a.m.

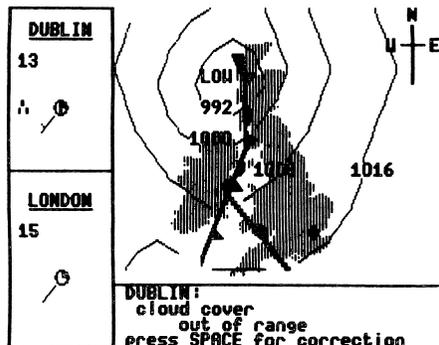| DUBLIN |
|--------|
| 13 |

LONDON
15

As the students follow the directions on the screen and put in their predictions, so the weather figures in the appropriate box will be altered.

When all the predictions at both the weather stations have been made, the students will be told if their figures were correct. The program recognises a varying range of values for any one synoptic situation.

LONDON FORECAST:
wind speed (0-9)? 1_

press RETURN, or ← to change

Summer :6 a.m.

DUBLIN
13

LONDON
15

DUBLIN:
cloud cover
        out of range
press SPACE for correction_

If the students' answers are not within the range, then they are told what is wrong and are given the opportunity to study their answer before pressing the ⎡ SPACE BAR ⎤ for a more likely figure.

After advancing the weather situation by follow-
ing the directions given on the screen, there will be
two more occasions when the students will be asked
for their predictions. The stop times are the same
as those used by the Meteorological Office for their
weather readings.

After the last of the corrections have been made,
the students are given their score as a percentage
of correct observations.

On pressing the [SPACE BAR] the student will
be returned to the **Student Mode – Key**.

   The situation is now similar to that described at
the beginning of the **Student Mode** directions
except that the next 23 weather situations generated,
whilst still in **Student Mode**, will all be different
in some way.

   For the teacher's convenience if [CTRL] [A]
are pressed at the same time whilst the students are
being questioned, you will be taken back to the
Student Mode – Key and a new weather situation
will then be generated if the [SPACE BAR] is
pressed.

   To get back to any of the other menus, press
[ESC] as instructed.

Summer :6 p.m.

DUBLIN
19

LONDON
19

Your weather forecasts were
73% correct.
press SPACE to cont.._
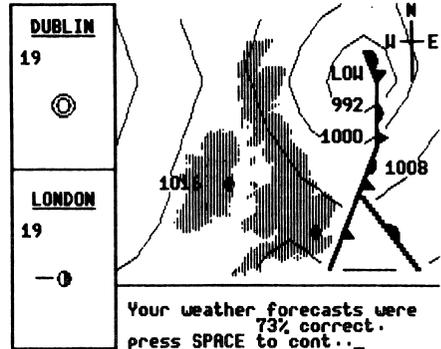
4 Teaching suggestions

The use of this program will be largely dictated by the availability of computers, size of monitors as well as style of teaching. The following suggestions might be of some use.

The relationship between current weather and synoptic charts

With a single monitor with a large enough screen, the teacher can direct the weather simulation in front of a group or even the whole class. Starting with the **Teacher Mode** to illustrate the symbols that are used, the teacher should next choose a synoptic situation from the menu.

It is important that the teacher discusses each new stage of the program as there is a great deal of detail on the screen at any one time.

Once all the symbols are understood by the students, and it is appreciated where the weather details for each town will appear, it is worth considering the type of air mass that might be present. For instance, somewhat dry conditions associated with a depression might indicate a tropical continental air mass rather than tropical maritime.

By advancing the system and freezing the movement as described elsewhere, the class can make a detailed study of the progress of a given weather situation and the effect that this has on the observed weather. The teacher can use the program to:

1. compare different weather situations;
2. study the effect of the time of the day on a given weather situation;
3. show the contrast in the weather given a similar synoptic situation but differing time of year.

As the teacher becomes familiar with the program it will become apparent that there are endless possibilities in allowing the computer to generate the points to be discussed. This would be using the program as an electronic blackboard to put over a complex set of ideas.

Weather forecasting

The strength of this program is in the possibility of attempting to forecast the weather given a certain weather situation.

This can be done as a class lesson but it is strongly recommended that small groups of students are organised so that each group can spend some time in discussing and forecasting. They should be reminded to:

1. identify the type of weather situation that they are presented with;
2. be aware of the weather at the start of a simulation;
3. carefully consider the time of the year and the time of the day as given in the title.

The forecasts will be checked within a range of values. As an example, sometimes a wind direction between S.W. and N.W. will be accepted whereas in other situations only one value will be correct. This is to make the program as realistic as possible.

It should be possible for students to get an accuracy of between 65 to 85 per cent. As they become familiar with the program this should increase.

Comparison with school weather station figures

For those schools that keep their own weather station figures it is possible to make some interesting comparisons between the figures collected and the ones displayed by the program for similar weather situations.

If you are interested in a further extension of this, refer to the Appendix on page 15.

These are only a few suggestions as to the use of this program. It has been primarily designed to 'stand alone' with no worksheets but this does not mean that written work cannot be generated.

5 Screen displays

These screen displays illustrate the six synoptic situations used by the program. Each situation has four starting times: 6 a.m., 12 noon, 6 p.m. and 12 midnight. There is an entirely different set of figures held in the main data bank for each starting time thereby creating 24 different weather situations.
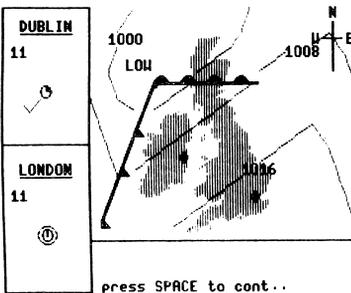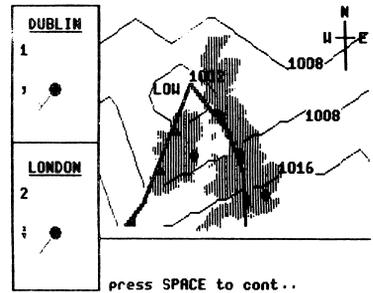
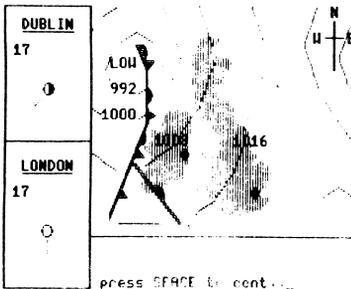Summer Anticyclone:6 a.m.
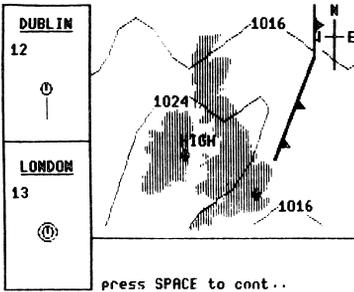
Winter Anticyclone:12 midnight
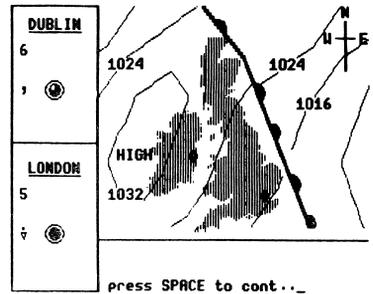
Summer Unoccluded depression:6 p.m.
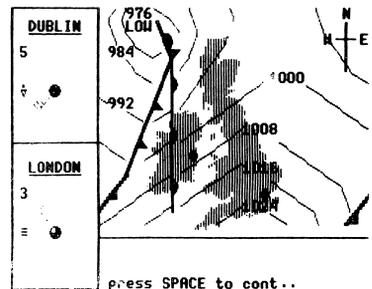

Winter Unoccluded depression:12 noon

Summer Occluded depression:12 noon

Winter Occluded depression:6 a.m.

6 Appendix

Summary of commands

| RETURN | – pressing this key confirms a choice.

| ESC | – pressing this enables the user to alter a choice or return to a menu.

| SPACE BAR | – pressing this allows the program to continue.

Teacher mode

| ESC | – pressing this whilst animation is in progress will take you back to a menu. It is possible to halt the animation by pressing any other key.

Student Mode

| CTRL | A | – pressing these keys together whilst at a six hour halt, will take you back to a menu. All other operations are as instructed on the screen.

For Apple version:
If you wish to load a new program from a different disk without turning off the computer, follow this procedure:
1. Load the new disk.
2. Go through the Introductory Menu.
3. Press | 3 | to leave this program.
4. Press | RESET | (Apple II +)
   | CTRL | RESET | (Apple IIe)
5. This will only work if the RESET function has not been disabled as described in the Apple Owner's Manual.
For BBC version: turn off the computer in the normal way.

General program construction

Most of the synoptic situations and weather figures have been derived from the Daily Weather Summaries mentioned elsewhere in this manual, but as with 'real life' forecasting, these figures do not represent the only interpretations of the situations and although the figures given whilst in **Teacher Mode** will always be the same for any one weather situation, there is a range of answers that are possible in the **Student Mode**.

There are 4800 weather figures held in a data bank on the disk with 200 of these being read into a three dimensional array in the computer for each new weather display. These can be altered by the user if they are acquainted with file handling in the machines and if they are willing to generate a new set of figures to fit the displayed synoptic situation (3).

Both the Apple version and the BBC version rely on alteration of the normal display characters for the animation – it is advised that after using the BBC version, the computer is turned off as directed by the last title page so that all default values are fully reset.

Neither version can be expanded for standard machines as they fill all useful memory – in the Apple by straddling the two hi-res pages and in the BBC by overlaying procedures.

References

3) A disk-based program is available that will allow the user to alter the weather figures file as well as the name and position of the weather stations (this would allow a local town or even the school to be named and weather figures related to the locality as well as the synoptic situation to be used). For further details write to Soft-Teach Educational Computing, Sturgess Farmhouse, The Marsh, Longbridge Deverill, Wilts, BA12 7EA.